



Reach the Peak Lassen Peak Trail Rehabilitation Environmental Assessment

December 2009

Lassen Volcanic National Park
Mineral, California

United States Department of the Interior • National Park Service

Executive Summary

This Environmental Assessment has been prepared to satisfy the requirements of the National Environmental Policy Act (NEPA) of 1969 as amended, including the Council on Environmental Quality (CEQ) regulations found at 40 CFR 1500 *et seq.* This Environmental Assessment also facilitates compliance with *National Park Service Management Policies* (2006) and NPS Director's Order 12: *Conservation Planning and Environmental Impact Analysis* as well as a variety of other federal laws enacted for the protection of the environment. This Environmental Assessment is intended to disclose and analyze impacts from four management alternatives developed for the rehabilitation of the Lassen Peak Trail.

Alternative A: No Action (Continue Current Management): Existing management, including ongoing maintenance and occasional reconstruction of the non-wilderness Lassen Peak Trail, would continue. There would continue to be no trailside toilets and human waste disposal problems would also therefore continue. Social / way trails would continue to be the primary means of access in the summit crater and true summit areas. Interpretation would be provided by existing interpretive exhibits and occasional staff presence. Aside from removal of older exhibits, rehabilitation or replacement of exhibits would generally only occur as these were damaged.

Elements Common to All Action Alternatives: All action alternatives (Alternatives B, C, and D) would include: rehabilitation or reconstruction of the trail tread, including rock walls and steps; shoulder season way finding / access improvements; relocation of the radio repeater structure; use of rock from within and outside the park for trail rehabilitation; helicopter transport of materials for the Peak trail rehabilitation; ongoing trail maintenance; increased trail monitoring; and potential implementation of a hiker shuttle.

Alternative B: Minor Changes in Lassen Peak Trail Visitor Experience: The Lassen Peak Trail would be rehabilitated in a single, phased project to a consistent four-foot width (including narrowing of existing wider sections) to replicate its historic condition. No additional group turnouts would be added. There would be no trailside toilets, therefore human waste disposal problems would continue. Social / way trails would continue to be the primary means of access in the crater and true summit areas. The NPS would not maintain a summit register. Limited interpretive opportunities would continue to occur from rehabilitation of existing interpretive exhibits or occasional staff presence and programs.

Alternative C: Modest Improvements in Lassen Peak Trail Visitor Experience: The lower section of trail (approximately 1.2 miles to tree line) would be widened to approximately six feet, while the upper section would remain at its historic width of approximately four feet. A trailside toilet would be provided at a wide area about 0.6 miles from the summit. Approximately 6-8 new turnouts would be constructed alongside the trail to accommodate groups of 10-15 people. There would be designated loop and/or spur trails in the summit crater area and a designated route with stabilized tread and a cable with stanchions leading to the true summit, where the summit register would be identified. A new trail in wilderness to connect the Manzanita Creek Trail to the Lassen Peak Trail would also be constructed.

Alternative D: Lassen Peak Trail Visitor Use Accommodation: The upper and lower sections of trail would be widened to approximately six feet, where possible. Trailside toilets would be provided in two locations (one located approximately 0.75-1.0 mile from the parking area and one approximately 0.6 miles from the summit). Approximately 6 turnouts would accommodate groups of 15-20 people and 2-4 turnouts would accommodate groups of 10-15 people. A formally constructed loop trail in the summit crater area would contain interpretive wayside panels. Another formal trail with even tread, including rock steps would lead to the true summit. The summit register would be moved down to the summit plateau area to allow more people to access it. A new trail in wilderness to connect the Manzanita Creek Trail to the Lassen Peak Trail would also be constructed.

Information on submitting comments during the 30-day public review period for this Environmental Assessment is contained in *Chapter II: Purpose and Need* (under Public Participation) and in *Chapter VI: Consultation and Coordination*.

How this Plan / Environmental Assessment (EA) is Organized

i. Table of Contents: This lists the chapters and primary subsections of each and where they may be found within the document.

Chapter I Introduction: This chapter introduces the park, the project area and the planning background for the project, including the purpose and significance of the park and the scope of the project.

Chapter II Purpose and Need: This chapter identifies the purpose and need for the proposed actions and the planning background for the project, including related laws, NPS policy, and park plans. It also summarizes public participation to date.

Chapter III Alternatives: This chapter describes the proposed alternative courses of action; including the reasons for dismissing options that do not meet project objectives or other defined criteria. It also identifies and provides analysis related to the selection of the Environmentally Preferable Alternative. Impact Topics describes the potentially affected resources and laws or policy relating to their inclusion in this EA. This section also identifies those resources that have been dismissed from further analysis due to their having no identified or negligible potential environmental consequences. The *Alternative Comparison Chart* (Table III-1) highlights the major differences among the alternatives.

Chapter IV Affected Environment: *Affected Environment* describes the existing environment by resource category.

Chapter V Environmental Consequences: *Methodology* identifies the means by which impacts to various resources are analyzed. It also describes NPS policy regarding impairment of park resources. *Environmental Consequences* provides analysis of effects associated with the alternatives including cumulative impacts. Similar to Chapter III: Alternatives, the Environmental Consequences section contains an *Impact Comparison Chart* (Table V-1) to compare the differences in projected impacts among the alternatives.

Chapter VI Consultation and Coordination (List of Persons and Agencies Consulted / Preparers): This chapter provides additional information about public and internal scoping, preparation and review of the EA.

Chapter VII References: This section provides bibliographical information for sources cited in this EA.

Appendix 1 Summary of Impact Avoidance, Minimization and Mitigation Measures: This section summarizes ways potential impacts to resources will be avoided, minimized or mitigated as included in the Environmental Consequences section.

Appendix 2 Minimum Requirement Analysis for Manzanita Creek Connector Trail: This section provides the reasoning for proposed construction methods to be used on the Manzanita Creek Connector Trail.

Appendix 3 Draft National Register Nomination Boundary Amendment (Detached): This is the proposed amendment that would extend the boundary of the Lassen Volcanic National Park Highway Historic District and allow listing the trail on the National Register.

Appendix 4 Preliminary Lassen Peak Trail Cultural Landscape Inventory (Detached): This section identifies the features inventoried in a recent survey of the Lassen Peak Trail and whether they are contributing to or compatible with the historic character.

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Chapter I: Introduction

General Description of Park

Lassen Volcanic National Park encompasses 106,372 acres on the southern tip of the Cascade Range in northeastern California (Figure 1). The park is located approximately 70 miles east of Redding and Red Bluff, California and 14 miles from Chester, California. It is also within a day's drive of two major metropolitan centers (Sacramento and San Francisco) as well as Reno, Nevada.

Lassen Volcanic National Park was established by an Act of Congress on August 9, 1916 "*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 the previously designated Cinder Cone and Lassen Peak National Monuments, which were established in 1907 as part of the Lassen Peak Forest Reserve. Portions of the park lie in four different counties (Tehama, Plumas, Lassen and Shasta), with most being in Shasta County.

At the time of its designation as a national monument, the eruption of Lassen Peak was the most recent volcanic eruption in the continental United States. Although the eruption of Mount St. Helens in 1980 changed that, it did not change the significance of Lassen Peak as one of the largest plug dome volcanoes in the world. In addition, the park is unique in its preservation of the three other types of volcanoes (shield, composite and cinder cones) in a relatively small geographic area. The park, sometimes referred to as Little Yellowstone (NPS HAER 2000), also contains the most extensive undisturbed network of hydrothermal resources west of Yellowstone National Park, including boiling springs, mudpots, and fumaroles (NPS 2003B). According to the park map and guide, the park is a compact laboratory of volcanic phenomena and associated thermal features except true geysers (NPS 2003C).

In addition to its geologic features, the park is at the apex of three biogeographic regions – the southern Cascades, the northern Sierra Nevada, and the Basin and Range Province. The overlap of these regions results in exceptionally high biodiversity in the park, with 779 species of plants, 56 species of mammals, 190 species of birds, 18 species of reptiles and amphibians and an unknown number of invertebrate species.

Approximately 400,000 people visit Lassen Volcanic National Park each year. The park provides a variety of opportunities for people to learn about volcanism and other park resources and to enjoy various recreational pursuits, including sightseeing, camping, picnicking and hiking. Over 75 percent of the park is congressionally designated wilderness.

Decision to be Made

This Environmental Assessment has been prepared to satisfy the requirements of the National Environmental Policy Act (NEPA) of 1969 as amended, including the Council on Environmental Quality (CEQ) regulations found at 40 CFR 1500 *et seq.* This Environmental Assessment also facilitates compliance with National Park Service policy and a variety of other federal laws, including Section 106 of the National Historic Preservation Act, Section 7 of the Endangered Species Act, the Wilderness Act, Clean Water Act, and the Clean Air Act enacted for the protection of the environment.

NEPA requires the documentation and evaluation of potential impacts resulting from federal actions on lands under federal jurisdiction. An Environmental Assessment discloses the potential environmental consequences of implementing the proposed action and other reasonable and feasible alternatives. NEPA is intended to provide decision-makers with sound knowledge of the environmental consequences of the alternatives available to them. In this case, the superintendent of Lassen Volcanic National Park

and the Pacific West Regional Director are faced with a decision regarding whether to rehabilitate the Lassen Peak Trail as described herein.

Lassen Volcanic National Park Mission

The park's mission as stated in the approved Strategic Plan is "to conserve, preserve, and protect Lassen Volcanic National Park and its geological, biological, and cultural resources for the enjoyment, education, and inspiration of present and future generations." The goals associated with this mission are:

- Natural, cultural, and wilderness resources and associated values are protected, restored, and maintained in good condition and managed within their broader ecosystem and cultural context.
- The park contributes to knowledge about cultural and natural resources and associated values; management decisions about resources and visitors are based on adequate scholarly and scientific information.
- Visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and recreational opportunities.
- Park visitors and the general public understand and appreciate the preservation of parks and their resources for this and future generations.
- The park uses current and sustainable management practices, systems, and technologies to accomplish its mission.
- The park increases its managerial capabilities through initiatives and support from other agencies, organizations, and individuals (NPS 2003B:8).

More recently, Lassen Volcanic National Park staff developed new mission and vision statements for the park's Strategic Plan (NPS 2009):

Mission: Our shared mission is to conserve, preserve, and protect Lassen Volcanic National Park, including its geological, biological, and cultural resources, for the enjoyment, education, and inspiration of present and future generations.

Vision: We, as stewards of Lassen Volcanic National Park, in collaboration with our stakeholders and partners, will demonstrate exemplary leadership in adaptability, sustainability, resource protection and interpretation of the unique features for which the park was established, and serve as a model for our global community.

Lassen Volcanic National Park Purpose and Significance

Lassen Volcanic National Park is an outstanding example of a dynamic geologic landscape and is of unquestioned national significance. Lassen Peak erupted over a six-year period between 1914 and 1921. 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 hydrothermal resources west of Yellowstone National Park, including outstanding examples of boiling springs, mudpots, and fumaroles.

In 1972 Congress designated 75 percent of the park (78,982 acres) as the Lassen Volcanic Wilderness. Appropriate recreation on lands managed for wilderness values include such activities as hiking, backpacking, horseback riding and fishing. The Wilderness Act, passed by Congress in 1964, provides guidance to federal agencies with respect to the management of wilderness areas. This act restricts the construction of roads, buildings, and other man-made improvements and the use of motorized vehicles in wilderness.

In addition to natural resources, the park preserves nationally significant cultural resources including 84 historic buildings that are on the park's List of Classified Structures (most of which date from the Civilian

Conservation Corps era), over 106 Native American archeological sites, and portions of the Nobles Emigrant Trail.

Scope of Proposed Lassen Peak Trail Rehabilitation

This Environmental Assessment is intended to disclose and analyze impacts from four management alternatives developed for the rehabilitation of the Lassen Peak Trail:

Alternative A: No Action (Continue Current Management)

Alternative B: Minor Changes in Lassen Peak Trail Visitor Experience

Alternative C: Modest Improvements in Lassen Peak Trail Visitor Experience

Alternative D: Lassen Peak Trail Visitor Use Accommodation

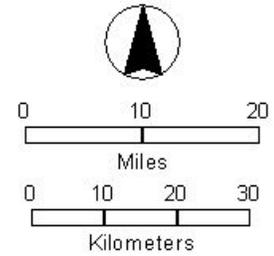
The following overall goals guided development of the alternatives:

- Improving public health and safety;
- Improving visitor access and enjoyment within the project area; and
- Improving or maintaining park natural and cultural resources conditions in the project area,

In addition, the following objectives were identified to improve resource conditions and visitor experience in the project area:

- Address threats to public health and safety;
- Improve the condition of the Lassen Peak Trail;
- Address human waste management issues;
- Increase the consistency of interpretation;
- Consider accommodating more visitors;
- Consider designation / delineation of summit area trails; and
- Consider a trail to connect the Manzanita Lake area to the Lassen Peak area.

Figure 1: Lassen Volcanic National Park Region



REGION

Lassen Volcanic National Park

United States Department of the Interior, National Park Service

Chapter II: Purpose and Need

1. Purpose and Need

The Lassen Peak Trail begins at the Lassen Peak parking lot (8,440 feet) and terminates at the top of Lassen Peak (10,457 feet). What began as a seasonal social trail in the early 1900s and was later constructed and envisioned as one of the park's premiere visitor experiences in the 1920s, has become a heavily traveled trail, a popular 2.5 mile hike to the top of one of the largest plug dome volcanoes in the world. It is a visitor experience undertaken by more than 30,000 of Lassen Volcanic National Park's 400,000 annual visitors, primarily during the 90-day summer peak season, when up to 600 people take the hike on a typical Saturday.

Hiking the non-wilderness Lassen Peak Trail is a highlight of the park visitor experience. The trail condition, however, varies from good to poor, with many trail locations that are deteriorating and eroding. This condition contributes to numerous safety concerns and resource degradation along the route. Among the most pressing problems are those that follow:

- ◆ In some locations, the trail is narrow and does not allow adequate space for two hikers to pass when traveling in opposite directions.
- ◆ Some sections of the trail are difficult to locate in the early season after the road and trailhead open. During this time, when snow still covers north-facing slopes and high elevations, some sections of the trail are consistently cut by visitors avoiding steep icy slopes. Hiking off the established route contributes to off-trail erosion and loss of plants.
- ◆ Some rock retaining walls constructed during the historic period are in need of repairs following decades of trail use. Some poorly constructed rock retaining walls have been damaged by weathering and off-trail travel.
- ◆ Although historically pit toilets were located along the trail, none are now present. As a result, the three to six hour excursion on the trail results in observable human waste impacts.
- ◆ Interpretation of the geology, scenic views and other key features associated with the trail is inconsistent and varies in appearance and themes, depending on when the signs or wayside exhibits were installed.
- ◆ Although groups frequently use the trail, there are few appropriate areas that allow groups to step aside to discuss key features or to allow other hiking parties to pass.
- ◆ The loss of some historic trail features, such as switchback-end (corner) vista points, has occurred from visitors' short-cutting switchbacks over time.
- ◆ Because access to the trail is only available from the Lassen Peak Trailhead parking area, visitors must often drive from distant campgrounds to access the trail (no trails connect to it from other popular visitor use areas).

In addition to problems primarily associated with trail access and the main trail, there are problems associated with the summit area visitor experience and resource conditions, including the following:

- ◆ The trail terminates in an unsatisfactory location for some visitors, because the current end of the maintained trail is not actually at the true summit.
- ◆ Off-trail hiking in the crater contributes to the trampling of sensitive plants and often places visitors in the position of scaling rock outcrops.
- ◆ Unmarked social trails are used to climb to the true summit and to explore the crater rim. Although marked trails in the crater rim area were constructed beginning in 1937, only remnants exist and they cannot easily be followed.
- ◆ A radio repeater located at the true summit impedes the visitor experience because it can be seen from the main park road / Lassen Scenic Byway.

Lastly, a popular adjacent area – the Vulcan's Castle, as well as connection to the Manzanita Lake area are only available via cross-country hiking and have therefore been affected by social trails.

Increasing access to the Lassen Peak Trail via a proposed new trail in wilderness would allow visitors another means to access the trail and would open access to the Vulcan's Castle, one of the park's most spectacular wilderness destinations. Extension of the Manzanita Creek Trail to the Vulcan's Castle area would provide trail access to a unique area of the park and would mitigate currently occurring resource impacts by decreasing the number of social trails.

Proposed rehabilitation of the Lassen Peak Trail would improve the visitor experience, reduce resource damage and improve visitor safety. If physical connection to the Manzanita Lake park developed area was made, it could diminish the need for visitors to drive through the park to access the trailhead and expand visitor use opportunities but would require new trail construction in wilderness.

2. Planning Background

Lassen Peak Trail

The Lassen Peak Trail was designed by NPS engineer Ward P. Webber to have a width of four feet and a grade of 15 percent. This necessitated 29 switchbacks above treeline (NPS 2009:3). According to the amended National Register nomination, Webber did the location work for a trail up Lassen Peak in the fall of 1929, as one of the final two contracts to build the Lassen Volcanic National Park Highway, which was well underway with rough grading nearby. He staked the trail route, and wrote a report about its location, in much the same way as a highway engineer would start the process of road design (NPS 2009: 5).

NPS Chief Engineer, Kittredge identified the purpose of National Park trails in a speech at a conference in 1915. As noted in the amendment to the Lassen Volcanic National Park Highway Historic District, Kittredge concluded a speech at this conference *by making a case for the importance of trails in national parks as a means for visitors to find inspiration more fully than from a road. Properly built trails, whether in the frontcountry or backcountry, constituted the best way to make new conservationists and prepare the next generation to carry on the work of protecting the national parks and the ideals associated with wilderness preservation* (NPS 2009: section 8, page 5).

The Lassen Peak Trail was originally a foot path up the peak, with some construction occurring by the early 1920s, shortly after the eruption. A March 10, 1936 report accounting for funding identifies several connections made in 1928 with the Lassen Peak Trail – one the Lake Helen-Lassen Peak Trail and another the Hat Lake-Lassen Peak Trail, although neither of these trails remain today.

The Lassen Peak Trail was later reconstructed, beginning in 1930. As noted above, in the fall of 1929, Ward P. Webber (Associate Engineer from Field Headquarters) together with Superintendent Collins staked out the route of the trail. Work began July 11, 1930. A newspaper article from the time states that the trail would have a maximum grade of 15 per cent, be four feet in width and two and a half miles long, and will take off from the summit of the Lassen Park Highway, which was to have been completed that summer (*Red Bluff Daily News* August 21, 1930).

A crew of ten men worked until September 24, when severe heavy snow fell, with the trail about 50 percent complete. Work on the trail resumed in July 1931 and continued until October 15, 1931. Work again resumed in July of 1932 (mostly for post-construction work). As noted in the report (March 10, 1936), *"the trail is built on the loose [sic] talus slope of Lassen, and heavy maintenance, as well as some reconstruction, is necessary every year. Dry rock retaining walls on the switchbacks suffered quite a bit over the winter, and a lot of time was consumed in rebuilding several of these. The very end of the trail on top of the mountain had not been completed before, and this was accomplished this season.*

In 1931, a report mentions that the grading for the trail is nearly complete but that it will be difficult to maintain.

. . . The loose volcanic ash, rocks and cinders which are characteristic of the peak continually slide into the trail bed and a standard route soon becomes filled with this material, making a narrow and rough path to the top of Lassen, which has been and shall probably continue to be the principal point of interest in this park. . .

The letter from L.W. Collins, superintendent to NPS Chief Engineer Kittredge recommends the purchase of a bulldozer to maintain the trail and states that “If this is done it will result in a continued better condition of the trail and consequently give a better impression of the National Park Service to the public” (Letter from LW Collins, Lassen National Park Superintendent to NPS Chief Engineer Kittredge).

Later in 1931, an August 13-19 trip report from Assistant Landscape Architect Merel S. Sager to Chief Landscape Architect Thomas Vint identified another ongoing maintenance issue.

. . . Construction is continuing at the upper end of this trail. Considerable difficulty is being experienced in preventing tourists from cutting across the switchbacks which results in a great deal of extra maintenance work. . . .

Figure 2: Lassen Peak Trailhead c. 1935



At the time the use of barbed wire was contemplated to prevent this short-cutting and Sager states that Vint has concurred that it may be tried, but it is unlikely that it ever was actually installed.

On July 16, 1932, a memo from Superintendent Collins to Chief Engineer Kittredge notes that “the construction and grading of the trail was completely finished last season.” This letter cites the damage being done by pack horses and the recent need to prohibit them but asks for advice on surfacing the trail with crushed rock and oil to allow them again as soon as possible because “unquestionably more people would make the trip if they could ride.” By January 20, 1933, a letter from Chief Engineer F.A. Kittredge to Superintendent Collins requests and then justifies oiling the trail to reduce dust and notes problems with the first application. This letter also highlights the Lassen Peak Trail experience:

It seems to be the ambition of practically every visitor to the park to climb Lassen Peak. And the climb is worthy of their ambition. From the parking area at the foot of the mountains, the trail, two and one-half miles long, zig-zags its way to the summit of the peak, an elevation rise for the hiker of practically two thousand feet to gain the 10,453 [sic] elevation of the Peak. The reward of the climber is a magnificent one. With the exception of Mount Shasta, some seventy-five miles to the

north, Lassen Peak overlords the surrounding country as far as the eye can see. Great vistas of vast rolling hills unfold themselves beneath him, forests become great masses of dark green, and lakes seem giant mirrors. The craters of Lassen with their many steam vents, the Spinx [sic] Head, Hermits Castle, and a small lake of cobalt blue await his exploration. Truly a worth while trip.

By 1934, a report on field activities for the road and trail shows the (then) trail and road connection.

A May – October 1934 report of CCC activities does not specifically mention the Lassen Peak Trail, however, the work summary includes trail maintenance and construction and proposed work listed near the end cites a need to develop a rock observatory on Lassen Peak with panotopo tables, telescope and benches (Assistant Landscape Architect Hoggson letter through Superintendent to Chief Landscape Architect (December 17, 1934).

By May 15, 1936, a report from Kittredge to the NPS Director (enclosing a report by George W. Reed, Associate Engineer) identifies 29 switchbacks on the Lassen Peak Trail and states that 5,000 visitors per year are climbing the peak. It also states that a topographic survey of the peak has been made and that proposed construction of a warming station and trails can now occur.

An August 28, 1936 report identifies two dry pit latrines near the bottom, two half-way up and two on the top, with one set in a clump of trees and the other two on rock. A September 28, 1936 report from Theodore G. Meier, the resident Landscape Architect to the Regional Landscape Architect states that staining was finished within September for the Lassen Peak latrines, describing “. . . *the structures half way up and on the top are conspicuous due to lack of cover, but the conventional brown sides and green roofs makes them stand out more than ever.*” Apparently these were not long-lasting because one year later pack strings are shown carrying up materials for six more.

By March 15, 1937 a report from Geo. W. Reed describes activities in 1936 and photographs show a pack string carrying up wood for a pit toilet for the top of the peak. Later text states that “*Six toilets were constructed on Lassen Peak; two of the building at ¾ of a mile above the Lassen Peak Parking area, two at 2300 ft. from the top of the existing trail and two more on the Summit. All construction sites were picked in an endeavor to screen the structures as well as possible, behind trees or rocks.*” One photograph shows excavation by the CCC in a clump of trees. A later note states that “*heavy winds during September picked the two toilets off the top of the Peak and carried them down the side toward the craters. Even though the buildings were anchored, the force of the wind was greater. The toilets were knocked down into sections by a CCC crew and weighted down with rocks. They will be reconstructed in July, 1937, when snow conditions permit. Incidentally, the structures will be anchored down with bigger and better rocks.*” Photographs accompanying this text state that the trail is for pedestrian use only and that the pack strings are an anomaly.

Information in the report goes on to state that “*A well defined trail is proposed to extend from the end of the constructed Peak Trail to the Summit of the Peak.*”

Figure 3: Lassen Peak Toilets c. 1937



Crater Rim Trail

On February 13, 1936, a memo from Superintendent E.P. Leavitt documents the need for an extension of the Lassen Peak Trail around the top of the peak, constructing 3.5 total miles of trail (including 1.0 mile of new trail). This trail (in the Crater Rim area) was laid out but only partially constructed in 1937. In 1938, there was a harsh winter and the road opened only in late August. Because that year was also the last for the CCC work in the park, work on the trail halted until after World War II. By then the warming period experienced through the mid-1930s had also ended and the crater rim area remained in snow through late summer and into the fall, likely diminishing the need for additional trail construction. Although the crater rim trail was designed and partially constructed during the period of significance, it is considered non-contributing because it was not completed as intended and has since been modified. (Later additional work was done on the trail with at least two different navigation systems – numbered posts and directional arrows painted on rocks and even at some point, an interpretive brochure to accompany these.) Today, based on staff encounters with visitors on the trail, many visitors are confused about what is allowed within the summit crater area due to confusing signs about staying on the trail and the network of social trails / user defined trails that currently exists.

Additional Background

During the Mission 66 period, it appears as if a rehabilitation project on the Lassen Peak Trail was undertaken and it is during this time that many of the non-historic mortared rock walls were constructed, however, it is clear that there were likely several rehabilitation efforts, because even these walls differ from each other based on their construction (mortar and rocks).

Toilets were routinely carried in by helicopter from about 1970 to 1995 to a point two-thirds of the way up the trail behind a large rock outcrop. Today, with no toilets, there are numerous areas where people appear to be using areas behind rocks, rock walls or interpretive signs. An August 2009 survey indicates that many of the historic and non-historic rock walls have deteriorated and are failing, either because rocks have fallen out of them or because they have been undermined or both.

3. Relationship to Laws, National Park Service Policy and Park Planning Documents

LAWS

National Park Service Organic Act (1916) (16 USC 1)

The key provision of the legislation establishing the NPS, referred to as the 1916 Organic Act is:

The National Park Service shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified . . . by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

1970 National Park Service General Authorities Act (as amended) (Public Laws 91-368, 94-458, and 95-250 – the Redwood Act) (16 USC 1a et seq.)

This act prohibits the NPS from allowing any activities that would cause derogation of the values and purposes for which the parks have been established (except as directly and specifically provided by Congress in the enabling legislation for the parks). Therefore, all units are to be managed as national parks, based on their enabling legislation and without regard for their individual titles. Parks also adhere to other applicable federal laws and regulations, such as the Endangered Species Act, the National Historic Preservation Act, the Wilderness Act, and the Wild and Scenic Rivers Act. To articulate its responsibilities under these laws and regulations, the NPS has established management policies for all units under its stewardship (see *reference below*).

National Environmental Policy Act (NEPA) (Public Law 91-190) (42 USC 4341 et seq.)

NEPA requires the identification, documentation and public disclosure of the environmental consequences of federal actions. Section 102 of the act requires that “in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, there be a detailed statement concerning the environmental impact of a proposed action.” Regulations implementing NEPA are set for by the President’s Council on Environmental Quality (40 CFR Parts 1500-1508). CEQ regulations establish the requirements and process for agencies to fulfill their obligations under the act.

NEPA contains a procedural requirement for the preparation of environmental assessments. Impacts of the proposed action and the alternatives to the proposed action are clearly presented to enable a clear basis for choice from among the options by the decision maker and the public. The NPS has adopted specific procedures for analyzing environmental impacts and complying with NEPA (Director’s Order 12: *Conservation Planning, Environmental Impact Analysis, and Decision-making*).

Clean Water Act (CWA) (Public Laws 92-500 and 95-217) (33 USC 1241 et seq.)

Under the Clean Water Act (CWA), it is national policy to restore and maintain the chemical, physical, and biological integrity of the nation’s waters, to enhance the quality of water resources, and to prevent, control, and abate water pollution. Section 401 of the CWA as well as NPS policy requires analysis of impacts on water quality. Under Section 404, the Army Corps of Engineers issues either general or nationwide permits for the discharge or dredge or fill material into the waters of the United States, depending on the nature of proposed work. *NPS Management Policies* (2006) also provide more specific direction for the preservation, use, and quality of water in national parks.

Clean Air Act (as amended) (Public Law 88-206) (42 USC 7401 et seq.)

The Clean Air Act (CAA) states that park managers have an affirmative responsibility to protect park air quality and air quality related values (including visibility, plants, animals, soils, water quality, cultural resources and visitor health) from adverse air pollution impacts. Special visibility protection provisions of the Clean Air Act also apply to class I areas, including new national rules to prevent and remedy regional haze affecting these areas. Under existing visibility protection regulations, the NPS has identified “integral vistas” that are important to the visitor’s visual experience in many NPS class I areas, and it is NPS policy to protect these scenic views. Lassen Volcanic National Park is a class I area.

Endangered Species Act (Public Law 93-205) (16 USC 1531 et seq.)

The Endangered Species Act (ESA) requires federal agencies, in consultation with the Secretary of the Interior, to use their authorities in the furtherance of the purposes of the act and to carry out programs for the conservation of listed endangered and threatened species (16 USC 1535 Section 7(a)(1)). The ESA also directs federal agencies, in consultation with the Secretary of the Interior, to ensure that any action authorized, funded, or carried out by a federal agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat (16 USC 1535 Section 7(a)(2)). Consultation with the United States Fish and Wildlife Service (USFWS) is required if there is likely to be an effect.

Wilderness Act (1964) (Public Law 88-577) (16 USC 1131-1136)

The Wilderness Act and legislation establishing individual units of the national park system as wilderness establish consistent direction for the preservation, management, and use of wilderness and prohibit the construction of roads, buildings and other man-made improvements and the use of mechanized transportation in wilderness (with exceptions). The public purpose of wilderness in national parks includes the preservation of wilderness character and wilderness resources in an unimpaired condition, as well as for the purposes of recreational, scenic, scientific, education, conservation, and historical use. Approximately 75 percent of Lassen Volcanic National Park is designated wilderness. Another area is proposed wilderness.

National Historic Preservation Act (1966 as amended) (Public Laws 89-665 and 96-515) (16 USC 470)

The purpose of the National Historic Preservation Act (NHPA) is to preserve, conserve, and encourage the continuation of the diverse traditional prehistoric, historic, ethnic and folk cultural traditions that underlie and are a living expression of our American heritage. It directs federal agencies to inventory historic properties (Section 110) and to take into account the effect of any undertaking (a federally funded or assisted project) on historic properties (Section 106). "Historic property" is any district, building, structure, site, or object that is eligible for listing in the National Register of Historic Places because the property is significant at the national, state, or local level in American history, architecture, archeology, engineering, or culture. Requirements for implementing Section 106 are found in the Code of Federal Regulations (36 CFR Part 800).

Archaeological Resources Protection Act of 1979 (ARPA) (Public Law 96-95) (16 USC 470aa)

This act provides a means for additional protection of archeological resources and for prosecuting the collecting of resources on federal lands. Its purpose is to secure for the present and future benefit of the American people, the protection of archeological resources and sites that are on public lands and Indian lands (NPS 2006: 5.3.5.3)

MANAGEMENT POLICIES

Cultural Resources (5.1.3.2.1 National Register Nomination)

Park resources that appear to meet the criteria for the National Register of Historic Places will be nominated—either individually, as components of historic districts, or within multiple property nominations—for listing by the Keeper of the National Register. . .

5.3.5.2 Cultural Landscapes

The treatment of a cultural landscape will preserve significant physical attributes, biotic systems, and uses when those uses contribute to historical significance. Treatment decisions will be based on a cultural landscape's historical significance over time, existing conditions, and use. Treatment decisions will consider both the natural and built characteristics and features of a landscape, the dynamics inherent in natural processes and continued use, and the concerns of traditionally associated peoples.

The treatment implemented will be based on sound preservation practices to enable long-term preservation of a resource's historic features, qualities, and materials. There are three types of treatment for extant cultural landscapes: preservation, rehabilitation, and restoration.

5.3.5.2.1 Preservation

A cultural landscape will be preserved in its present condition if

- *that condition allows for satisfactory protection, maintenance, use, and interpretation; or*
- *another treatment is warranted but cannot be accomplished until some future time.*

5.3.5.2.2 Rehabilitation

A cultural landscape may be rehabilitated for contemporary use if

- *it cannot adequately serve an appropriate use in its present condition; and*
- *rehabilitation will retain its essential features and not alter its integrity and character or conflict with approved park management objectives.*

5.3.5.2.3 Restoration

A cultural landscape may be restored to an earlier appearance if

- *all changes after the proposed restoration period have been professionally evaluated and the significance of those changes has been fully considered;*
- *restoration is essential to public understanding of the park's cultural associations;*
- *sufficient data about that landscape's earlier appearance exist to enable its accurate restoration; and*
- *the disturbance or loss of significant archeological resources is minimized and mitigated by data recovery.*

6.3.10.2 Trails in Wilderness

Trails will be permitted within wilderness when they are determined to be necessary for resource protection and/or for providing for visitor use for the purposes of wilderness. . . Trail maintenance structures (such as water bars, gabions) may be provided, under minimum requirement protocols, where they are essential for resource preservation or where significant safety hazards exist during normal use periods. Historic and/or prehistoric trails will be administered in keeping with approved cultural resource and wilderness management plan requirements.

9.2.2 Trails and Walks

Trails and walks provide the only means of access into many areas within parks. These facilities will be planned and developed as integral parts of each park's transportation system and incorporate principles of universal design. Trails and walks will serve as management tools to help control the distribution and intensity of use. All trails and walks will be carefully situated, designed, and managed to

- *reduce conflicts with automobiles and incompatible uses;*
- *allow for a satisfying park experience;*
- *allow accessibility by the greatest number of people; and*
- *protect park resources.*

Heavily used trails and walks in developed areas may be surfaced as necessary for visitor safety, accessibility for persons with impaired mobility, resource protection, and/or erosion control. Surface materials should be carefully selected, taking into account factors such as the purpose and location of a trail or walk and the potential for erosion and other environmental impacts. . .

9.2.2.2 Hiking Trails

Trail design will vary to accommodate a wide range of users and be appropriate to user patterns and site conditions. Wetlands will generally be avoided, and where possible they will be spanned by a boardwalk or other means, using sustainable materials that will not disturb hydrologic or ecological processes. Backcountry trails will offer visitors a primitive outdoor experience, and these trails will be unsurfaced and modest in character except where a more durable surface is needed. The use of nonnative materials is generally not permitted on backcountry trails.

9.3.1.5 Wayside Exhibits

Wayside exhibits may be provided along roads and heavily used walks and trails to interpret onsite resources.

PARK PLANNING DOCUMENTS

LASSEN NATIONAL PARK GENERAL MANAGEMENT PLAN (NPS 2002)

The park's General Management Plan/Environmental Impact Statement (NPS 2003B) provides long-term direction for park resource preservation and visitor use. Management zones and their "prescriptions provide the basis for a system of management intended to ensure that resources are passed on unimpaired to future generations and visitor experiences remain high quality (NPS 2003B:18)."

The proposed project area primarily occurs within the Scenic Drive Zone as described below (NPS 2003B:19-20):

This zone includes the main park road extending from the Highway 44 junction at the north entrance to the southwest entrance. It encompasses the paved roads, pullouts, overlooks, and associated trails and small picnic areas, parking areas and other facilities that support visitor touring, including the Lassen Peak Parking Lot and the Lassen Peak Trail.

Resource Conditions goals for this zone state: *Although there is concentrated visitor use and extensive development in this zone, natural systems are not significantly affected. Biological inventories and assessments provide sufficient information to ensure that there are no impacts from development or visitor use on sensitive or threatened and endangered species habitat, wetlands are avoided in any new development and restored where already impacted, thermal areas are protected from inappropriate visitor uses, and streams are protected from erosion and polluted runoff.*

Visitor Experience Criteria note: *Visitors use the paved roadways, trails and associated developments in the scenic drive zone to tour the park, enjoy scenic overlooks and interpretive media and gain access into other park zones. . . Some trails and most facilities in this zone are accessible to disabled persons.*

Management Criteria include: *Intensive management is provided . . . to ensure resource protection and public safety with . . . regular trail, road and roadside facility maintenance. . . Interpretation includes signs, displays, wayside exhibits and milepost guides . . . Facilities are rustic and consistent with the defining elements of the cultural landscape. . .*

The Manzanita Creek Connector Trail occurs partially within the Scenic Drive Zone (identified above) and partially within the Wilderness Zone (NPS 2003B:18-19):

Resource Conditions goals for the Wilderness Zone state:

Natural resource conditions are intended to be pristine in this zone, regulated fully by natural processes uninfluenced by human activities, except as may be needed to restore natural conditions. . . Plant and animal communities function as part of an entire ecosystem, and natural geologic processes proceed unhindered. . . Historic structures and sites, cultural landscapes, ethnographic and archeological sites within the zone are documented and appropriate preservation standards applied.

Visitor Experience Criteria note:

Visitors to the wilderness experience a landscape where human impacts are minimized. Use of this zone requires a relatively high degree of physical exertion and an extended time commitment. . . Opportunities for independence, closeness to nature, tranquility and the application of outdoor skills are high. There is a low probability of encountering other visitors or NPS staff except in the vicinity of lakes. Visitor use at lakes is dispersed and of low intensity.

Management includes:

Offsite management of visitor behavior includes wilderness visitor education programs, such as Leave No Trace®. Developed facilities are minimal in this zone, consisting of trails, minimal directional signing and bridges where essential at key stream crossings. . .

ENVIRONMENTAL ASSESSMENTS

Repave and Rehabilitate A Portion of the Lassen Volcanic National Park Highway (Mileposts 6.7 to 28.4) Environmental Assessment (May 2005)

This project is the completion of the rehabilitation of the Lassen Volcanic National Park Highway (remainder of the main park road), a distance of about 21.7 miles. Proposed project work (partially completed) includes repair and rehabilitation of the campground loop roads at Manzanita Lake, Crags Campground, Lost Creek Campground and North and South Summit Lake campgrounds. Road rehabilitation began at the end of the previous rehabilitation project, just north of the Bumpass Hell Parking Area, and extended northward to where the Phase I project concluded at the Manzanita Lake Campground Entrance Road. Like the first phase of this project, it included repaving and rehabilitation of numerous areas along the route, including spur roads providing access to campgrounds and picnic areas, and pullouts. This project is ongoing and should be completed by fall 2010.

Warner Valley Comprehensive Site Plan / Draft Environmental Impact Statement (in process)

The Warner Valley Comprehensive Site Plan is meant to address natural and cultural resource conflicts and to improve circulation and parking in Warner Valley. The current NPS planning effort has several primary purposes: (1) improvements to the visitor experience and safety through improvements to infrastructure and relocating infrastructure so it is less visible; (2) ecological restoration of the larger Warner Valley fen and wetland areas; (3) repair or removal of Dream Lake Dam and restoration of the damaged riparian/wetland complex; and (4) removal of the non-contributing features from Drakesbad Guest Ranch Historic District. All alternatives would preserve the 10 historic buildings in Drakesbad. They also propose restoration of the Drakesbad meadow, but accomplish it in different ways.

Alternative 2 (the agency-preferred and environmentally-preferred alternative) includes the following components: (i) ecological restoration of wetlands throughout Warner Valley along with permanently filling ditches with appropriate soil in Drakesbad Meadow; (ii) creating a concession housing and service center outside of the Drakesbad Guest Ranch Historic District composed of tent cabins surrounding a single-story bathhouse building; and (iii) removing Dream Lake Dam and allowing the area to revert to a riparian/wetland complex.

Two additional alternatives are analyzed in the EIS: *Alternative 1*, the No Action Alternative would continue current management practices; *Alternative 3* includes: (i) restoration of Warner Valley fen through the damming of ditches; (ii) creating a concession housing and service center outside the Drakesbad Guest Ranch Historic District composed of a two-story dormitory building with bathrooms; and (iii) re-constructing Dream Lake Dam to Bureau of Reclamation engineering standards.

The Draft EIS was released in August 2009. Public comments were due November 21, 2009.

4. Public Participation

Public involvement is a key component of the NEPA process. In this part of the process, the general public, federal, state, local agencies and organizations are provided an opportunity to identify concerns and issues regarding the potential effects of proposed federal actions. The opportunity to provide input is called "scoping."

Internal scoping is the effort to engage professional staff from Lassen Volcanic National Park and other NPS offices to provide information regarding proposed actions that may affect park resources. The park conducted internal scoping beginning in spring 2007 upon initial development of a project proposal in response to the call for NPS centennial projects from the Pacific West Regional Office. A variety of comments from park staff regarding vegetation, wildlife, maintenance, water resources and planning concerns have been received since that time. In addition, specific comments were provided by the USGS regarding an initial proposal to develop a new trail on the southwest-face of Lassen Peak. Other specific comments and a report were provided by trail designers from the California State Parks based on a site visit to ascertain the condition of the Lassen Peak Trail with the trails manager. Additional internal scoping meetings were held with the Lassen Park Foundation, the non-profit park organization supporting alternative development and potential implementation of the proposed project through fundraising. An informal hike up Lassen Peak was also provided for the National Park Trust board. Formal meetings to develop alternatives for the proposed project began in July 2008.

Public scoping was conducted through a press release was issued on August 1, 2008 that was published in the Chester Progressive (8/6/08) and Redding Record Searchlight (9-2-08). Informal surveys of visitors to the Lassen Peak Trail were also conducted in August and September of 2008. The formal public scoping period for this Environmental Assessment occurred from August 1, 2008 to September 15, 2008.

Lassen Volcanic National Park staff provided surveys to visitors hiking the Lassen Peak Trail during informal encounters on the Lassen Peak Trail for about a week. These surveys were also available from a box at the Lassen Peak Trailhead and in the visitor center during the public scoping period. The surveys contained the following questions:

1. The NPS is considering putting waterless toilets ½ mile below the summit. These toilets are likely to be visible from the trail and will require some maintenance trips with llamas or helicopters. Do you want trailside toilets and do you have related suggestions?
2. Many visitors' experience on the Lassen summit has been hemmed in by NPS installed rare plant fences and a permanent snow field. This has had the desired effect of protecting the resources. The permanent snowfield has melted and the NPS is considering a more defined trail to the true summit and perhaps an interpretive loop trail. If the NPS defines trails we will probably request that visitors refrain from unstructured exploring of the crater. Would you favor defined trails? Would you like benches and/or more exhibits at the top?
3. The current trail was not built to accommodate the number of hikers who currently climb the peak during July and August. Rather than widening the trail, NPS could limit hikers through a free day use permit system or by reducing the number of parking spaces. Would you support either idea?
4. If the NPS created an 8-mile trail from Manzanita Lake, up Manzanita Creek, through the saddle between Eagle Peak and Ski Heil Peak and down to the Peak Parking lot, would you use it?
5. Please give us any other suggestions about what would have made your hike more enjoyable or would help the NPS protect the natural and cultural resources?

A summary of responses to these questions is provided below.

In addition to approximately 39 Lassen Peak Trail Questionnaire forms turned in, another eight emails and two comment letters were received during the public scoping period: all were from individuals. No letters from non-profit or other organizations were received. One letter was received (prior to public scoping) from a public agency representative (USGS). The public comments were received via U.S. mail, email (8), fax and in person. The summary below includes information from these additional public scoping comments.

During internal scoping, the park's USGS representative considered the idea of a southwest face trail to the summit as advocated by some park staff (see *Alternatives Considered But Dismissed* in the next chapter). This letter also addressed the potential for impacts to soils and vegetation on the lower and upper parts of the trail, stating that the lower portion where vegetation occurred was wide enough to allow visitors to pass on the trail, whereas the upper portion, where there was little soil and little vegetation was narrower. Vegetation concerns are primarily associated with alpine areas on the summit. Finally, this letter noted that "construction of a loop at the summit would probably reduce the tendency for hikers to wander off the poorly established route and help to protect sensitive plants. But in many years [as noted on the survey form] snow cover at the summit persists well into late summer and will make it difficult to establish a route and maintain a trail (Clyne 2007)."

Toilets

Slightly more than half (22) of the visitors or parties who participated in the survey thought toilets along the trail were needed. Sixteen others thought they were not needed or should not be provided and one person did not answer the question. One email response commented on the smell of urine but advocated the need for toilets only associated with the construction of the loop trail at the summit. Based on staff encounters with visitors, when the trail is crowded and especially in the afternoon most people seemed to want toilets. When the trail is not crowded most don't want them. Many visitors identified the need for toilets to blend in, and also understand how difficult it will be to maintain them. Several comments indicated adamant opposition to locating toilets alongside the trail, including one from the

leader of school and summer camp groups of kids who stated that (based on frequent visits) a restroom has never been needed by these groups.

Designated Trails to True Summit / Summit Crater

Most (24) visitors or parties thought designated trails should be provided, while four disagreed with designated trails (with three citing a desire to explore / or be allowed within unstructured areas as well) and eleven did not answer the question. One commenter suggested a trail with cobblestones, while another advocated a loop trail. Based on staff encounters with visitors on the trail, many visitors are confused about what is allowed within the summit crater area due to confusing signs about staying on the trail ("Do not leave the trail") based on the obvious network of social trails / user defined trails that currently exists. Many individuals enjoyed the scramble to the top but identified concerns about safety and effects on alpine vegetation as well as a confusing array of possible routes. One commenter stated that unless there have been safety issues associated with the current informal scramble, than it should be retained. (While the scramble appears dangerous, the park has documented few injuries in this area.)

Reducing Parking Capacity

Only a few people or parties (6) indicated that parking should be reduced. The others were essentially evenly split by not answering the question (16) or by not recommending any reduction (17).

Requiring Permits to Limit Hikers / Trail widening to Accommodate More Visitors

There was a fairly even split regarding visitors or parties who thought permits were a good idea (14) but slightly more were opposed to them (16). Others did not answer the question (7) or thought permits might be o.k. during certain times (2). In this discussion, additional comments included widen the trail (2) or do not widen the trail (2). Two additional commenters submitting later letters disagreed with widening the trail. Based on encounters with visitors on the trail, most believed the trail to be wide enough. Several commented that it could be wider in some places. Most thought trail conditions were fine as is. When presented with a choice between widening the trail or adding permits, nearly all were supportive of widening. Email and letter comments generally indicated that widening was not necessary. A few visitors verbally expressed the desire for a less slippery tread surface.

Interpretive Exhibits

When asked about more exhibits or an interpretive trail visitors or parties were essentially evenly divided, with 16 agreeing with the need for new exhibits or an interpretive trail and 15 disagreeing with one or both of these. Eight people did not answer the question. Encounters with visitors and comment forms also resulted in the following comment: Provide additional interpretive signs, especially those that identify distance (mileage) and viewshed features. Other commenters identified a desire for more information about hiking etiquette and rare plants. One commenter favored adding a message about the importance of soundscape (silence) on the peak. Based on trail encounters with visitors, most liked the interpretive signs and wanted more, however as the season waned in September, there were more visitors requesting fewer signs.

Other Signs

In addition to more frequent or more consistent mileage markers on the trail to the summit, some comments advocated signs identifying whether or not restrooms were available.

Benches

Ten visitors or parties favored benches on top, while 17 did not and 11 did not answer the question. Encounters with visitors on the trail identified a desire for landscape appropriate seating (flat rocks vs. benches). At least one commenter thought benches would detract from the accomplishment of climbing the peak.

Manzanita Creek Connector Trail

Twenty visitors or parties were in favor of constructing the connector trail, while six were opposed to it. Five did not answer the question and another eight thought they might hike it. Based on encounters with visitors on the trail, some visitors were very enthusiastic about it while others were not opposed but may have not understood park geography enough to understand what was proposed. Some visitors thought it

would be too long unless a shuttle was available. Several of the later emails / letters also indicated a strong desire to see this trail constructed. One commenter suggested adding a loop around Vulcan's Castle so people could take a loop hike from the Lassen Peak parking lot and back.

Trail Short-cutting

Many visitors acknowledged that the cutting of switchbacks is a problem. In some cases, however, the alternate route seems nearly as well developed as the designated trail. Two park identified locations where short-cutting occurs are primarily associated with snow retention on switchback corners, rather than willful trail cutting by visitors once the trail is free of snow (see *Purpose and Need* above).

Presence of Edith's Checkerspot (Euphydryas editha) and Sheridan's Hairstreak (Callophrys sheridanii) Butterflies

One comment letter identified the presence of the above butterflies associated with the trail and requested minimal alteration in the area of their habitat.

Other Comments

The following ideas were expressed by many comments:

- The trail, its width and visitor experience are fine without improvement.

The following unrelated comments were expressed by one or two comments:

- Consider locating an anemometer and/or thermometer on the summit plateau.
- Keep campgrounds open later in the season.
- Promote other peaks and a trail to Chaos Crags.
- Provide more merchandise (memorabilia) for sale at Manzanita Lake.
- Keep the food kiosk open later.
- Regulate the number of visitors.

a. Issues and Concerns Addressed in this Document

All of the above issues and concerns were considered in the planning process and/or are addressed in this document except for the unrelated comments identified under the next heading.

b. Issues and Concerns NOT Addressed in this Document

The following issues, however, were considered but rejected by the planning team. Reasoning is given in *Chapter III: Alternatives* under the heading *Alternatives Considered but Rejected*.

- Providing water on the trail or at the parking lot.

There is currently no feasible way to provide water on the Lassen Peak Trail without major impacts to other park resources.

- Regulate the number of visitors

Park staff initially considered strategies to manage the number of hikers on the Lassen Peak Trail, including changing the size of the parking lot or establishing a day use permit for hiking the trail.

The following issues generated through public scoping are not within the scope of this project and are therefore not analyzed in detail in the document:

- Provide more merchandise (memorabilia) for sale at Manzanita Lake.
- Keep campgrounds open later in the season.
- Keep the food kiosk open later.
- Promote other peaks and a trail to Chaos Crags.

The proposed project does not include changes to concessions operations, hours of operation or other areas outside the Lassen Peak Trail / proposed Manzanita Creek Connector Trail corridor.

Public Review of Environmental Assessment

This Environmental Assessment is being made available to the public, federal, state and local agencies and organizations through press releases distributed to a wide variety of news media, direct mailing, placement on the park's website and announcements in press releases as well as in local public libraries (Plumas (Quincy), Tehama (Red Bluff), and Shasta (Redding and Burney Branch) county libraries, Susanville, Chester, Singletown, and Chico libraries). Copies of the document may also be obtained from:

Mail: Superintendent, Lassen Volcanic National Park
P.O. Box 100, Mineral, California 96063

Fax: (530) 595-3262

Email: lavo_planning@nps.gov

Internet (PEPC): <http://parkplanning.nps.gov> or

Internet (Park): <http://www.nps.gov/lavo/parkmgmt/index.htm>

Responses to comments on the Environmental Assessment will be addressed in the proposed Finding of No Significant Impact (FONSI) or will be used to prepare an Environmental Impact Statement (if appropriate). (For more information about specific agency and staff consultation, see *Chapter VI: Consultation and Coordination*).

Chapter III: Alternatives

Introduction

The interdisciplinary project team sought input and analysis from subject matter experts, and applied ideas from public scoping to develop reasonable and feasible alternative actions that would meet the project's purpose and need (Chapter II).

The following goals guided development of the alternative actions proposed for the Lassen Peak Trail Rehabilitation project:

Improve Resource Conditions and Visitor Experience by:

- Minimizing trail-cutting;
- Improving safety conditions;
- Addressing human waste management issues (including the lack of a trailside toilet);
- Increasing the consistency of interpretation;
- Considering a trail to connect the Manzanita Lake area to the Lassen Peak Parking area; and
- Considering designation / delineation of summit area trails.

Guided by the Lassen Volcanic National Park General Management Plan (NPS 2002), interdisciplinary team participants from the park and region considered a number of key criteria to achieve the desired visitor experience, including the physical needs for trail rehabilitation, the tools that would be used in trail rehabilitation, and visual impacts from within and outside the project area, to formulate the management strategies described in the range of alternatives.

Among the key considerations were improving the visitor experience on the trail, including trail use, human waste management, safety and interpretation; and protecting natural, cultural and wilderness resources. Proposed specific improvements considered include features that would allow for hikers to safely pass in opposite directions; improve the visual quality and content of interpretive signs; address public health issues regarding human waste; ongoing protection for sensitive plants; eliminate off-trail travel; and providing a means for visitors to reach the trail from the north side of the park, as well as to access the adjacent Vulcan's Castle area.

Background

The Lassen Peak Trail was constructed beginning in 1929, with most construction done between 1930 and 1931. By 1932, some of the dry-stack masonry walls were repaired. The trail was designed with a grade of less than approximately 15 percent and a width of four feet by then NPS Engineer, Ward P. Webb. The trail ascends Lassen Peak, which contains slopes of between 30 and 80 percent.

The Lassen Peak Trail currently has a variable width of two to eight feet, is approximately 2.5 miles long and ascends Lassen Peak at a variable grade of approximately 15 percent. It is stabilized in 66 locations with either dry-stack or wet mortared rock walls of two or more tiers. Rock within the dry-stack rock walls is primarily locally sourced native rock, while rock in the wet mortared walls is a combination of locally sourced native rock and rock imported from other sites within or outside the park.

Types of Rock walls

Dry-stack / Dry-laid Rockwall: A dry-stack or dry-laid rockwall uses friction to keep it together.

Dry-Stack Rock walls are laid in courses, with care to maximize connection points between rocks.

Wet Mortar Rockwall: A wet mortar rock wall uses cement for stability.

1. Lassen Peak Trail Project Area Description

The Lassen Peak Trail parking area (8,440 feet) is located approximately 6.75 miles from the southwest entrance station. There, the heavily used 2.3 mile long Lassen Peak Trail ascends to a plateau near the summit of Lassen Peak.

Trail Description: The existing trail has a variable width from approximately 3-8 feet wide over the bottom ½ mile, narrowing to a single track from 2-4 feet wide as it ascends.

Trail Conditions: The trail may often be snow-covered even into late July. As a result off-trail impacts (including short-cutting of switchbacks) are a common occurrence and have resulted in numerous social trails emanating from the main trail. One of the most obvious of these occurs near the base of the trail on the south face of the first switchback, at approximately 8,500 feet. A 2002 trail assessment called for a visual barrier with interpretive / regulatory signage at this location.

Above this section, near approximately 9,200 feet are a series of rock walls with differing construction methods and origins. All are constructed of rock, some are dry-stack masonry and well-constructed, others are poorly consolidated dry-stack masonry, and others are mortared / concrete reinforced retaining wall with some laid on and some keyed into the slope.

Over the years, most of the existing switchbacks have been heavily modified due to snow retention in the switchback corners. In many cases, this snow retention encourages hikers to cut the trail where the snow meets the trail instead of continuing out onto the snow-covered section of trail (*see adjacent photo*). Over time this has resulted in shorter switchbacks. Loose material sliding from above each leg also has filled the trail tread, slowly moving the trail uphill. As this occurs, the grade of the trail becomes steeper. Some switchbacks have been shortened by as much as 60 feet, making the overall grade steeper by shortening the distance covered to reach the next switchback.

Summit Crater Area: Above the summit plateau, is a partially constructed trail heading toward the crater area that gives way to numerous social trails as well as to an undesignated route leading to the true summit. At the true summit is a radio repeater.

True Summit: The true summit area of Lassen Peak is located a short distance from the summit plateau, near the existing radio repeater.

Repeater: The structure housing the Lassen Peak radio repeater has often been defaced. Equipment at the site includes an adjacent associated photovoltaic panel and stand to provide power to the electronic equipment. Many hikers have questioned the purpose of the structure at this location. It is a point of visitor attention that detracts from the surrounding view. A 2002 trail assessment noted that the effects from the repeater could potentially be minimized by interpretive / identification signage. There is currently no signing explaining the existence and importance of the structure. As a result, the structure is a frequent target of vandalism, including damage and graffiti.

2. Alternative A: No Action (Continue Current Management)

Vision: The Lassen Peak Trail would retain its current rugged hiking experience. Although ongoing maintenance of the trail and rock walls would continue to occur, there would be no major rehabilitation of deteriorating elements, including the trail tread.

Alternative A Summary: There would be no change in the Lassen Peak Trail from current conditions. Ongoing maintenance would continue to occur and there could be occasional reconstruction of features (including rock retaining walls) however, overall rehabilitation of the trail in a single planned project would not occur. There would continue to be no trailside toilets and human waste issues would therefore also continue. Social trails would continue to be the primary means of access in the crater and true summit areas. Limited interpretive opportunities would continue to occur from existing interpretive exhibits or occasional staff presence and programs. Rehabilitation or replacement of exhibits would generally only occur as these were damaged.

Lassen Peak Trail to Summit Plateau

Width: The Lassen Peak Trail has a variable width. It varies from approximately two to eight feet, depending on the section (with the lower portions of the trail generally being wider and the upper portions

narrower) or where it is constrained by vegetation, such as where it passes between mature whitebark pines.

Grade: While the overall grade of the trail was designed to be less than 15 percent (see *Background* above), it is locally steeper. Over the years the trail has also become steeper at the switchback corners due to these switchbacks becoming shorter from short-cutting during shoulder seasons and from deferred maintenance.

Group Turnouts: There is one designated turnout approximately 2,000 feet (1/3 mile) from the trailhead that is used informally to stage groups and as a formal turnout for existing interpretive programs. It is about 15 feet square and can accommodate approximately 20 people.

Interpretation: The existing array of interpretive exhibits from 2002 would be retained. (The 1970s era exhibits are planned for removal under all alternatives.) The 2002 interpretive exhibits focus primarily on interpreting the eruption of Lassen Peak and on other geological information. A number of the exhibits also identify distances from the summit.

Summit Plateau

Visitor Experience: The denuded plateau area would continue to be a rest area/lunch destination for hikers. Because there is no elevation marker at this location many visitors would continue to believe they had reached the summit of Lassen Peak. Other visitors, however, would continue to walk over existing social trails to scramble to the true summit area. These and other visitors would also walk into the crater area, although there would continue to be no signs directing visitors to either the true summit or the summit crater area.

Rare Plant Enclosure: The low profile fence enclosure that protects an endemic rare plant would be retained. As noted in the Superintendent's Compendium of Regulations, this area located at approximately 10,360 feet is closed to all foot traffic. As the rare plant area expands, the fenced area would also be expanded.

Interpretation: Interpretive wayside exhibits mounted on concrete/stone bases would be retained to provide information and orientation on the summit plateau.

Summit Crater Area

Access: In 1937, the park started construction of a formal Crater Trail. Records suggest it was not finished then but later interpretive brochures identify a trail in use in the mid-1950s. Since then the trail has deteriorated. Access in the crater area is now via a disjointed series of social trails. A few marked rocks delineating the trail with arrows and sections of constructed trail remain but are confusing. There is also a constructed rock enclosure. Because there would continue to be no designated trails in this area in Alternative A, the social trails and these remnant constructed features would likely remain, however the social trails could be restored over time as staffing and funding permit.

Interpretation: Although a trail guide linked to numbered posts has been located that formerly interpreted the crater area, the posts have been removed and the guide is no longer published. As a result, there would continue to be no interpretation in the crater area under Alternative A.

True Summit

Access: Access to the true summit would continue to be via a scramble over unmarked social trails and uneven, loose rocks.

Summit Register: There would continue to be a steel can containing a note pad that is used as a summit register in an inconspicuous location within the rocks at the true summit; this location would continue to be unsigned and unadvertised. Currently, this summit register is not managed or maintained. This kind of register is similar to other peaks in the park.

Toilets

There would continue to be no toilets located alongside the Lassen Peak Trail, although toilets would continue to be provided at the Lassen Peak Trail parking area. Visitors would continue to individually select privacy in out-of-the-way locations to deposit human waste and/or to use toilets located at the trailhead.

Restoration

In addition to existing planned restoration projects, there would be ongoing restoration of social trails as staffing and funding permitted.

3. Actions Common to All Action Alternatives (B, C and D)

Trail Improvements

Shoulder Season Way Finding:

As in Alternative A, bamboo or other narrow wands would be used to mark the location of the Lassen Peak Trail during the shoulder seasons to prevent visitors from becoming lost or from wandering into unsafe areas near the edges of switchbacks. Trail wandering would continue to occur in spring and fall when the trail is snow-covered. Wandering the trail also minimizes trail-cutting and therefore erosion damage. The park also uses crews to shovel trenches in some sections.

Shoulder Season Access:

Although stairs were part of the original design for the trail, most of these areas appear to have deteriorated and then been removed over time. From the elevation gain alone (2,000 feet in 2.3 miles) stairs were essential. There are currently two eastern switchback ends on the lower section of trail where snow / ice obscure the existing trail during spring and fall and visitors now need to choose between safety and resource damage options by traversing a steep, icy section of trail or cutting a switchback. Based on trail-cutting evidence, it is clear that visitors opt for the safest route. To accommodate this use, a series of steps to form a trail bypass would be constructed in these two areas to allow for improved visitor safety during spring and fall. Other similar areas where steep icy sections preclude walking on the established trail could also be identified and slight reroutes constructed over time as needed. The number of sections with steps would be determined depending on the success of initial sections designed to curb switchback-cutting.

Repeater: As noted above, there is currently a radio repeater located near the true summit of Lassen Peak. The repeater, however, is not marked or interpreted. Under current conditions, periodic maintenance of the electronics and structure requires helicopter transportation to move tools, equipment and technical staff to perform work. Winter work on the electronics, which is periodically necessary, can be very hazardous due to severe environmental conditions. Department of the Interior mandated changes to existing electronics (including narrow-band and digital radio use) will require a larger structure to house additional equipment necessary and will also likely require a larger photovoltaic panel array.

Therefore, under all alternatives, the park would remove the repeater structure, electronics and photovoltaic array. Frequency spread modeling and analysis has identified other locations that can give similar radio coverage for all agencies that use this site. The repeater would be left in place for three years to allow for an alternative system to be constructed in another location(s) to provide acceptable radio coverage.

Trail Construction

Procurement of Materials: Because most rock found alongside the Lassen Peak Trail is not appropriate for building rock walls and/or because the quantities needed would result in the creation of borrow areas or dangerous procurement using high-lining to transport rock on steep, unstable slopes, rock needed for rock wall construction would be obtained from existing wall deconstruction, from loose talus at the Lake Helen quarry or from outside the park. The majority of the rock would come from local quarries outside the park. It would be trucked to Lost Creek quarry and then air-lifted to pre-identified landing zones along the trail. Small quantities would also be harvested from the Helen Lake quarry and locations on the peak.

Transport of Materials: Because of the need to import rock and other fill materials from outside the park to the Lassen Peak Trail project area, helicopters would be used to transport materials to strategic locations specifically selected to minimize impacts to soil and vegetation and to provide for ease of handling the imported materials. The rock would then be moved to the job site by carts or other low impact mechanized devices. Because the trail is not built to stock use standards and because the trail currently has sections of steps not able to be traversed by wheeled carts, and because the volume of rock to be removed would be relocated more safely and quickly during the short work season, helicopters have been determined to be the most effective tool. NPS staff will determine the safest mix of helicopter support and trail carts to safely and efficiently rehabilitate the trail. Movement of these materials and supplies would be timed to minimize effects on visitor experience. Equipment and materials would most likely be staged from Lost Creek helipad and flown to appropriate trailside locations and then moved by hand, trail cart or stock from those locations to individual project sites along the trail. For logistical reasons, stock is the least likely means that would be used to transport rock. (There would be no helicopter transport of materials associated with the construction of the wilderness-located Manzanita Creek Connector Trail in Alternatives C and D.)

Rock walls: New and rehabilitated rock walls would be constructed with typical design details. Proposed rock wall designs are based on NPS standard trail designs (including the collective expertise of park and NPS trails staff). The typical design is for a four-foot high wall built on the steepest slopes. Variations of this design would be used for most walls (which are generally two to three feet high and are on less steep slopes). Similarly, for the handful of walls that exceed four feet, a modified design would be used. Typical designs have also been reviewed by State of California trails staff, who have concurred that the proposed design drawings represent a safe and long lasting approach.

Trail Maintenance

Following trail rehabilitation and in areas that would not be rehabilitated (such as the true summit and summit crater areas in Alternative B) there would continue to be ongoing trail maintenance as appropriate to minimize unsafe trail and facility conditions for visitors. The trail naturally deteriorates over time from snow creep and other weather related factors.

Trail Monitoring

Periodic monitoring of the Lassen Peak Trail would occur by resource, interpretive, maintenance or law enforcement park staff during the construction process for this project. Studies in other parks have shown that a uniformed presence improves compliance with resource protection measures and improves visitor safety more than signs or other methods. As a result, under all action alternatives, the park would endeavor to have a uniformed NPS staff member present on the trail during high use periods.

Hiker Shuttle

In all action alternatives, the park would create a new hiker shuttle to move visitors between points of interest along the main park road, including between Manzanita Lake Campground and the Lassen Peak Parking Lot. This would likely be most beneficial in Alternatives B and C, where it would increase use of the Manzanita Lake Connector Trail.

4. Alternative B: Minor Changes in Lassen Peak Trail Visitor Use Experience

Vision: As in Alternative A, the Lassen Peak Trail would retain its current rugged hiking experience. The trail, however, would be reconstructed to a consistent four-foot width and dry-stack and mortared rock retaining walls would be reconstructed or rehabilitated as appropriate to retain historic fabric. The summit plateau and true summit visitor experiences would be the same as in Alternative A, with no designated / constructed trails or additional interpretive elements.

Alternative B Summary: The primary differences between Alternative B and Alternative A would be that in Alternative B the trail would be rehabilitated in a single phased project to a consistent four-foot width (including narrowing of existing wider sections) to replicate its historic condition. Rock walls and steps would be reconstructed or rehabilitated as appropriate to minimize loss of historic fabric and to retain their functionality. Although groups could continue to use the trail, there would be no accommodations made

to increase the width of the trail or stopping points as part of the trail rehabilitation project. As in Alternative A, there would be no trailside restrooms so human waste issues would continue. Also as in Alternative A, social trails would continue to be the primary means of access in the crater and true summit areas. The NPS would not maintain a summit register. Limited interpretive opportunities would continue to occur from existing interpretive exhibits or occasional staff presence and programs. Unlike in Alternative A, there would be rehabilitation of the 2002 exhibits to improve interpretive opportunities. As in Alternative A, rehabilitation or replacement of exhibits would generally only occur as these were damaged.

Lassen Peak Trail to Summit Plateau

Width: To replicate its historic condition, the Lassen Peak Trail would be reconstructed to a consistent four-foot width, where possible. The current average width of the Lassen Peak Trail is approximately six feet. Unlike the variable width in Alternative A, most sections wider than four feet would be narrowed to four feet. One exception is the first 656 feet, which would be left six feet wide because it would be cost prohibitive to narrow it to four feet and because this section appears to be close to six feet wide in the original construction (1930s photos).

Grade: As in Alternative A and as originally constructed, there would be little change in overall grade and it would remain at about 15 percent according to its original designed grade. There would be a slight reduction in grade from current conditions at some historic switchback corners where the trail would be extended to historic viewpoints.

Group Turnouts: As in Alternative A, there would be no specific accommodations for groups. One existing group turnout would remain approximately 1/3 of a mile from the trailhead. As a result of extending the trail to historic switchback corners, however, additional group accommodation would likely occur.

Interpretation: Interpretation would continue to be via a series of interpretive signs installed in 2002. In addition, there would be some effort made to increase NPS interpretive staff on the trail and to link electronic media programming to the trail.

Summit Plateau

Visitor Experience: Because there would be no changes to this area, including no designation of trails in the summit crater or true summit areas, the visitor experience would continue to be the same as described in Alternative A.

Rare Plant Enclosure: As in Alternative A, the low profile fence enclosure that protects an endemic rare plant would be retained and expanded as necessary.

Interpretation: Interpretation would be the similar to Alternative A (via existing waysides installed on concrete/stone bases), except that in Alternative B, the interpretive panels would be replaced with updated information.

Summit Crater Area

Access: As in Alternative A, access to the Crater area would continue to be via existing social trails, which could be restored over time. Also as in Alternative A, remnant constructed trail and rock features would remain.

Interpretation: As in Alternative A, there would continue to be no formal interpretation (signs) in the Crater area.

True Summit

Access: As in Alternative A, access to the true summit would continue to be via a scramble over unmarked social trails and uneven, loose rocks.

Summit Register: Because there would continue to be an undesignated path to the true summit, a summit register would not be located at the top as it has been in the past.

Toilets

As in Alternative A, there would be no toilets located alongside the Lassen Peak Trail. Visitors would also continue to individually select privacy in out-of-the-way locations to deposit human waste and/or to use toilets located at the trailhead.

Restoration

As in Alternative A, ongoing restoration projects would continue and could include additional restoration of social trails as staffing and funding permitted.

Cultural Resources Treatment

To comply with the Secretary of the Interior's Standards for Rehabilitation (to minimize effects on the historic contributing features of the Lassen Peak Trail), in Alternative B trail rehabilitation would maintain / rehabilitate the original alignment and width from the trailhead to the Summit Plateau. Where dry-stack rock walls retain integrity, they would be stabilized using appropriate reconstruction techniques. Failing dry-stack rock walls would be rebuilt using original and imported rock. Where needed, new foundation rocks could be used. All mortared walls (non-contributing) are failing and these would be redesigned as dry-stack rock walls and would likely rely on imported rock. Some historic switchback corners would be recaptured by extending the trail to them. Changes from historic construction techniques, if needed, would be to improve safety and would meet the Secretary of the Interior's Standards for Rehabilitation. There would be no adverse effect on the contribution of the historic Lassen Peak Trail to the Lassen Volcanic National Park Highway Historic District.

5. Alternative C: Modest Improvements in Lassen Peak Trail Visitor Experience (Preferred)

Vision: The Lassen Peak Trail would accommodate a modest increase in visitor use capacity while maintaining a rugged hiking experience.

Alternative C Summary: Similar to Alternative B, Alternative C calls for rehabilitation of the Lassen Peak Trail. In Alternative C, however, the lower section of trail (approximately 1.2 miles to tree line) would be widened to approximately six feet, whereas the upper section would be the same as in Alternative B, approximately four feet. In addition a restroom would be provided at a wide area approximately two-thirds of the way to the summit and approximately 6-8 new turnouts would be constructed alongside the trail to accommodate small groups (10-15 people). Whereas summit crater and true summit trails would remain undesignated in Alternatives A and B, in Alternative C, there would be designated loop and/or spur trails in the summit crater area and a designated route with stabilized tread and a cable with stanchions leading to the true summit, where the summit register would be identified. In addition, a new 5.5 mile long trail would be constructed in wilderness to link the Lassen Peak Trail with the Manzanita Creek Trail and the spectacular Vulcan's Castle area.

Lassen Peak Trail to Summit Plateau

Width: As noted, the lower portion of the trail (approximately 1.2 miles) up to tree line would be widened where possible to approximately six feet (as noted above this is the average width of the current trail). Above treeline, the trail would continue at a width of approximately four feet (as in Alternative B).

Grade: As in Alternatives A and B, and as originally constructed, there would be little change in overall grade and that grade would be 15 percent or less according to its original designed grade. As in Alternative B, there would be a slight reduction in grade at some historic switchback corners where the trail would be extended to the historic viewpoint. Most historic viewpoints would be met by the trail in this alternative.

Group Turnouts: There would be approximately 6-8 new turnouts constructed to accommodate small groups of 10-15 people. These turnouts would be approximately 15 feet long and 10 feet wide (150 square feet) and could include benches constructed from local materials, such as large flat rocks, etc.

Interpretation: Interpretation would be the same as in Alternative B, except that additional signs would be added to replace those from the 1970s. In addition, NPS interpretive staff and electronic media programming would increase (see Table III-1 below).

Summit Plateau

Visitor Experience: Designation of routes extending beyond the Summit Plateau toward the Summit Crater and true summit areas and improvements in wayside exhibits and interpretive signage along the trail would improve the visitor experience.

Rare Plant Enclosure: As in Alternatives A and B, the low profile fence enclosure that protects an endemic rare plant would be retained and expanded as necessary.

Interpretation: As in Alternative B, the interpretive panels would be replaced. Unlike in Alternative B, however, information would link to the new interpretive exhibits along the trail and identify landscape features. A Comprehensive Interpretive Plan is proposed for 2010 and would aid the NPS in determining the most appropriate stories to interpret on the Lassen Peak Trail. Potential interpretive improvements are shown in Table III-1 below.

Table III-1: Potential Interpretive Improvements

Turnout	Distance from bottom	Potential capacity	Views captured	Possible Interpretive themes	Notes
1	0.3	25+	Vulcan's eye	Mountain hemlock ecosystem Native American creation story/ use of mountain	Currently existing interpretive gathering space.
2	0.65	15-20	First grand southern view including Lake Almanor	Mountain hemlock / white bark pine transition Early settlement patterns	Alternative D potential toilet location.
3	1.0	5-12	Brokeoff Mountain view	Ancient Tehama	Small, but old retaining wall exists
4	1.1	5-10	Southern/ lake Helen	White bark pine ecosystem	A wide spot in trail.
5	1.25	20-25	270° view	Glacier processes / volcanoes	Area would need to be long, narrow and slightly sloped. This would be a great mid-mountain goal.
6	1.65	5-15	Southern/Lake Helen	Vulcanology- what created the area	Mostly just a rest area – maybe there is a better area above.
7	1.9	15-25	Western view to Central Valley	Vulcanology themes – rock types: what's recent what's not	Alternative C and D toilet location.
8	2.2	5-10	Southeastern view	Just a tiny rest area	This is on an eastern switchback corner.
9	2.3	10-15	Western view to Central Valley	Landscape sign points out features: other themes.	This is so close to top people may not stop.

10	2.45 current summit circle	100+	Crater, Mt Shasta, everything south	Bring interpretive stories to conclusion. Landscape sign.	This is a lunch spot and it would have extensive interpretation.
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Summit Crater Area

Access: A narrow (18 inches wide) formal loop and/or spur trail(s) (0.2 – 0.4 miles long) would be designated and indicated with native rock cairns or similar monuments.

Interpretation: The new spur or loop trail(s) could be linked to an interpretive trail guide to identify points of interest.

True Summit

Access: Unlike in Alternatives A and B, where the rock scramble to the true summit would continue, Alternative C would result in the construction of a designated route to the summit. The first portion would likely follow the existing social trail alignment and would be approximately 18 inches wide, while the final 100 yards would likely consist of stabilized rocks and soil and a cable held by stanchions alongside it to identify the path. Although the stanchions would likely remain, the cable would be removed in winter.

Summit Register: Once the radio system repeater structures are removed, the area would be leveled by moving materials around and a new summit register would be located more prominently. Documents and scribes left in the register would periodically be taken from the register for potential inclusion in the park’s archives.

Toilets

A trailside toilet would be constructed approximately two-thirds of the way to the summit. The toilet would likely have two user compartments and be gender specific. The toilet would initially be a low-odor vault evaporator toilet within a low-profile shelter. If the toilets are working acceptably after five years, a low-profile building faced with rock (to blend into the surroundings) would be constructed to contain them. It would be designed to be large enough to accommodate projected use and to be serviced regularly for cleaning and once a year via helicopter to remove waste (all waste would be contained or stored within the structure and disposed of in accordance with state and federal standards when removed). Although the building would not be visible from the highway or most lower elevation locations, it would be visible from the summit and from the trail. If the toilets are not functioning at an acceptable level after the five-year trial period, the park would explore other options, including removal.

Manzanita Lake Connector Trail

The Manzanita Lake Connector Trail would begin from the Lassen Peak parking area and connect with the existing 3.5 mile long Manzanita Creek Trail. There are currently social trails that have developed in both locations. Those beginning from the Lassen Peak parking area have developed as visitors try to access Vulcan’s Castle and other areas beyond the parking lot. Those at the end of the Manzanita Creek Trail have developed because that trail ends abruptly without an obvious final destination.

The connector trail would begin on the west side of the Lassen Peak parking area and continue west for approximately one mile, providing views down toward Lake Helen and Emerald Lake toward Conard and Brokeoff mountains. At that point, it would cross the saddle between Ski Heil and Eagle Peak, where views of the Trinity Alps are available. As the trail continues, it would descend toward the Manzanita Creek Trail and would include views of Loomis Peak, Thousand Lakes Wilderness, Chaos Crags, Crescent Cliffs (including Lassen Peak), Eagle Peak and Vulcan’s Castle.

The trail would be designed with an overall grade of approximately 10 percent and would be approximately two feet wide and 5.5 miles long before connecting with the Manzanita Creek Trail (for a total length of approximately 9.0 miles between Manzanita Lake Campground and the Lassen Peak parking area). Approximately 5.15 miles would be located in wilderness. Due to its general side-hill location, a three to four-foot bench would be constructed for the trail tread with occasional dry-stack stone retaining walls (with buried rock foundations) and rock steps as needed. Trail surfacing would consist of

crushed rock manufactured on site using hand tools. Both the surfacing rock and the rock for trail features would be obtained from areas alongside the trail according to the park's standards for use of local materials.

Several small unnamed drainages would be crossed and a small pond and a wet meadow skirted by the proposed trail. The trail would also traverse through a diverse mountain hemlock forest and several talus areas. There would be several places where large rocks would facilitate crossing of small perennial drainages and one location where a wooden bridge, constructed of local materials would be constructed.

The trail would be constructed using hand tools (pulaskis, McCleods, shovels, rock bars, etc.), but would also include some chainsaw use. The trail crew would use mechanical tools such as tampers and a punjar to construct the short sections traversing talus fields. The trail would traverse talus to avoid fragile meadow communities. Mechanical tools are the minimum tool in boulder strewn environments (see Appendix 2). All materials used would be from the local area and no blasting is planned.

No interpretive display panels or electronic media would be used or located in the wilderness portion of this trail.

Improve Manzanita Creek Trailhead Parking

The Manzanita Creek Trailhead Parking area would be improved by enlarging it to hold 5-10 cars (approximately 750 – 1,500 square feet).

Restoration

As in Alternatives A and B, ongoing restoration projects would continue and could include additional restoration of social trails as staffing and funding permitted. In addition, shortcuts between switchbacks on the main Lassen Peak Trail, social trails on the peak, and social trails in the Vulcan's Castle vicinity would be restored.

Cultural Resources Treatment

To comply with the Secretary of the Interior's Standards for Rehabilitation (to minimize effects on the historic contributing features of the Lassen Peak Trail), in Alternative C trail rehabilitation would maintain / rehabilitate the original alignment and width from the trailhead to the wide area approximately half way to the summit plateau. Actions associated with rock walls would be the same as described above in Alternative B. In Alternative C, however, most historic switchback corners would be recaptured by extending the trail to meet them. There would be no adverse effect on the contribution of the historic Lassen Peak Trail to the Lassen Volcanic National Park Highway Historic District.

6. Alternative D: Lassen Peak Trail Visitor Use Accommodation

Vision: The Lassen Peak Trail would accommodate more visitors, including novice hikers and groups.

Alternative D Summary: Similar to Alternatives B and C, Alternative D calls for rehabilitation of the Lassen Peak Trail. Unlike in Alternative C, where only the lower portion of the trail would be widened, in Alternative D both the upper and lower portions of the trail would be widened up to the summit plateau to approximately six feet, where possible. In addition to the restroom provided 0.6 miles from the summit in Alternative C, there would be a restroom located approximately 0.75-1.0 mile from the parking area. There would also be more and larger turnouts than proposed in Alternative C, with approximately six turnouts accommodating larger groups of 15-20 people and two to four turnouts accommodating small groups of 10-15 people. As in Alternative C, there would be designated trails in the summit crater area and to access the true summit, however, in Alternative D, these trails would be wider (24 inches instead of 18 inches) and would be built to NPS trail standards. Interpretive wayside panels would be located along the crater loop trail in the summit crater area. Instead of a cable and stanchions leading to the true summit, there would be a formal trail with even tread, including rock steps. The summit register would be moved down to the summit plateau area to allow more people to access it. As in Alternative C, a new 5.5 mile long trail would be constructed in wilderness to link the Lassen Peak Trail with the Manzanita Creek Trail and the spectacular Vulcan's Castle area.

Lassen Peak Trail to Summit Plateau

Width: Both the upper and lower portions of the Lassen Peak Trail would be widened where possible to approximately six feet.

Grade: As in Alternatives A, B and C, and as originally constructed, there would be little change in overall grade. Also as in Alternatives B and C, there would be a slight reduction in grade at historic switchback corners where the trail would be extended to the historic viewpoint, however in Alternative D, all historic switchback corners would be met by the trail. Some trail realignment would also occur in the lower half of the trail to reduce the grade.

Group Turnouts: There would be approximately six new turnouts constructed to accommodate large groups of 15-20 people. These turnouts would be approximately 15 feet square (225 square feet) and could include benches. In addition, there would be 2-4 smaller turnouts at historic viewpoints that would accommodate smaller groups of 10-15 people.

Interpretation: As in Alternative C, there would be new interpretive signs, however, in Alternative D, all of the existing waysides and signs would be redesigned and would integrate traditional exhibits with NPS ranger and personal electronic media programming. In addition to interpretation of the volcano, there would be additional information about biology and human history.

Summit Plateau

Visitor Experience: As in Alternative C, there would be designation of formal trails extending beyond the Summit Plateau toward the Summit Crater and true summit areas and improvements in wayside exhibits and interpretive signage along the trail that would improve the visitor experience.

Rare Plant Enclosure: As in Alternatives A, B and C, the low profile fence enclosure that protects an endemic rare plant would be retained and expanded as necessary.

Interpretation: Actions would be the same as described in Alternative C. Interpretive panels would be replaced and information would link to the new interpretive exhibits along the trail and identify landscape features.

Summit Crater Area

Access: Actions would be similar to Alternative C, except that the trail would be wider (24 inches and could be slightly longer (up to 0.5 mile) and it would be a loop trail that would access more interpretive features and viewpoints.

Interpretation: In addition to accessing key interpretive features, the loop trail in the summit crater area would contain trailside interpretive exhibits to aid visitors in understanding the area. As with other exhibits, these would contain information about the volcano as well as about natural and human history.

True Summit

Access: As in Alternative C, there would be a designated trail to the summit. The first portion would likely follow the existing social trail alignment and would be slightly wider than in Alternative C, about 24 inches wide, with a slightly easier tread created by moving aside rocks and constructing steps. The last 300 feet would be a series of steps and landings. Unlike Alternative C, there would not be stanchions or a cable.

Summit Register: Although access to the true summit would be easier, the summit register would be located at the summit plateau, leaving the true summit as an area for reflection, with a cleared flat area in the vicinity of the former repeater site to accommodate a small group, but few to no signs.

Toilets

Actions would be the same as described in Alternative C, plus a second toilet would be added approximately 0.75-1.0 mile above the trailhead. As in Alternative C, the toilets would likely have two user compartments and be gender specific. Specifications for this toilet would be similar to the toilet described earlier – self-contained vault with a low profile building and minimal servicing needs. Because

there would be a toilet at a lower elevation location, the higher elevation toilet could potentially be downsized.

Manzanita Lake Connector Trail

Actions would be the same as described in Alternative C except that in Alternative D, there could be additional connections made from the proposed trail to reach Bumpass Hell parking (1/2 mile) and/or to access Soda Lake (1/2 mile). Trail standards and construction techniques would be the same for these sections. The decision to construct these routes would be based on visitation and whether social trails were developing based on visitor use monitoring. Separate environmental analysis would also occur if a decision was made to construct them.

Improve Manzanita Creek Trailhead Parking

Actions would be the same as described in Alternative C.

Restoration

Actions would be the same as described in Alternative C, with restoration of social trails on the main Lassen Peak Trail, on the peak, and near Vulcan's Castle. In addition, in Alternative D, there would be active restoration of social trails in the summit crater area.

Cultural Resources Treatment

To comply with the Secretary of the Interior's Standards for Rehabilitation (to minimize effects on the historic contributing features of the Lassen Peak Trail), in Alternative D trail rehabilitation would focus on retaining key character-defining features on the Lassen Peak Trail. Actions associated with rock walls would be the same as described above in Alternative B. Instead of capturing most historic switchback corners (as in Alternative C), however, all would be recaptured by extending the trail to meet them. Some reconstructed walls could have a modern engineered base, possibly including reinforced concrete; however, the parts that visitors would see would be dry-stack. This change from historic construction techniques would be to improve safety. There would be no adverse effect on the contribution of the historic Lassen Peak Trail to the Lassen Volcanic National Park Highway Historic District.

7. Alternatives Considered But Rejected

Under the National Environmental Policy Act (NEPA) alternatives may be eliminated from detailed study based on the following reasons [40 CFR 1504.14 (a)]:

- *Technical or economic infeasibility;*
- *Inability to meet project objectives or resolve need for the project;*
- *Duplication of other less environmentally damaging alternatives;*
- *Conflicts with an up-to-date valid plan, statement of purpose and significance, or other policy; and therefore, would require a major change in that plan or policy to implement; and*
- *Environmental impacts too great.*

New Southwest Face Lassen Peak Trail

Initially the proposed project was to have focused on constructing a new trail (approximately two miles long and six feet wide) on the southwest face of Lassen Peak to serve as a safe shoulder season (spring) access. It was envisioned that this new trail would melt out while snow lingered on the existing trail and would therefore be a safer shoulder season route. Upon construction, the new trail would have been open only to downhill hikers, while the existing trail would have been open to uphill hikers, creating a loop trail experience.

Although the southwest face trail would have been designed to discourage short-cutting and off trail travel it would have been constructed primarily in loose talus, resulting in an extensive and very expensive array of rock retaining walls and other stabilization measures, and the long-term need to routinely clear the trail, all expensive endeavors. In addition, rehabilitation of the existing trail would still have been needed.

As proposed this six-foot wide trail up the unvegetated southwest flank of Lassen Peak would also have been much more conspicuous than the existing trail. Although this trail would have melted out earlier (allowing for longer season hiking of Lassen Peak), it likely would have been more dangerous during descent due to being surrounded by loose talus, with the ongoing potential for short-cutting to result in a prolonged slide downhill.

Based on consultation with the USGS, the proposed route would have suffered from and been exposed to the same problems of snow cover and switchback cutting as the present route. More importantly, it likely would require more maintenance than the existing trail due to its location on a more unstable scree slope.

This alternative was considered and rejected because of its economic infeasibility; because it would have added dangerous conditions (as noted by USGS and California trail experts); because it would have been difficult to maintain; and because the existing trail was found to be historic.

No Use of Helicopters to Transport Materials

Initial proposals focused on the use of trail carts and stock, rather than helicopters, to move materials and supplies. Large trail carts (only) would have forced the trail to be much wider and to remove / avoid the use of stairs. Stock use (only) would have required thousands of trips on a trail not designed for stock standards, which would have resulted in overuse of the trail before the rehabilitation was complete or in a redesign to stock standards. These means (complete reliance on trail carts or stock) were rejected due to their technical infeasibility and because they would have resulted in greater adverse impacts on the historic trail (from conversion to allow for routine wheeled vehicle use or major stock use).

Use of Blue Bags to Manage Human Waste

Although a variety of means to manage human waste issues were considered, including a toilet located at the summit plateau (see below) and blue bags, these were eventually discarded. Because the Lassen Peak Trail is essentially a front-country trail used by people of all ages and backgrounds, requiring these visitors to use blue bags (as in mountaineering) to dispose of human waste would require a major visitor education effort to increase the comfort level of visitors in using them. Using a blue bag involves defecating in a blue bag and then carrying it to a designated blue bag depository. Because the Lassen Peak Trail is used by a wide range of the general public, rather than mountain climbers, it is likely that most would be reluctant to use the method. In addition because there are very limited opportunities for privacy, it is unlikely that most visitors would opt to use them, resulting in an inability to resolve the need for their use. In addition, their use would require other features, such as deposit locations and periodic removal of the bags / barrels.

Although blue bags are used successfully on Mt. Shasta and on some other peaks in the northwest, the situation and the visitors are very different. Mt. Shasta is climbed by fewer people, most with extensive backcountry and mountaineering experience. Because fewer visitors are spread over multiple routes, privacy is possible. There are no known areas that experience the number and type of visitors as Lassen Peak that rely on blue bags. The Lassen Peak Trail is a family trail with few trees or large rocks for privacy; it would generally be inappropriate for people to be squatting and defecating to use blue bags on the side of the trail given the number and array of visitors.

Constructing Different Kinds of Toilets / Toilets Located in Different Areas

A wide array of toilet options were considered during the planning process, including locating a toilet at the summit plateau and constructing pit or vault or composting toilets. These options were eventually considered but rejected, primarily for technical infeasibility due to the high elevation anaerobic and low solar gain conditions as well as because of potential impacts to the Historic District. Summit area toilets were actually constructed in 1936 then were demolished by a wind event a short-time later and reconstructed again. Pit toilets have been discouraged by the State of California and vault and composting toilets would be infeasible due to the repetitive need to remove waste and because of the number of visitors that would likely use the facilities if they were present. Composting toilets work poorly at low temperatures, require daily consistent maintenance (which would have been unlikely to be achieved due to the day use nature of the trail), do not handle spikes in use well (most use would have

occurred on two days of the week), and would require large solar air heaters which would have impacted a larger area and would not blend well with the environment.

Reducing the Size of the Lassen Peak Parking Lot

Although the planning team initially considered modifications to the Lassen Peak Parking Lot, actions associated with this parking lot were previously considered in the park road rehabilitation environmental assessment and are therefore outside the scope of the proposed project. In addition, the team concluded that there was no need to modify the size of the parking area due to its consistent use for snowplay and during the summer. The Lassen Peak Parking Lot is also part of the Historic District.

Lassen Volcanic National Park as the Sole Rock Source

Although most of the rock originally used in the construction of the Lassen Peak Trail came from the park, most borrow areas where rock was obtained have since been closed except for the Lake Helen quarry area. Obtaining all rock from inside the park would necessitate opening and developing a new quarry with a variety of unacceptable adverse impacts. New borrow areas are permitted to be opened in national parks only under a very strict guidelines identified in *NPS Management Policies* (2006). Because of the quantities of rock that would be needed for some parts of the rehabilitation project (such as rock walls in all alternatives), most rock would need to come from outside the park. The alternatives and the park's trail maintenance standards allow for use where possible of local materials, including nearby rock or rocks that have come from historically constructed rock walls. Loose rocks from the base of the Lake Helen quarry would likely also be used. In addition historic preservation standards are focused on allowing for the use of historic materials over imported materials.

Wide, Designated Summit Crater Loop

Constructing a four-foot wide designated summit crater loop trail was considered and rejected in favor of two narrower options in Alternatives C and D. These narrower trails would be less expensive and have fewer resource impacts than a wider trail. In addition, the use of this area does not currently show a need for a wider trail. Although the hike up Lassen Peak is very popular, most visitors arrive at the top fairly tired and therefore most (more than 90 percent) do not explore the crater. With a more formal trail (including wayfinding), another 10-15 percent of visitors may choose to explore the crater area. Such an increase, however, would not justify a wider trail.

Narrowing or Greater Widening the Lassen Peak Trail

Initially the planning team considered reducing the width of the trail in one of the alternatives to focus on a different type of visitor experience, however, two factors resulted in this being rejected: 1) the popularity of the trail, with approximately 22,000 hikers in 2008, making it the second most popular hike in the park; and 2) research that led to understanding the historic nature of the trail and components of its originally designed width of four feet.

Constructing a More Direct Trail to Manzanita Lake

A more direct trail to Manzanita Lake would have resulted in a slightly shorter trail but it would have been much steeper, with grades in excess of 12 percent, resulting in a trail that was not as pleasurable to hike and which would be difficult to maintain (due to increased potential for natural erosion). It is likely that the steeper trail would have resulted in a less desirable visitor experience, and not have met project objectives for a high quality visitor experience.

A Quota or Reservation System to Restrict Day Use Lassen Peak Trail Hikers

As noted in the GMP (NPS 2002), "There is no evidence to suggest that Lassen Volcanic National Park is, on a parkwide basis, exceeding or even close to exceeding its carrying capacity or that carrying capacity will be exceeded during the life of this general management plan considering the potential for increased visitation. While resource damage is occurring at discrete locations in the park, . . .that damage is attributable to poorly located or designed facilities and/or insufficient management of visitors, and can realistically be remediated by measures other than visitation reduction (NPS 2003B:18)." As a result this alternative component was rejected in favor of trail rehabilitation to allow for a more adequately designed facility, including the opportunity to design designated trails for areas experiencing resource damage (such as the summit crater and true summit).

Loop Trail around Vulcan's Castle

This action, suggested as an additional short trail opportunity for day use visitors to the Lassen Peak Trailhead Parking Lot, was dismissed because a survey of the area could not identify a desirable route that would not be too steep. Instead, the proposed Manzanita Creek Connector Trail in Alternatives C and D would pass close to this area.

8. Environmentally Preferred Alternative

In accordance with Director's Order-12, *Conservation Planning, Environmental Impact Analysis, and Decision-making* and CEQ (Council on Environmental Quality) requirements, the NPS is required to identify the "environmentally preferred alternative" in all environmental documents, including Environmental Assessments. The environmentally preferred alternative is determined by applying the criteria suggested in the National Environmental Policy Act (NEPA) of 1969, which is guided by the CEQ). The CEQ (46 FR 18026 - 46 FR 18038) provides direction that the "environmentally preferable alternative is the alternative that would promote the national environmental policy as expressed in NEPA's Section 101," including:

- Fulfilling the responsibilities of each generation as trustee of the environment for succeeding generations;
- Ensuring for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings;
- Attaining the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
- Preserving important historic, cultural and natural aspects of our national heritage and maintaining, wherever possible, an environment that supports diversity and variety of individual choice;
- Achieving a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
- Enhancing the quality of renewable resources and approaching the maximum attainable recycling of depletable resources (NEPA Section 101(b)).

Generally, these criteria mean the environmentally preferable alternative is the alternative that causes the least damage to the biological and physical environment and that best protects, preserves, and enhances historic, cultural, and natural resources (46 FR 18026 – 46 FR 18038).

In this Environmental Assessment, the Alternative that best meets these criteria is Alternative C, the NPS's preferred alternative. Review of resource and visitor impacts and mitigation strategies has found that the preferred alternative achieves the greatest balance between the need for repairing the trail and the need for preserving natural and cultural resources and improving the visitor experience in the park. This alternative was selected as the best alternative when taking into account greater enhancements and upgrades to park maintenance operations, visitor and employee safety, and long-term operational costs.

The Preferred Alternative has the following benefits:

- As with Alternatives B and D, it would rehabilitate the Lassen Peak Trail in one complete project within a few years, instead of intermittently, over time, as in Alternative A.
- As with Alternatives B and D, it would meet the criterion for enhancing safe, healthful, productive, and esthetically and culturally pleasing surroundings through its rehabilitation of the Lassen Peak Trail.
- As with Alternative D, it would meet the goal of providing the widest range of beneficial uses of the environment without harm from the construction and additional opportunities present in the designation of a summit crater trail, a true summit route and from construction of the Manzanita Creek Connector Trail.

- It would have the same beneficial effects as Alternative B and fewer adverse effects than Alternative D on natural and cultural resources, including on the eligibility of the Lassen Peak Trail as part of the Lassen Volcanic National Park Highway Historic District.
- By adding one restroom and a designated trail in the summit crater area and a designated route to the true summit, instead of two restrooms and designated trails in the summit crater and true summit areas as in Alternative D, it would achieve a balance between enhancing visitor experience (population) and minimizing resource use by enhancing preservation.
- By using fewer resources than Alternative D, Alternatives B and C would minimize depletion of resources. Because the trail would be widened less in the upper, narrow section, fewer rock walls would need to be completely reconstructed in Alternative C, compared to Alternative D. Allowing the lower section of the trail to remain wide would minimize work needed to narrow it as described in Alternative B.

9. Impact Topics Considered

Specific impact topics were developed to address potential natural, cultural, recreational and park operations impacts that might result from the proposed Alternatives as identified by the public, NPS, and other agencies, and to address federal laws, regulations, executive orders, and NPS policy. A brief rationale for the selection or non-selection of each impact topic is given below.

Impacts of the alternatives on the following topics are presented in this Environmental Assessment: soils; water resources, including wetlands and water quality; vegetation; wildlife; special status species; prehistoric and historic archeological resources; ethnography; historic structures / cultural landscapes; visitor experience, including safety and scenic resources; wilderness and park operations.

Geology, Geological Hazards and Soils: *Management Policies* (NPS 2006) require the NPS to understand and preserve and to prevent, to the extent possible the unnatural erosion, physical removal, or contamination of the soil and to preserve important geological resources. Because the alternatives would involve ground-disturbing activities with the potential for erosion or sedimentation impacts to occur, soils are addressed. Geology and Geological Hazards are also addressed because there are a variety of natural forces at work that should be considered in making changes to the Lassen Peak Trail and in constructing the Manzanita Creek Trail (*see also Visitor Experience – Safety*).

Water Resources (Water Quality): The 1972 Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977, is a national policy to restore and maintain the chemical, physical, and biological integrity of the nation's waters, to enhance the quality of water resources, and to prevent, and control, and abate water pollution. *Management Policies* (NPS 2006) provide direction for the preservation, use, and quality of water in national parks.

The Clean Water Act is a national policy aimed at restoring, maintaining, and enhancing the chemical, physical, and biological integrity of the nation's waters and to prevent, control, and abate water pollution. Construction will result in earth disturbing activities, which increases the potential for erosion and sedimentation to occur. Section 401 of the *Clean Water Act* as well as NPS policy requires analysis of impacts on water quality.

Water Resources (Wetlands): Executive Order 11990 requires that impacts to wetlands be addressed. Nearby wetlands would be avoided in Alternatives C and D.

Vegetation: The *National Environmental Policy Act* (NEPA) calls for examination of the impacts on the components of affected ecosystems. NPS policy is to protect the natural abundance and diversity of park native species and communities, including avoiding, minimizing or mitigating potential impacts from proposed projects. The action alternatives would affect vegetation.

Wildlife: The *National Environmental Policy Act* (NEPA) calls for examination of the impacts on the components of affected ecosystems. NPS policy is to protect the natural abundance and diversity of park native species and communities, including avoiding, minimizing or mitigating potential impacts from

proposed projects. More than 260 native species of terrestrial and aquatic vertebrates have been recorded in the park, including 56 mammals, 190 birds, and 18 amphibians and reptiles. Many wildlife species reside in or near the project area.

Special Status Species: The *Endangered Species Act* (ESA) requires an examination of impacts to all federally listed threatened or endangered species. NPS policy also requires an analysis of impacts to state-listed threatened or endangered species and federal candidate species. Under the ESA, the NPS is mandated to promote the conservation of all federal threatened and endangered species and their critical habitats within the park boundary. Management Policies include the additional stipulation to conserve and manage species proposed for listing. Ongoing informal consultation with the U.S. Fish and Wildlife Service, and California Department of Fish and Game (Natural Diversity Database) has identified several important rare, threatened and endangered species that may occur within the project area in Lassen Volcanic National Park.

Prehistoric and Historic Archeological Resources: Conformance with the *Archeological Resources Protection Act* in protecting known or undiscovered archeological resources is required. Since the proposed project involves ground disturbance, analysis of impacts to archeological resources is important.

Ethnography: Lassen Volcanic National Park and the surrounding area have a long history of use by prehistoric and contemporary Native Americans. Analysis of impacts to known resources is important under the *National Historic Preservation Act* and other laws. The National Park Service defines ethnographic resources as any "site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it" (DO-28: *Cultural Resource Management Guideline*: 181). Native American tribes affiliated with the park have identified a special significance associated with Lassen Peak.

Historic Structures/Cultural Landscapes: Consideration of the impacts to cultural resources is required under provisions of Section 106 of the *National Historic Preservation Act of 1966*, as amended, and the 2008 *Programmatic Agreement among the National Park Service, the National Conference of State Historic Preservation Officers, and the Advisory Council on Historic Preservation*. It is also required under *Management Policies* (2006). Federal land managing agencies are required to consider the effects proposed actions have on properties listed in, or eligible for inclusion in, the National Register of Historic Places (i.e., Historic Properties), and allow the Advisory Council on Historic Preservation a reasonable opportunity to comment. Agencies are required to consult with federal, state, local, and tribal governments/organizations, identify historic properties, assess adverse effects to historic properties, and negate, minimize, or mitigate adverse effects to historic properties while engaged in any Federal or federally assisted undertaking (36 CFR Part 800). The Lassen Peak Trail is considered a historic trail because it was constructed in association with the Lassen Volcanic National Park Highway, a National Register listed historic district. A national register nomination has been prepared to expand this historic district to include the trail.

Visitor Experience (including safety and scenic resources): Dependent on the selected alternative, a variety of impacts to visitor experience may occur. Based on *Management Policies* (2006), impacts to visitors are considered with respect to park undertakings.

Wilderness: In October 1972, Congress designated 75% of the park (78,982 acres) as the Lassen Volcanic Wilderness. The 2003 General Management Plan for Lassen Volcanic National Park proposes an additional 25,000 acres be designated as wilderness. NPS wilderness management policies are based on provisions of the 1916 NPS Organic Act, the 1964 Wilderness Act, and legislation establishing individual units of the national park system. These policies establish consistent service-wide direction for the preservation, management, and use of wilderness and prohibit the construction of roads, buildings and other man-made improvements and the use of motorized vehicles in wilderness. All park management activities proposed within wilderness are subject to review following the minimum requirement concept and decision guidelines. The public purpose of wilderness in national parks includes the preservation of wilderness character and wilderness resources in an unimpaired condition, as well as for the purposes of

recreational, scenic, scientific, education, conservation, and historical use. Two of the action alternatives include a new trail in designated wilderness to connect the Lassen Peak parking area with the Manzanita Creek Trail.

Park Operations: Impacts to park operations and visitor services are considered in Environmental Assessments to disclose the degree to which proposed actions would change park management strategies and methods.

10. Impact Topics Dismissed from Further Analysis

The topics listed below either would not be affected or would be affected only negligibly by the alternatives evaluated in this Environmental Assessment. Therefore, these topics have been dismissed from further analysis. Negligible effects are localized impacts not detectable over existing conditions.

Air Quality: Lassen Volcanic National Park is in a mandatory class I airshed under the Clean Air Act (1977). Class I areas are afforded the highest degree of protection under the Clean Air Act. This designation allows very little additional deterioration of air quality. The Clean Air Act states that park managers have an affirmative responsibility to protect park air quality related values (including visibility, plants, animals, soils, water quality, cultural resources and visitor health) from adverse air pollution impacts. Special visibility protection provisions of the Clean Air Act also apply to class I areas, including new national rules to prevent and remedy regional haze affecting these areas. Under existing visibility protection regulations, the NPS identified "integral vistas" that are important to the visitor's visual experience in NPS class I areas, and it is NPS policy to protect these scenic views. None are currently being monitored.

While there would be short-term negligible adverse effects on air quality from the transport of materials to the project area and from some activities, such as soil excavation, within the project area, these impacts are small in comparison to regional effects from transportation, fire and other more widespread activities and would not result in long-term adverse impacts to air quality. If a shuttle was developed in Alternatives B-D, there would be negligible long-term beneficial effects.

Water Resources:

Water Quantity: The increased/decreased use of water to provide for public use may also have an impact on park resources, such as amphibians. There is no increased or decreased use of water proposed as a result of the proposed actions described in this Environmental Assessment.

Floodplains: Executive Order 11988 (Floodplain Management) requires an examination of impacts to floodplains and potential risk involved in placing facilities within floodplains. NPS Management Policies, DO-2 (Planning Guidelines), and DO-12 (Conservation Planning, Environmental Impact Analysis, and Decision Making) provide guidelines for proposals in floodplains. Executive Order 11988 requires that impacts to floodplains be addressed. No floodplains would be affected by actions proposed in this Environmental Assessment. The requirements of this executive order do not apply to the proposed action. No new facilities are proposed within floodplains.

Geologic/Hydrothermal Resources/Geological Hazards: Lassen Volcanic National Park has an extensive history of eruptions, ashfall, debris flows and other geologic events that have shaped the present landforms. Within the park is a diverse array of volcanic resources including composite volcanoes, shield volcanoes, plug dome volcanoes, tephra cones, lava flows, and active hydrothermal areas. These present an ongoing hazard to visitors and staff. *Management Policies* (NPS 2006) calls for analysis of geological hazards should they be relevant. While geologic hazards could occur at any time, the proposed project would not influence their occurrence or affect them.

Prime and Unique Farmlands: No unique agricultural soils are believed to exist in the park because its soils generally contain low nutrient levels or are poorly developed (of recent volcanic origin) and acidic.

Collections: *Management Policies* (NPS 2006) and other cultural resources laws identify the need to evaluate effects on National Park Service Collections if applicable. The collections at Lassen Volcanic National Park would not be affected by the proposed project, except by the potential addition of material for the collections if any is found (see mitigation measures under *Archeological Resources* in Chapter V: *Environmental Consequences*).

Socioeconomics: Socioeconomic impact analysis is required, as appropriate, under NEPA and *Management Policies* (NPS 2006) pertaining to gateway communities. The local and regional economy and most business of the communities surrounding the park are based on logging and wood products manufacturing, cattle ranching, agriculture, professional services, tourist sales and services, and educational research. Actions evaluated in this Environmental Assessment would have negligible short-term economic benefits from construction-related expenditures and employment and would include economic gains for some local and regional businesses and individuals. These effects would be negligible in context of the overall local and regional economy.

Environmental Justice: Executive Order 12898 requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. This Executive Order does not apply to the subject of this Environmental Assessment. The actions evaluated in this Environmental Assessment would not adversely affect socially or economically disadvantaged populations.

Table III- 2: Alternative Comparison Chart

Components	Alternative A (No Action) Continue Current Management	Alternative B Minor Changes in Lassen Peak Trail Visitor Experience	Alternative C Modest Changes in Lassen Peak Trail Visitor Experience	Alternative D Lassen Peak Trail Visitor Use Accommodation
Vision	Continue Current Management	Trail retains current rugged hiking experience with few additional constructed elements. Experience similar to Alternative A.	Trail accommodates a modest increase in visitor use capacity while maintaining a rugged hiking experience.	Trail accommodates more visitors, including novice hikers and groups.
Major Differences	<p>No change from current conditions.</p> <p>Maintenance is ongoing but major trail rehabilitation does not occur.</p>	<p>Trail rehabilitation to consistent width.</p> <p>Group use but no modifications to accommodate.</p> <p>Existing scramble to true summit retained</p> <p>No restroom.</p> <p>Existing informal trails in crater area.</p> <p>Some opportunities for visitor education.</p>	<p>Trail widened in lower section; rehabilitated above.</p> <p>Accommodate small groups (10-15 people).</p> <p>Trail provides safer access to true summit.</p> <p>One restroom provided along trail.</p> <p>Designated crater area trail(s).</p> <p>Enhanced opportunities for visitor education.</p>	<p>Trail widened and rehabilitated throughout.</p> <p>Accommodate large groups (15-20 people).</p> <p>Trail provides safer access to true summit.</p> <p>Two restrooms provided along trail.</p> <p>Crater Loop interpretive trail.</p> <p>Most opportunities for visitor education.</p>
Trailside Interpretation	Retain existing 2002 exhibits.	Retain 2002 exhibits. Allow for NPS Ranger or electronic media interpretation.	<p>Same as Alternative B except more exhibits. NPS Ranger and personal electronic media interpretation likely.</p> <p>Additional interpretation of biology and natural history.</p>	<p>Design and develop new interpretive exhibits to integrate traditional exhibits with NPS Ranger and personal electronic media interpretation.</p> <p>Interpret biology and human history as well as vulcanology.</p>
Lassen Peak Trail Features				
Width	Variable. Approx. between 2-feet and 8-feet. No change from current conditions.	Consistent. Four-feet (including narrowing of wider sections).	Variable. Six-feet wide for approx. 1.2 miles (tree line) where possible; 4-feet wide beyond to summit plateau.	Generally wider. Six-feet to summit plateau where possible.

Components	Alternative A (No Action) Continue Current Management	Alternative B Minor Changes in Lassen Peak Trail Visitor Experience	Alternative C Modest Changes in Lassen Peak Trail Visitor Experience	Alternative D Lassen Peak Trail Visitor Use Accommodation
			No narrowing of wider sections.	No narrowing of wider sections.
Grade	No change.	Minor changes to link trail with some historic viewpoints at corners, where minimal reconstruction is needed.	Moderate changes to link trail with most historic viewpoints at corners, reducing grade where possible.	Moderate changes to link trail with all historic viewpoints at corners, reducing grade. Additional minor alignment changes to reduce grade in lower section.
Rock walls: Rock Source	n/a	Rock obtained from outside park and from within the Lake Helen quarry.		
Rock walls: Construction	n/a	Rock wall design and construction techniques will be identical in all alternatives.		
Interpretive Turnouts	No change. Existing wide areas retained.	Same as Alternative A.	Same as Alternative A plus construct 6-8 new turnouts to accommodate groups of 10-15 people.	Same as Alternative C except construct 6-8 new turnouts to accommodate groups of 20-25 people and 2-4 smaller turnouts to accommodate groups of 10-15 people.
Spring and Fall Shoulder Season Accommodation: Wanding (route marking on a partially snow-covered trail)	Common To All Alternatives: The trail will be wanded with bamboo or similar poles when the road is open and the trail is obscured by snow.			
Spring and Fall Shoulder Season Accommodation: Trail Features	No change	Construct seasonal bypass areas to allow visitors to avoid existing steep icy sections of trail.		
Construction: Mechanized Use	N/A	Helicopter staged from Lost Creek Helipad. Use of small trail cart.	Same as Alternative B except that larger trail cart would be used.	
Summit and Peak Areas				
Current Summit Plateau Interpretation	Retain current array of exhibits.	Same as Alternative A except replace interpretive panels with updated information.	Remove existing interpretive exhibits and replace with thematic exhibits that identify landscape features and share key interpretive story.	Same as Alternative C plus add summit plateau register.
True Summit	Retain existing scramble to true summit.	Same as Alternative A.	Construct narrow, designated trail / route. Designate route with cable and stanchions over final 100 yards with stabilized tread over rocks. Remove cable in winter.	Construct a 2-foot wide trail with 15-20 percent grade where possible by moving rock and creating rock steps instead of using a cable or railing.

Components	Alternative A (No Action) Continue Current Management	Alternative B Minor Changes in Lassen Peak Trail Visitor Experience	Alternative C Modest Changes in Lassen Peak Trail Visitor Experience	Alternative D Lassen Peak Trail Visitor Use Accommodation
Summit Crater Area	Informal social trails.	Same as Alternative A.	Designate narrow formal loop and/or spur trails (0.2 – 0.4 miles long) with native rock cairns or similar monuments. Consider interpretation of features with a guide.	Construct a 2-foot wide 0.2 – 0.5 mile long loop trail. Loop would travel to viewpoints and key interpretive features. Some materials could be imported. Trailside interpretive exhibits would be provided.
Radio System Repeater Area and Summit Register	Repeater is probably removed as part of the NPS project to switch to a digital radio system in the next few years. Inconspicuous summit register hidden in the rocks is informally provided.	Same as Alternative A except remove or minimize repeater if continued area coverage can be retained. Remove and do not replace the summit register.	Remove or minimize repeater if continued area coverage can be retained. Create small level area to allow summit experience by moving rocks (no imported materials). Provide NPS-maintained summit register and make it more prominent.	Remove or minimize repeater if continued area coverage can be retained. Create level area at summit to accommodate small group. (Summit register relocated to summit plateau – see above).
Rare Plant Exclosure	Common to All: Retain and enhance low profile fence to prevent trampling of rare plants.			
Toilets	No toilet.	Same as Alternative A.	Construct self-contained evaporator or similar toilet at “Belly Button” mid-point designed for helicopter waste removal once a year. Initially toilet would be located within low-profile shelter. Eventually, a low-profile rock-faced building would be constructed.	Same as Alternative C except construct additional self-contained toilet alongside lower section of trail (between 0.75 and 1.0 miles above parking lot).
Connector Trail	N/A	N/A	Construct 5.5 miles of new trail (2-foot wide with maximum grade of 12 percent) to connect existing Manzanita Creek Trail with Lassen Peak parking area.	Same as Alternative C, plus consider constructing spur trails from connector trail to Bumpass Hell parking and/or to Soda Lake.
Hiker Shuttle	N/A	Consider creating a concession or permitted weekend-focused shuttle system to move hikers		

Components	Alternative A (No Action) Continue Current Management	Alternative B Minor Changes in Lassen Peak Trail Visitor Experience	Alternative C Modest Changes in Lassen Peak Trail Visitor Experience	Alternative D Lassen Peak Trail Visitor Use Accommodation
		between Manzanita Campground and the Lassen Peak parking area.		
Restoration	Continue ongoing restoration projects, including rehabilitation of social trails.	Restore short-cuts between switchbacks on Lassen Peak Trail.	Same as Alternative B plus remove / restore social trails in crater area and at Vulcan's Castle.	Same as Alternative B plus remove / restore social trails in crater area and at Vulcan's Castle.

Chapter IV: Affected Environment

1. Geology / Geological Hazards

Lassen Peak formed 27,000 years ago as a volcanic vent on Brokeoff Volcano's northern flank (NPS 2007). It rises 2,000 feet above the surrounding area to an elevation of 10,457 feet. Lassen Peak lies at the southern terminus of the Cascade Range, a chain of active volcanoes which stretches from Lassen north to Mount Garibaldi in British Columbia. Lassen Peak is one of the world's largest plug dome volcanoes. It last erupted in the second decade of the 20th century, beginning on May 14, 1915. The volcanic landscape that it left behind continues to simmer with bubbling mudpots, steaming fumaroles, and boiling water. A variety of volcanic features can be seen in the park, from shield volcanoes, cinder cones, a composite volcano and lava flows, to steaming vents. The Devastated Area is the remains of a mudflow and avalanche typical of Cascades volcanic eruptions. Chaos Jumbles were created not by volcanic activity, but by a huge rock avalanche that traveled across the valley with such force that it ran 400 feet up Table Mountain before losing momentum and surging back down across Manzanita Creek. Where the landscape remained unaffected by the eruption, glaciated canyons, forests and rushing streams are found (NPS 2007).

A variety of natural geologic forces are at work in Lassen Volcanic National Park. These include rock fall, and slope failure through slumps or slump-flows and seismic events. These natural forces have and will continue to affect the Lassen Peak Trail and have resulted in the deterioration or loss of sections of the Lassen Peak Trail over time. Although very rare, large earthquakes occur without warning and often cause isolated incidences of rock fall. Slumps, soil saturation and seismic induced failure are also rare occurrences.

Lassen Peak is a young volcanic dome composed primarily of relatively weak and fragmental carapace rock. The rock types that comprise the peak (breccia carapace) include rock compositions whose primary characteristic is the tendency to easily break-up. These forces have created much of the talus slopes. Because of this, natural rock fall from all aspects and ridgelines associated with the peak can occur.

Down-slope movement of rocks is most common during the freeze/thaw conditions that exist in late spring and early summer. Rocks that have fallen on winter snowpack are the most likely to be dislodged from slopes and ridges as the snow melts. Because they lie on top of snow, these recently moved rocks create a greater hazard than rocks that have been in place longer. Visitors also routinely dislodge rocks by stepping off or to the side of the trail (either deliberately or accidentally) (see *Visitor Experience: Safety* section below). While no major rockslides, are known to have occurred along the trail ridge since it was constructed, there have been numerous instances of single or a small number of rocks being dislodged.

2. Soils

The soils within Lassen Volcanic National Park are generally rocky, shallow, rapidly drained and strongly acidic. They are almost exclusively volcanic in origin. Depths vary from several feet in lower elevation meadows to thin or nonexistent soil formation in higher elevations. The distribution of many herbs, shrubs, and trees in the park and throughout the Cascade Range follows geologic formations and soil properties as much as climatic factors. In the vicinity of Chaos Jumbles, for example, there are three distinct overlapping rock fall avalanches, each with soil of a different texture and composition and each with a different vegetative cover. Because of their rocky porous nature, most soils are rather resistant to erosion. Erosion does occur in conjunction with some heavily used trails. Detailed soil information comes from a few small development projects and is site specific. A park-wide soil survey by the Natural Resource Conservation Service was begun in 2005. The final soil survey map and associated descriptions should be completed by 2010. Soils on the Lassen Peak Trail, like other areas of the park are poorly developed, particularly in the highest elevations. The slopes of Lassen Peak primarily consist of talus or scree (loose rock). In a few locations, there is a thin veneer of soil. The connector trail mostly traverses areas with shallow, rapidly drained, acidic soils.

3. Water Resources

Lassen Volcanic National Park contains portions of five drainage basins. Four of the drainage basins (nearly the entire park) flow into the Sacramento River and eventually into the Pacific Ocean. A small area on the eastside of the park flows into the landlocked Eagle Lake drainage basin. The northern half of the park is the Hat Creek drainage, which ultimately feeds into the northern Sacramento River system via the Pit River. The western and southern portions of the park also flow to the Sacramento River via three main channels: the southeast portion of the park drains via the Upper North Fork of the Feather River, which is dammed approximately 18 miles outside the park at Lake Almanor; and the west and southwest portions of the park flow into Battle Creek and Mill Creek, respectively. Mill Creek currently has no dams blocking anadromous fish and is one of very few stream courses remaining in California to have its biologic integrity preserved from its origin in northern California to the Sacramento River. As a result, Mill Creek has been identified as a potential Wild and Scenic River (NPS 2003B).

The park contains over 200 lakes and ponds and 15 perennial streams. Inventory data on aquatic life in these water bodies, however, is very limited. Some lakes have been significantly modified by past programs of stocking non-native sport fish, which continued until 1992.

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

A. Water Quality

Water quality is generally considered to be excellent because Lassen Volcanic National Park is located at the top of its watersheds. Aside from park developed areas, there is no other development that could affect park waters. Water quality data has been sporadically collected over the years, including some data from the park's hydrothermal areas at Sulphur Works, Bumpass Hell and Devils Kitchen.

Surface water from a total of six sources (Butte Lake, Manzanita Creek, Lost Creek, East Fork Hat Creek, Forest Creek, and Martin Creek) and two springs (Drakesbad Springs and Warner Valley Springs) is treated to provide drinking water for park visitors and staff. Drinking water is monitored daily to ensure a safe supply for human use.

Periodic sampling and testing is also performed in park waters where existing sewage systems or human use levels are such that contamination is a possibility. A Sanitary Survey in 1997 tested for temperature, pH, turbidity, dissolved oxygen, coliform, giardia, cryptosporidium and flow rates for five watersheds. This survey provided baseline data for a water quality monitoring program that will continue every five years to better understand the impact of visitation on water quality and ambient water quality and water intakes.

Broad based chemical analysis and testing for herbicides and pesticides has been conducted in five watersheds (Forest Creek, North Fork of Hat Creek, Lost Creek, Manzanita Creek and Flat Iron Ridge Spring) over the last twelve years. No pesticides have ever been detected in any of the park's watersheds.

There are no perennial streams adjacent to the Lassen Peak Trail. The peak, however, is the headwaters for the following drainages: Hat Creek, Kings Creek and an unnamed stream off the northeast side of the peak. Perennial streams near the Manzanita Creek Trail and proposed area for the Manzanita Connector Trail (Alternatives C and D) include: Manzanita Creek.

B. Wetlands

Wetlands are a critical resource in the park. Although they constitute only a small percent of the park's area, they support a disproportionate share of plant species diversity as well as providing critical wildlife

habitat. National Wetlands Inventory maps were produced in 1989 for the park and surrounding National Forest System lands, though most of these maps have not been digitized or ground-truthed for accuracy. Based on several rough estimates for vegetation types, wet meadow and riparian zones total more than 2,000 acres in the park. In addition to the larger wetlands in Dersch Meadows, Kings Creek, and Warner Valley, there are hundreds of smaller wetlands throughout the park; many are linked to lakes, ponds, and perennial streams throughout the park's wilderness.

Of these areas, the meadows are considered palustrine (freshwater not associated with lakes, but rather with persistent groundwater), persistent emergent wetlands (dominated by an array of grass-like plants and true grasses) and Manzanita Creek is an upper perennial riverine wetland.

Two kinds of palustrine wetlands are located in or near the proposed project area under Alternatives C and D. Palustrine wetlands are supported by persistent groundwater and include all nontidal wetlands dominated by trees, shrubs, persistent emergents, or emergent mosses or lichens. They may take the form of marshes, stream margins, and fens, as well as shallow permanent or intermittent ponds. The dominant vegetation cover type may be forest, herbaceous wetland, or scrub-shrub wetland (Cowardin *et al.* 1979).

One palustrine wetland is a sedge-dominated seep located on a north-facing slope at the head of Manzanita Creek. The seep was dry in early August, but the site clearly supports a wetland species of sedge. The other palustrine wetland is an herbaceous riparian type, supported by perennial rivulets of water flowing from springs at the base of the Crescent Cliffs. The trail crosses three of these. Each of the rivulets is approximately one foot wide. Dominant species include brook saxifrage (*Saxifraga odontoloma*), arrow-leaf groundsel (*Senecio triangularis*), bog orchids (*Platanthera sparsiflora* and *P. leucostachys*), mosses, and liverworts.

Several other wetlands are near the proposed route of the trail, but would be avoided by its construction (see *Chapter V: Environmental Consequences*).

4. Vegetation

Lassen Volcanic National Park covers approximately 166.2 square miles (106,372 acres). Elevations in the park range from 5,300 feet at Warner Valley to 10,457 feet atop Lassen Peak. The park contains a far greater diversity of plant species than its size would suggest. This is due in part to the fact that the park occupies a geographic zone where three major ecological systems meet: the southern Cascades, the Sierra Nevada, and the Great Basin. Each system contributes a unique floristic element to the park's vegetation. In addition, the park's dynamic history of glaciation and recent volcanic activity creates a suite of diverse substrates ranging from excessively dry volcanic cinders to hydrothermally altered clays. The range of geologic formations and chemically and texturally varied soil types contribute to species diversity as well as many anomalies within each community type.

Four major plant communities occur within the park, including red fir forest, yellow pine forest, subalpine forest and alpine fellfields. Minor plant communities include montane chaparral, herbaceous wet meadows and riparian areas. Each community type is described below, in order of abundance within the park.

Red Fir Forest: Red fir forest is the most widespread forest type in the park and is a common upper montane forest type throughout the Sierra Nevada and in the southern Cascades. In the park, red fir forest grows between 6,500 and 8,000 feet and covers approximately one third of the park. In these forests, red fir (*Abies magnifica*) is the dominant canopy tree; however, lodgepole pine (*Pinus contorta* ssp. *murrayana*), mountain hemlock (*Tsuga mertensiana*), western white pine (*Pinus monticola*) and white fir (*Abies concolor*) may also be present. Mature red fir trees are commonly 60 to 120 feet tall and live to be more than 300 years old. Red fir seedling distribution is closely related to exposure to sun; seedlings generally only become established in sites with part to full shade. Common shrubs and flowers in red fir forests include woolly mules'-ear (*Wyethia mollis*), lupine (*Lupinus* spp.), beardtongue (*Penstemon* spp.), and pinemat manzanita (*Arctostaphylos nevadensis*).

Yellow Pine Forest: This open forest occupies flats and slopes below 6,000 feet and is best developed around Manzanita Lake and Butte Lake. The canopy of mature stands consists of scattered large Jeffrey pine (*Pinus jeffreyi*) with or without ponderosa pine (*Pinus ponderosa*). Depending on site conditions and the time since the last fire, the canopy may include sugar pine (*Pinus lambertiana*), white fir, ponderosa pine, lodgepole pine, western white pine, incense cedar (*Calocedrus decurrens*) and red fir. In the absence of fire, these minor species will gradually fill in and dominate the forest canopy. The soils associated with this forest type have significantly higher potassium, calcium, and magnesium than most other Lassen Park forest types (Parker 1991). Common understory species include western needlegrass (*Achnatherum occidentale*), bottlebrush squirreltail (*Elymus elymoides*), and greenleaf manzanita (*Arctostaphylos patula*).

Subalpine Forest: This forest type occurs at elevations above 8,500 feet and is therefore limited to the upper slopes and cold drainages of the taller peaks within the park. The canopy is dominated by mountain hemlock and whitebark pine (*Pinus albicaulis*), a highly weather resistant pine that may grow as high as 10,000 feet. Shrubs and flowers include currants (*Ribes* sp.), willow (*Salix* sp.), lupine (*Lupinus* sp.), ragwort (*Senecio* sp.), pearly everlasting (*Anaphalis margaritacea*), rubber rabbitbrush (*Chrysothamnus nauseosus*), and pine mat manzanita (*Arctostaphylos nevadensis*). Large openings within the subalpine forest zone may contain dry meadows dominated by silvery lupine (*Lupinus obtusilobus*).

Alpine Meadows and Fellfields: These areas, located above treeline, are carpeted with colorful wildflowers, including spreading phlox (*Phlox diffusa*), scorpionweed (*Phacelia* sp.), stonecrops (*Sedum* spp.), alpine saxifrage (*Saxifraga tolmei*), cinquefoils (*Potentilla* sp.), beardtongue (*Penstemon* sp.), alpine daisy (*Erigeron compositus*), and buckwheats (*Eriogonum* spp.). Several rare species occur only in these habitats.

Montane Chaparral: Pinder *et al.* (1997) found that most chaparral species in the park occur below 7,500 feet on relatively dry sites. These scattered shrub fields, which comprise approximately 10 percent of the park, are dominated by greenleaf and pinemat manzanita (*Arctostaphylos patula* and *A. nevadensis*), tobaccobrush (*Ceanothus velutinus*), and bush chinquapin (*Chrysolepis sempervirens*) as well as gooseberry (*Ribes* spp.), serviceberry (*Amelanchier utahensis*), and bitter cherry (*Prunus emarginata*).

Herbaceous Wet Meadows: Herbaceous wetland communities are scattered throughout the park. They form densely vegetated, wet meadows near seeps, streams and lakes that contain primarily grass and grass-like species including sedges (*Carex* spp.), and perennial grasses, including Thurber's bentgrass (*Agrostis thuberiana*), tufted hairgrass (*Deschampsia caespitosa*), bluejoint reedgrass (*Calamagrostis canadensis*), and pull-up muhly (*Muhlenbergia filiformis*) (Taylor 1990b). Common flowering plants include monkeyflower (*Mimulus* sp.), bog laurel (*Kalmia* sp.), California corn lily (*Veratrum californicum*), alpine shooting star (*Dodecatheon alpinum*) and lupine. Wet meadows in the Park are often ringed by a belt of pure lodgepole pine forest.

Riparian Areas: These woody wetland communities are supported by surface water, and are associated with springs, stream banks, and lake margins throughout the park. The most common community in these sites is a shrubland dominated by willows and alders. Riparian woodlands of aspen (*Populus tremuloides*) or black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) are rare and scattered in low-elevation wet areas. In addition to the deciduous trees and shrubs, these communities support many showy herbaceous species such as cow parsnip (*Heracleum maximum*), monkeyflower, and arrowleaf ragwort (*Senecio triangularis*).

Although most of the park is vegetated, areas of recent volcanic activity tend to be rocky, exposed and relatively devoid of vegetation. The volcanic eruptions of Lassen Peak destroyed more than three square miles of forests, and the areas affected by the eruption of Cinder Cone 340 years ago are still largely barren.

The Lassen Peak Trail travels through both subalpine forests and alpine fellfields. Plants observed along the Lassen Peak Trail include whitebark pine, mountain hemlock, silvery lupine (*Lupinus obtusilobus*), fleecflower (*Polygonum davisiae*), showy sedge (*Carex spectabilis*), and buckwheat (*Eriogonum* spp.).

The proposed route of the Manzanita Lake Connector Trail (Alternatives C and D) traverses both subalpine forest (Lassen Peak parking lot to the vicinity of Vulcan's Castle) and red fir forest (Vulcan's Castle to Manzanita Creek). North of the saddle between Lassen and Loomis peaks, the trail crosses several riparian corridors and small wet meadows. Common forest species observed along the route include mountain hemlock, whitebark pine, red fir, western white pine, bush chinquapin, gooseberry, pinemat manzanita, pussytoes (*Antennaria* spp.), fleecflower, and Cascade rockbrake fern (*Cryptogramma cascadenis*). The riparian areas are dominated by willows and alder, accompanied by mountain heather (*Phyllodoce breweri*), corn lily, sedges, rushes, and grasses.

5. Wildlife

More than 260 native species of terrestrial and aquatic animals have been recorded in the park area, including 61 species of mammals, 138 species of birds and 15 species of amphibians and reptiles. Another three occurred historically but have not been documented recently, including the great gray owl, wolverine and Pacific fisher. Little is known about the distribution and abundance of most wildlife species.

Small mammals include the deer mouse, five species of shrew, Allen's and yellow-pine chipmunk, Douglas squirrel, flying squirrel, golden-mantled ground squirrel, yellow-bellied marmot and pika. Small and medium-sized carnivores include the long-tailed weasel, pine marten, raccoon, striped skunk, river otter, bobcat, red fox and coyote. Large mammals include the black bear, black-tailed deer and mountain lion. In addition, seven species of bats occur in the park.

Of the birds approximately 80 species are known to nest in the park. Raptors include the northern goshawk, Cooper's hawk, red-tailed hawk, sharp-shinned hawk, peregrine falcon, golden eagle, bald eagle, northern saw-whet owl, spotted owl, great horned owl, and northern pygmy owl. Although no suitable habitat for nesting raptors occurs on the Lassen Peak Trail, the proposed Manzanita Creek Connector Trail crosses some suitable habitat.

Other bird species include the gray jay, Clark's nutcracker, red-breasted sapsucker, common flicker, pileated woodpecker, Steller's jay, Oregon junco, warbling vireo, Audubon's warbler, Wilson's warbler, hermit warbler, fox sparrow, and song sparrow.

Amphibians include the western toad, Pacific tree frog, Cascades frog and long-toed salamander. Reptiles include the western terrestrial garter snake, northern alligator lizard, rubber boa and sagebrush lizard.

Although most park lakes are naturally barren, four native species of fish occur in the park, including rainbow trout, Tahoe sucker, tui chub and Lahontan redband. In addition there are a number of introduced fish, including brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*). Stocking of hatchery-reared rainbow and brown trout occurred from the park's establishment until 1992.

While recent systematic surveys have not found any fish because of downstream barriers that prevent native rainbow and exotic brown trout from entering this part of the stream, the nearby Manzanita Lake fishery has been state designated as a "blue ribbon" fishery, with native Eagle Lake Rainbow Trout. Fishing there is catch and release with regular creel censuses conducted. Regardless, Manzanita Creek is closed to fishing. Lost Creek, Hat Creek, and Kings Creek have populations of non-native brook trout.

The park also contains a wide variety of known and unknown invertebrates, including insects, spiders and worms.

The following wildlife have been observed on the Lassen Peak Trail: mammals – yellow-bellied marmot (*Marmota flaviventris*), red fox (*Vulpes vulpes*), golden-mantled ground squirrel (*Spermophilus lateralis*),

pika (*Ochotona princeps*), pine marten (*Martes americana*), long-tailed weasel (*Mustela frenata*), black bear (*Ursus americanus*), and chipmunk (*Eutamias* spp.); birds – gray-crowned rosy finch, kestrel, dark-eyed junco, ferruginous hawk, golden eagle, mountain bluebird, peregrine falcon, prairie falcon, red-tailed hawk, sharp-shinned hawk, American pipit, common raven, rock wren, Clark’s nutcracker, northern goshawk, Nashville warbler, northern flicker, Townsend’s solitaire, white-crowned sparrow, turkey vulture; butterflies – California tortoiseshell butterfly; and reptiles – sagebrush lizard. Most raptors were seen during fall migration.

The following additional mammals would be expected to occur on the Manzanita Lake Connector Trail: mountain lion (*Felis concolor*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), black-tailed deer (*Odocoileus hemionus*), snowshoe hare (*Lepus americana*), pocket gopher (*Thomomys* spp.), Douglas squirrel (*Tamiasciurus douglassi*), and northern flying squirrel (*Glaucomys sabrinus*). A variety of additional birds, as well as the following reptiles and amphibians: Pacific tree frog, common garter snake, northern alligator lizard, and various butterfly species.

6. Special Status Species

A. Plants

Lassen Volcanic National Park does not contain any plant species currently listed as threatened or endangered under the Federal Endangered Species Act. Golden draba and Mount Lassen smelowskia are considered rare, threatened, or endangered in California. There is a petition for federal listing of whitebark pine (*Pinus albicaulis*). Twenty special status species that have been identified by park staff and the California Native Plant Society (CNPS) (Koenig 2004A). Almost all special status plants occur within the high elevation subalpine zone or in floating peat mats within isolated wetlands. Comprehensive monitoring plans have been developed for only three of the species found on Lassen Peak because they occur adjacent to an area of high visitor use. Plans are needed for other at-risk species as well.

Table IV-1: Special Status Plants

Scientific Name	Common Name	California Status	NatureServe Global Status	NatureServe State Status	Occurrence
<i>Asplenium septentrional</i>	Northern spleenwort	2.3	G4 / G5	S2 / S3	Possible on connector trail but not found
<i>Campanula scabrella</i>	Rough rarebell	4.3	G4 / G5		Possible on peak and near Ski Heil
<i>Carex lasiocarpa</i>	Wooly-fruited sedge	2.3	G5	S1.3	Not present in project area
<i>Carex limosa</i>	Shore sedge	2.2	G5	S3	Not present in project area
<i>Collomia larsenii</i>	Talus collomia	2.2	G4	S1.2	Known from Lassen Peak
<i>Draba aureola</i>	Golden draba	1B.3	G4	S1.3	Known from Lassen Peak
<i>Drosera angelica</i>	Long-leafed sundew	2.3	G5	S2 / S3	Not present in project area
<i>Erigeron elegantulus</i>	Volcanic daisy	4.3	G4 / G5		Possible on connector trail but not found
<i>Lycopus uniflorus</i>	Northern dugleweed	4.3	G5	S3.3	Not present in project area
<i>Penstemon cinicola</i>	Ash beard-tongue	4.3	G4	S3.3	Not present in project area
<i>Penstemon heterodoxus</i> var. <i>shastensis</i>	Shasta beard-tongue	4.3	G5T3	S3.3	Possible on connector trail but not found
<i>Phlox muscoides</i>	Moss phlox	2.3	G5	S3.3	Possible but not found

Scientific Name	Common Name	California Status	NatureServe Global Status	NatureServe State Status	Occurrence
<i>Potamogeton praelongus</i>	White-stemmed pondweed	2.3	G5	S1/S2	Not present in project area
<i>Rhynchospora alba</i>	White-beaked rush	2.2	G5	S3.2	Not present in project area
<i>Scheuchzeria palustris ssp. americana</i>	American scheuchzeria	2.1	G5T5	S1.1	Not present in project area
<i>Scirpus subterminalis</i>	Water bulrush	2.3	G4 / G5	S2 / S3	Not present in project area
<i>Silene suksdorfii</i>	Cascade alpine catchfly	2.3	G4 / G5	S2.3	Possible on Lassen Peak and connector trail
<i>Smelowskia ovalis var. congesta</i>	Mt. Lassen smelowskia	1B.2	G5 T1	S1.2	Known from Lassen Peak
<i>Stellaria obtusa</i>	Obtuse starwort	4.3	G5	S3.3	Very unlikely in project area but known from Blue Lake Canyon
<i>Trimorpha acris var. debilis</i>	Northern daisy	2.3	G5T4	S2 / S3	Possible on Lassen Peak and connector trail

Key to CNPS Status

- 1B= rare, threatened, or endangered in CA and elsewhere
2= rare, threatened, or endangered in CA. More common elsewhere.
3= plants needing more information about them.
4= plants of limited distribution.
.1= Seriously endangered in California (over 80% of occurrences threatened / high degree and immediacy of threat)
.2= Fairly endangered in California (20-80% occurrences threatened)
.3= Not very endangered in California (<20% of occurrences threatened or no current threats known)

State: State rank by NatureServe (<http://natureserve.org/Explorer>)

- S1 = Less than 6 EOs OR less than 1,000 individuals OR less than 2,000 acres
S1.1 = very threatened
S1.2 = threatened
S1.3 = no current threats known
S2 = 6-20 EOs OR 1,000-3,000 individuals OR 2,000-10,000 acres
S2.1 = very threatened
S2.2 = threatened
S2.3 = no current threats known
S3 = 21-80 EOs or 3,000-10,000 individuals OR 10,000-50,000 acres
S3.1 = very threatened
S3.2 = threatened
S3.3 = no current threats known
? = uncertainty

G: Global rank NatureServe

- G4 = Apparently secure; this rank is clearly lower than G3 but factors exist to cause some concern; i.e., there is some threat, or somewhat narrow habitat.
G5 = Population or stand demonstrably secure to ineradicable due to being commonly found in the world.
T= rank of subspecies

B. Wildlife

Table IV-2: Federally Threatened and Endangered Wildlife

Species	Federal Status
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California Red Legged Frog (<i>Rana aurora draytonii</i>)	Threatened
Delta Smelt (<i>Hypomysus transpacificus</i>)	Threatened
Central Valley Steelhead (<i>Oncorhynchus mykiss</i>)	Threatened
Winter Run Chinook Salmon (<i>Oncorhynchus tshawytscha</i>)	Endangered
Shasta crayfish (<i>Pacifastacus fortis</i>)	Endangered
Central Valley spring-run chinook salmon (<i>Oncorhynchus tshawytscha</i>)	Threatened
Vernal pool invertebrates	Critical habitat

The federally listed species described below have not been found in the park and suitable habitat does not exist or would not be affected in the project area.

California Red-legged Frog. This species has not been positively identified within the park. It inhabits elevations generally lower than the project area from sea level to about 5,000 feet. Nearly all of the known occurrences are from below 3,500 feet. California red-legged frogs spend most of their lives in and near sheltered backwaters of ponds, marshes, springs, streams, and reservoirs. Deep pools with dense stands of overhanging willows and an intermixed fringe of cattails are considered optimal habitat. No suitable habitat occurs in the project area. There would be no effect on red-legged frogs from this project.

Delta Smelt and Central Valley steelhead. These species occur or spawn in the Sacramento River and its tributaries. No streams within the park have been found to support these species, therefore there would be no effect from this project.

Winter-run Chinook Salmon. This species is found only in the upper Sacramento River. No streams within the park have been found to support this species and no suitable habitat exists within the project area. There would be no effect on Winter-run Chinook from this project.

Central Valley Spring-run Chinook Salmon. This species is found within the Sacramento River and its tributaries – Butte, Big Chico, Deer, and Mill creeks. These salmon enter the Sacramento River between February and June. They move upstream and enter the tributaries between February and July, peaking in May and June, where they stay in pools until spawning occurs in mid-August to mid-October (September peak). There are no current records of spring-run chinook salmon within the section of Mill Creek that is within Lassen Volcanic National Park. No suitable habitat occurs within the project area. There would be no effect on Spring-run Chinook from this project.

Shasta crayfish. This species is only known from Shasta County in lower elevation waters outside of the park. They inhabit cool, clear, spring-fed lakes, rivers, and streams and most are found in still and moderately flowing waters. No suitable habitat occurs in the project area for this species. There would be no effect on Shasta crayfish from this project.

Vernal pool invertebrates. Vernal pools are seasonally flooded shallow depressions in grasslands that have hardpan, clay or volcanic soils that prevent water penetration. These depressions fill with water in the rainy season and dry out as the summer progresses. Several species of invertebrates (some listed as threatened or endangered) live and breed in these pools. Likely vernal pools located near the project area and the invertebrates associated with them would not be affected by this project because of their distance from proposed activities.

Candidate Species

Pacific fisher (*Martes pennanti pacifica*) are believed to be extirpated from the park and typically avoid areas with human activity and development, such as the proposed project area. There would be no effect on Pacific fisher from this project.

State Listed Wildlife

Bald Eagle (*Haliaeetus leucocephalus*) (State 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. Due to recovery efforts, In 2007 the Bald Eagle was removed from the Federal list. It is currently listed as State Endangered under the California Endangered Species Act. The Park will continue, however, to treat Bald Eagles as a special status species. 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 is one known Bald Eagle nesting pair in Lassen Volcanic National Park at Snag Lake. This pair along with a nest was discovered in 1980 on the west shore of Snag Lake. This pair has been monitored yearly since its discovery. The original nest was monitored until 2001 when the nest tree fell over during the winter of 2000/2001. A nest believed to be an historic nest was discovered in 2003 in the same general area as the original 1980 nest. This nest had no activity from 2003-2005. The lake was not officially surveyed in 2006 due to heavy snowfall late in the season. There were no visitor or staff sightings of bald eagles at Snag Lake in 2006. In 2007 and 2008, young of the year bald eagles were observed along with adult bald eagles but no new nest could be located. Surveys In 2009 discovered the bald eagles using the nest found in 2003 and successfully fledged two young from this nest. Hunting territory for this pair comprises most of the eastern half of the park. The only other known Bald Eagle activity in the park is seasonal foraging use of the Manzanita Lake area by Bald Eagles believed to nest outside of the park. There would be no effect on Bald Eagles because no habitat would be removed and no project work would take place near known nesting areas during the nesting season.

California wolverine (*Gulo gulo luteus*) (California threatened). Wolverine are believed to be extirpated from the park and typically avoid developed areas. Surveys for this species have occurred throughout the State over the past 10 years with a February 2008 confirmed camera / photo survey documenting a wolverine in the Tahoe National Forest, just north of Truckee, California. Due to its absence from the park, however, there would be no effect on California wolverine from this project.

Sierra Nevada red fox (*Vulpes vulpes necator*) (California threatened). Red fox 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 the park. This species is known to beg at parking areas and campgrounds throughout the park. A study was done on this species within the 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. Since the study, the batteries in the radio collars on the remaining foxes have died so the location and status of these foxes is unknown. From 2004 to 2007 there have been four sightings of a fox in the same area near Lassen Peak. It is assumed this is the same individual since it was observed in exactly the same area for four years. No radio collar has been visible on this individual. Due to already being habituated to human disturbance, there will be no effect on Sierra Nevada red fox by the actions proposed in this Environmental Assessment.

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 the 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. Although suitable habitat may exist near Crescent Cliffs, it would not be affected by the proposed project since no suitable roosting or foraging habitat would be modified and no nesting areas would be affected.

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 the park although no reproduction has been confirmed. Most sightings of this species is in the fall when they are seen flying over the park during migration. Due to the absence of

greater sandhill cranes and the negligible effect on this meadow under the proposed project, there will be no effect on greater sandhill cranes.

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 the park. This species is currently found in the Warner Valley area of the park where a breeding pair was discovered in 2004. Due to lack of habitat in the project area, there will be no effect on little willow flycatchers with this project.

Species of Park Concern

Mammals

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 the park. Suitable habitat would not be affected by actions proposed in this Environmental Assessment and noise generated by the proposed actions would be similar to ambient levels. There will be no effect on American marten from this project.

Sierra Nevada snowshoe hare (*Lepus americanus tahoensis*) occur in thickets of brush, pine, fir, and riparian vegetation. This species may be found in brush thickets along the road corridor. These thickets, located off the edge of the main park road, would not be affected by the proposed project. There would be no effect on snowshoe hare from this project.

Bats: 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. Although some suitable habitat exists along the Manzanita Creek Trail alignment, it would not be affected by proposed actions. There would be no effect on bat species from this project.

Birds

California spotted owl (*Strix occidentalis occidentalis*). The California spotted owl is associated with multi-storied coniferous forests with greater than 70% canopy cover and large trees (>30 inches in diameter) used for nesting. There are currently two known nesting pairs in Lassen Volcanic National Park (one located near Crags Campground and one located near Terminal Geyser). There are two historic nests located on the north side of Prospect Peak and the south side of Prospect Peak. In 2009, the Crags pair fledged two young and the Terminal Geyser pair fledged one young. Suitable habitat would not be affected by actions proposed in this Environmental Assessment and noise generated by the proposed actions would be similar to ambient traffic levels. There would be no effect on California spotted owls from this project.

Prairie falcons (*Falco mexicanus*). This species is found in arid dry grasslands and prairies with cliff ledges for nesting. There are historic breeding records of this species at Eagle Peak. There are historic breeding records of this species at Eagle Peak. Although suitable habitat may also exist near Crescent Cliffs, it would not be affected by the proposed project since no suitable roosting or foraging habitat would be modified and no activity would take place within this area.

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. Suitable habitat would not be affected by actions proposed in this Environmental Assessment and noise generated by the proposed actions would be similar to ambient traffic levels. There would be no effect on Northern Goshawk from this project.

American dipper (*Cinclus mexicanus*). This species 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 the park but would not be affected because due to lack of habitat in the project areas.

Vaux's swift (*Chaetura vauxi*). This species 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 the park. There would be no effect on this species due to the lack of habitat in the project area.

Rufous hummingbirds (*Selasphorus rufus*). This species does not breed in the 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. Due to its migratory nature and lack of habitat in the project area, this species would not be affected by this project.

Reptiles

Northwestern pond turtles (*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 and Reflection Lakes areas. There have been no recent sightings of this species in the park. Due to lack of habitat and no recent sightings, this species will not be affected by this project.

Amphibians

Cascades frog (*Rana cascadae*) inhabits lakes and meadows in the park. Numerous amphibian studies have shown this species to be declining throughout the Sierra Nevada and Cascade ranges. A fish and amphibian survey during the summer of 2004 found this species to occupy some of the ponds in the Juniper Lake area. No Cascades frogs were found in the project area during this survey. There will be no effect on this species because the Manzanita Creek Connector Trail alignment will avoid wetlands and cross bank to bank over ephemeral streams when these are dry.

7. Prehistoric and Historical Archeology

Area of Potential Effects for Cultural Resources

The area of potential effects for prehistoric and historic archeological resources, ethnographic resources, historic structures and cultural landscapes includes the Lassen Peak Trail and the proposed Manzanita Connector Trail corridor from the Lassen Peak Parking Lot to the Manzanita Creek Trail (see description of proposed trail in Chapter III: Alternatives).

Prehistoric Archeological Resources: Little is known of the early part of the prehistoric chronology of Lassen Volcanic National Park. Part of this may be, as Treganza (1963:14) suggests, because large areas suitable for use as seasonal campsites have been covered by the eruptions of Lassen Peak during and prior to the early 20th century. As noted by Journey (1970:31), there appears to be more evidence of prehistoric aboriginal use in the southern part of the park (most likely due to the volcanic disturbance in the north). These southern sites are generally low in elevation (often in the open valleys), near fresh water, and in areas that support game and other wild resources. The lack of early sites represented in the archeological record also appears to be partly due to the limited numbers of cultural resource inventories and test excavations conducted in the area. Many archeological sites, because of their seasonal, high elevation nature, have limited deposits. In general, the high elevations within the park precluded year-round occupation by prehistoric people. Park lands, however, were an important area for hunting game and gathering food and other materials for subsistence in lower river valleys.

Archeological sites, however, are distributed throughout the park from about 5,500 feet up to about 7,000 feet. Archeological sites include a large village, lithic scatters (from stone tool manufacture) and evidence of numerous smaller seasonal camps. To date, a total of 106 archeological sites are documented in the park. These include prehistoric flaked-stone artifact scatters and habitation sites with midden deposits, historic-period structures, features, and associated artifacts. Prehistoric site density varies within the park as a result of past volcanic activities. Volcanic tephra deposits cover much of the northern half of the park burying signs of early human activities in the park under layers of volcanic ash and lapilli. Recorded

prehistoric sites are sparse in the northern portion of the park with the many of the documented sites located in the Warner Valley or Sulphur Creek areas in the southern portion of the park.

Sulfur Creek: This archeological district listed on the National Register of Historic Places (NRHP) is located within the park but outside of the project area.

The Lassen Peak Trail (2.5 miles) and proposed Manzanita Creek Connector Trail (5.5 miles) were surveyed for archeological resources in October 2008; and the Lassen Peak area (39 acres) was surveyed in August 2009 by Native-X, Incorporated. These areas are part of the Lassen Peak and Reading Peak (1985) USGS quadrangles. For the trail corridors and the Lassen Peak area, surveys used pedestrian transects. The Lassen Peak transects were spaced at 33 feet or less, depending upon terrain. The Manzanita Creek Connector Trail transects surveyed a corridor 65 feet wide with transects spaced at 33 feet or less (Jones 2009).

According to Jones (2009), one previously conducted archeological survey included several places in the park, including the Lassen Peak Trail (Journey 1974 *in* Jones 2009). Although this survey found numerous cultural resources, none were located within the proposed project area. Another survey (Journey 1972 *in* Jones 2009) included the parking lot and trailhead for the Lassen Peak Trail. Based on Jones 2009, no sites were recorded within a mile of the proposed project area.

Historic Archeological Resources: European Americans Peter Skene Ogden, a Hudson's Bay Company trapper and Jedidiah Smith, an American fur trapper were the likely the first non-Native American visitors to the area. Ogden was in the vicinity of Mount Shasta in 1826-27 and Smith arrived a few years later. Smith named Lassen Peak "Mount Joseph." The name of the peak was later changed to Mount Saint Joseph by a government exploration party in 1841 and then in the 1850s was changed to Mount Lassen or Lassen Peak to recognize contributions from Danish immigrant explorer Peter Lassen (Jones 2009:5).

Peter Lassen and William H. Nobles founded the "Nobles Trail" to take emigrants into northern California. This trail which passes through the park is listed on the National Register of Historic Places. As a result, historic-period archeological sites in the park include features related to early emigration to California, homesteading, ranching, early use of the park area for recreation, and park administration and development. Other historic-period features include cabins, corrals, fence lines, old telephone lines, and related historical debris that have been documented in the park as archeological sites or are referenced in literature and historical records. The park Historic Resources Study (2003) provides an in-depth review of the park's history.

The Lassen Volcanic National Park Highway Historic District (Lassen Loop Highway / Lassen Peak Highway) is listed on the National Register (No. 06000527). This Historic District includes the Lassen Peak Parking Lot within the project area and is the subject of a revision to include the Lassen Peak Trail (see below). Other historic period archeological sites in Lassen Volcanic National Park listed on or eligible for the National Register are outside the project area.

The Lassen Peak Trail is considered an historic archeological site (Jones 2009). The trail contains rock walls of both dry and wet construction. There are two dry-stack stone circles on the top of the peak and one crescent. The largest ring measures approximately 13 feet by 15 feet and is of unknown origin. Due to the fact that many stones are "upside down" and still have discoloration from being buried, these features are probably 10-40 years old. Additional tiers have been added over time are therefore younger. During the archeological survey, no other historic period resources or artifacts were reported in the archeological survey as occurring on or alongside the trail. There are, however, numerous areas where the trail formerly extended to switchback corners. These areas of trail have been foreshortened over time by trail cutting primarily during shoulder season use.

As a result of the ski area rehabilitation and Southwest Visitor Services Facility projects, another archeological survey was conducted in 2003 by SWCA, Inc. (Berg 2003) The survey re-evaluated two of the sites within the Sulphur Creek Archeological District (CA-TEH-583/H and CA-TEH-596) and recorded

one new site (SWCA 1). This site consists of a few remains of a historic downhill ski area but was determined ineligible for the National Register.

8. Traditional Cultural Resources / Ethnography

Overview

The Lassen area has been described as a meeting point for at least four native groups. Use of the area by the Atsugewi, Yana, Yahai, and northern Maidu groups brought a mix of cultural elements characteristic of central and northeastern California with Great Basin-Plateau elements (Treganza 1963:5). Because of its weather and snow conditions, generally high elevation, and seasonally mobile deer populations, the Lassen area was not conducive to year-round living. Native American groups camped here in warmer months for hunting and gathering. Basket makers rather than potters, they left few artifacts other than stone points, knives, and metals (www.nps.gov/lavo accessed 4-28-09). For groups moving through the area, Lassen Peak provided seasonal resources on its slopes and in the open valleys and lakes that border it. Some of the most important resources include mule deer (*Odocoileus hemionus hemionus*), wild sunflower (*Wyethia mollis*), and various tubers. Journey (1970:30) draws a connection between sites where hopper mortars and pestles have been found and the reliance on wild sunflower as a staple in the late prehistoric and protohistoric diet.

Ethnographic resources may include places traditionally used to hunt or gather resources, trails or paths and associated camping sites, and ceremonial locations or places of religious significance. Affiliated American Indian groups still retain strong emotional ties to the Lassen Volcanic National Park area. There are ten federally recognized tribes in the Lassen area. They are: Berry Creek Rancheria, Enterprise Rancheria, Greenville Rancheria, Mechoopda Indian Tribe of the Chico Rancheria, Mooretown Rancheria, Redding Rancheria, Susanville Rancheria, Round Valley Indian Tribe, Pit River Tribe, and United Auburn Indian Community. Non-federally recognized tribes include: Honey Lake Maidu, Maidu Cultural and Development Group, and Plumas County Indians, Inc.

Five of the ten federally recognized tribes are routinely consulted with regarding park proposed actions. These tribes are Greenville Rancheria, Mooretown Rancheria, Redding Rancheria, Pit River Tribe and the Susanville Rancheria.

Organized groups of Maidu and Atsugewi are currently located to the southeast and north of the park. There are no organized groups of Yana or Yahai. Deur (2004) listed current membership and tribal associations for affiliated groups. Detailed ethnographic accounts for these groups (Garth 1978; Johnson 1978; Riddell 1978) and for the park (Schultz 1954) portray seasonal use of the park area by all three groups to exploit seasonally available food resources and to follow mobile game.

The park recently completed a *Traditional Use Study* (Deur 2004) that identified sacred areas. Some Traditional Cultural Places have been identified in the *Traditional Use Study* and some have been identified through consultation with Native American Tribes. Based on consultation, information pertaining to most culturally significant places is confidential.

Historic Use

The Lassen area was a meeting point for at least four American Indian groups: Atsugewi, Yana, Yahai, and Maidu. Because of its weather and snow conditions, generally high elevation, and seasonally mobile deer populations, the Lassen area was not conducive to year-round living. These Native American groups camped here in warmer months for hunting and gathering. Basket makers rather than potters, they left few artifacts other than stone points, knives, and metals. Some of these artifacts are displayed in the Loomis Museum, along with replicas of basketry and hunting devices. Tribal descendants still live in the area and are valuable partners to the park. Members have worked with the National Park Service to provide cultural demonstrations and to help visitors understand both modern and historical tribal culture.

In the recent Lassen Volcanic National Park Traditional Use Study (Deur 2004: 5) “all tribal consultants identified Lassen Peak and many other adjacent landscape features as important sacred sites, and places for religious ceremonies. Moreover, all formal interviewees discussed traditional plant gathering on the lands now sitting within Lassen Volcanic National Park, and some mentioned historical hunting and fishing activities as well.”

“Historically, members of all park-associated tribes ascended into the Lassen in the summer to pursue game and gather plants. Consultants reported that their ancestors ascended trails into the Lassen area in the late spring, as the snowpack quickly melted from its slopes. The water from this melting snow fed myriad streams, and fostered a burst of plant growth in the uplands, which drew game animals (Deur 2004:20).”

“. . . Lassen Peak, Snag Lake, and Butte Lake were all identified as vision quest sites during Pit River fieldwork conducted in 1956, and reported in Olmstead and Stewart (1978) Similarly, Dixon (1905: 267-79) reports the centrality of shamans within Maidu society, and associates the acquisition of shamanistic powers with the Lassen area and other high mountains within the Maidu territory, where tutelary spirits were said to dwell. . . Likewise, scant material on Yahi religious activities mentions high-altitude lakes presumably in the Lassen area, as being important for healing or the acquisition of power or luck, and mentions “snow mountain” – a term used by some contemporary consultants for Lassen Peak – as a power place (Harrington n.d. *in* Deur 2004: 24-25).”

Deur (2004:32) continues: “While many places in the park have been used for religious purposes, very few tribal members are said to have visited Lassen Peak, itself. Lassen Peak was said to be too dangerous for most humans. “It has sort of an aggressive spirit there,” more than the spirits found at other peaks, one that does not accommodate human visitors without placing challenges before them - “people had to be very careful.” (FB) One can “see and feel” that aggressive power if they are paying attention, and will sometimes be overcome by an inexplicable discomfort when near Lassen Peak. However, for those who are able to engage this power successfully, the rewards are great. “Lassen Peak power” is particularly strong, and will give an individual abilities that are rare for humans. Most people choose to access this power remotely from locations with clear views of Lassen Peak, but this typically does not impart the full powers potentially obtainable from the mountain.”

“In particular, the water in the small streams that drained off of the sides of Lassen Peak in the summertime was said to be considered very powerful. When people ascended to vision quest sites on the sides of Lassen Peak, they followed these small streams, bathing and drinking as they progressed upslope to acclimate to the pronounced powers of Lassen Peak (BG, LJ). Simple proximity to these creeks was said to be a source of healing power (Deur 2004:39).”

Lassen Peak was also a navigational landmark and for the Maidu, because they were mobile, there were the four cardinal directions, plus one for Lassen Peak. There are numerous examples of Lassen Peak’s use as a navigational aid, particularly when tribal members were displaced or lost (Deur 2004: 45).

Lassen Peak also had spiritual power and was, in some cases, too powerful for tribal members to go there. Contemporary consultants report that many ceremonial sites throughout their traditional territories are oriented toward Lassen Peak. Rock cairns, prayer seats, and other ceremonial features are said to be predictably located in places with unobstructed views of Lassen Peak. This is true not only in the areas immediately surrounding the park, but in locations as distant as Genessee, the Sacramento Valley and the California Coast Range, for example, all of which were mentioned as places where either archaeological features or oral accounts identified ritual sites aligned to Lassen Peak (Deur 2004:44).

“People still go to places with clear views of Lassen Peak to pray and participate in vision quests. More than one Maidu consultant suggested that, in the recent past, they had gone to a place with unobstructed views of Lassen for religious purposes. This is done in part to “tap into the power of Lassen” remotely, as one consultant succinctly put it.

Contemporary Use

Although there is a fair amount of written ethnographic data for these American Indian groups, less information about the groups' contemporary use of the park resources is available. The park is in the early stages of acquiring and documenting traditional and current use information from the local American Indian communities. No specific suggestions regarding contemporary use of Lassen Peak or the Lassen Peak Trail were offered in the recent ethnographic study (Deur 2004). The study does, however, mention that places with views of Lassen Peak were important to tribal consultants.

9. Historic Structures / Cultural Landscapes

Historic Structures

Historic-period structures located within the park include facilities related to early recreational development, and park administration and development. Lassen Volcanic National Park has 84 structures on the List of Classified Structures (LCS) (those considered eligible for or listed on the National Register). These include the facilities at the park headquarters complex, Manzanita Lake, Drakesbad, the Mt. Harkness fire lookout, the Summit Lake, Twin Lake, Horseshoe Lake and Warner Valley ranger stations, the Loomis Visitor Center, as well as numerous bridges, signs, trails, and other features.

Cultural Landscapes

Cultural landscapes are intertwined patterns of natural and constructed features that represent human manipulation and adaptation of the land. With cultural landscapes, large significant landscape features are easily identified, but the inclusion of small-scale contributing elements is often not as obvious. The park has identified at least six cultural landscapes that relate to historical use of the park, including park administration and development. These include: the Manzanita Lake, Drakesbad, Mineral Headquarters Historic District, Warner Valley Ranger Station/Campground, Nobles Emigrant Trail and the Main Park Road (Lassen Volcanic National Park Highway).

The Lassen Volcanic National Park Highway Historic District was determined to be eligible for the National Register of Historic Places at the national level of significance through a consensus determination between the NPS and the California State Historic Preservation Officer (SHPO) on February 15, 1995. It was listed on the National Register in 2004. Listing was based on a 2000 cultural landscape inventory (NPS 2000) and Historic American Engineering Record (HAER) documentation (HAER CA-270) in 1999 (NPS HAER 2000). As noted in the boundary expansion nomination for the Lassen Peak and Bumpass Hell trails:

“. . .the highway has a direct and significant association with NPS administration of Lassen Volcanic National Park and with development of tourism as an industry in northern California (criterion A), and for its expression as rustic architecture, especially that of the NPS (criterion C) during a period of significance extending from 1925 (when road construction began) until 1941 (when construction ceased).”

As stated in the HAER report, the significance of the highway is that it *“is a classic example of early twentieth century road design. The road, which is the sole means of automobile access to the greater part of Lassen Volcanic National Park, was carefully designed and located to maximize scenic opportunities for automobile tourists while preserving the majority of the park as wilderness. Built between 1925 and 1934, the Lassen Park Road is an example of an early collaboration between the National Park Service and the Bureau of Public Roads in the design and construction of national park roads. It represents an important example of national park planning, development and scenic road design in the early decades of the twentieth century.”*

The road alignment was designed to display the park's most scenic and geologically interesting areas. Roadside amenities, including scenic pullouts, trailhead parking areas, and roadside markers were designed to enhance the motorists' experience, to allow hikers access to the park's extensive backcountry trail system, and to add to the visitor's understanding of the dramatic geological processes that created the diverse volcanic landscape (NPS CLI 2000:1/6). As a result, the Lassen Volcanic National Park Highway is a linear landscape that extends 29.86 miles between the southwest and

northwest entrance stations of Lassen Volcanic National Park. The road traverses active hydrothermal areas, sub-alpine forests, mountain meadows, and barren areas. Designed in the early 1920s as a recreational pleasure drive, the Lassen Volcanic National Park Highway remains the primary means by which most visitors experience the park. According to the Cultural Landscape Inventory (NPS 2000:1/6), significant features include the road's route and alignment, scenic overlooks, headwalls, culverts, entrance pylons and the northwest entrance station.

Recent evidence and research association with the proposed rehabilitation of the Lassen Peak Trail has indicated that the Lassen Peak Trail was constructed in conjunction with the Lassen Volcanic National Park Highway District and should be considered for listing on the National Register in association with the road. An amendment to the Lassen Volcanic National Park Highway District has been prepared to describe the significance of the trail and its association with the road and to expand the boundary of that District to include the Lassen Peak and Bumpass Hell trails.

The proposed Lassen Volcanic National Park Highway Historic District expansion to include the Lassen Peak Trail includes the trail and extends from the trailhead to the crater rim. It encompasses all aspects of the immediately surrounding environment physically affected by construction of the Lassen Peak Trail and the Bumpass Hell Trail. This includes all land and features in a trail corridor no more than 12 feet wide, which includes the clearing needed for tread, cuts, fills, rest stations, drainage features, and retaining (parapet) walls (Mark 2009:7).

According to the amended nomination, the two trails, "along with other individual trail features pertaining to their original design and construction are eligible under Criterion A due to the association of the Lassen Peak Trail and the Bumpass Hell Trail with the history and development of Lassen Volcanic National Park. Each trail was an extension of the park's circulation system that emanated from construction of the Lassen Volcanic National Park Highway, a road whose completion greatly expedited the growth of tourism in this part of northern California. As the highway became the main way in which visitors experienced the park, the trails provided a means to reach the two most popular attractions at Lassen.

Both trails are eligible under Criterion C as expressions of newly formulated standards of trail construction articulated by NPS officials within the larger framework of rustic architecture that governed development in national parks before World War II. Along with roads, trails are an area where engineers played a key role in NPS landscape design between 1916 and 1942 (the identified period of significance in previous multiple property documentation), though the accomplishments of landscape architects have generally received more notice" (Mark 2009: 5).

Cultural landscapes are significant in the degree to which they contain integrity associated with the following features:

- spatial organization (the way elements are arranged within the landscape),
- land use (the use of landforms),
- natural systems and natural features (how these are retained or enhanced by landscape design),
- circulation (provision for vehicle and pedestrian travel in the landscape),
- vegetation (the use of landscaped vegetation to enhance or define areas),
- views and vistas (the integration of views and vistas),
- topography (the use of natural topography in the design),
- small scale features (elements of the landscape such as drinking fountains, curbing and other built elements),
- constructed water features (culverts, culvert headwalls, box culverts, etc), and
- buildings and structures (housing, administration, maintenance and other buildings, as well as bridges, utility systems, etc.).

Note: The underlined features above retain integrity for the Lassen Volcanic National Park Highway (NPS CLI 2000:3a/1). Those identified by italics retain integrity for the trail.

As noted in the nomination (NPS 2009: Section 7, Page 1): *“the design . . . consists of the following components: curvature, gradients, width, height, drainage, and overlooks or vista points. The Lassen Peak Trail largely consists of spiral curves, almost all at grade. Its minimum width is four feet, some sections (usually at overlooks) reach eight feet; height is unlimited due to the presence of very little overstory. Often steep with a targeted maximum grade of 15 percent (some sections above timberline exceed that figure), the trail is sloped slightly outward to provide sheeting for drainage instead of using culverts, dips, water bars, or check dams. Numerous overlooks at the apex of curves and switchbacks are provided and widened in many places so that small groups can congregate and for passage in both directions.”*

Most of the masonry structures on the Lassen Peak Trail are not original, *“but represent the continuing efforts to stabilize the trail since its construction. The ten (sic, actually more than 50) dry laid walls on the Lassen Peak Trail may be original, with some intended to stabilize the backslope (above grade) in a few cases, but most often the outslope (below grade) adjacent to the tread surface”* (Mark 2009: Section 7, Page 2).

The Lassen Peak Trail and Bumpass Hell Trail *“exhibit the characteristics associated with NPS trail standards at the time of their construction, but are distinctly different from the narrower backcountry routes built primarily as access to backcountry lakes and present fewer spectacular vistas. Both were designated as national recreation trails by the Secretary of the Interior on March 20, 1981”* (Mark 2009: Section 7, Page 3).

As noted in the nomination, the Lassen Peak Trail itself is a contributing structure. It replaced a route built by the USFS in 1914 to the summit of the peak. It was designed as a trail meant to *“further the experience of visitors traveling on the Lassen Volcanic National Park Highway. The most prevalent built feature on this trail are retaining walls (some original), and there is little in the way of realignment due to constraints imposed by the mountain’s topography”* (Mark 2009).

In addition, the following small-scale features on the trail are considered contributing:

- Dry-laid retaining walls: *“A majority of the ten (sic, actually more than 50) dry-laid features on the Lassen Peak Trail either date from the historic period or are compatible with original work. All function to stabilize the trail or near switchbacks, but these features also meet the goal of blending into the landscape”* (Mark 2009). New information, however, indicates that some of this original construction, however was of poor quality (Dolan 2009).

Non-contributing features include the:

- Masonry retaining walls: *“All 12 (sic actually 16) of the “wet” masonry features on the Lassen Peak Trail are nonhistoric, though some demonstrate the traditional NPS emphasis on specifying different sizes of stone, variations in color, a gradation of size from bottom to top, raking joints and keeping them small in proportion to the stone used. Most of the features simply replaced dry-laid walls in the same spot, and they still serve the same function of stabilizing the tread.”*
- Signs and wayside exhibits: *“All of the signs on the Lassen Peak and Bumpass Hell trails are contemporary and post-date the period of significance. Wayside exhibits with stone masonry bases are also located on each trail, with none reflecting park design of the historic period, but they provide some continuity with NPS intent of the time that allowed for educational enrichment in conjunction with the recreational experience of visitors.”*
- Comfort stations: *“Two portable restrooms located on the Lassen Peak Trail above the switchbacks in an area 0.6 miles from the summit were removed in the late 1990s, though some evidence of anchoring their bases remains. The fiberglass toilets were a successor to wooden privies built at the same location in 1937. The latter were once more numerous, but the privies were frequently replaced due to damage from storms and snow loads”* (Mark 2009).

Since this nomination was prepared, a more detailed cultural landscape inventory (preliminary) of the Lassen Peak Trail features has been conducted (Dolan 2009) and found:

Feature	Number
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Dry laid retaining walls	50
Wet mortared retaining walls	16
Rock barriers (single courses of rock)	6
Stone steps	6 sets
Water barbs (rock grade breaks)	8

Of these, the following were recommended as contributing or non-contributing (Dolan 2009):

Contributing

- 23 dry laid retaining walls,
- 6 sets of stone steps, and
- 8 water bars.

Non-contributing

- 27 dry laid retaining walls,
- 16 wet mortared retaining walls, and
- 6 rock barriers.

Along the 2.3 miles of trail, dry laid retaining walls are by far the most predominant feature. In general, however, these retaining walls (both dry and wet mortared) are in poor condition, with an immediate need for stabilization or rehabilitation to prevent further deterioration. Less than half (23/50) of the dry laid retaining walls were found to be original (contributing), with the majority of original walls having only their lowest rock courses being original, and the upper courses being subsequently altered. None of the wet mortared walls are original (typically added in the 1970s) as found by dates inscribed on some of them within the mortar. More than half (27/50) of the dry laid retaining walls were found to be not original and/or severely altered, but are most likely located in a similar location to the original walls and which follow a similar alignment. Most of the non-original (non-contributing) walls were found to be incompatible with the historic character of the trail (19/27), as a result of partial collapse, or use of a construction technique atypical of the originals (Dolan 2009).

The original dry laid retaining walls were found to be poorly constructed, not following standard craftsmanship design details from the rustic period of development of the national parks (inter-war period). The original walls of the Lassen Peak trail differ from typical crafted walls of the rustic period by not using large rock, not having a consistent 30 degree batter, not have their lowest course rock embedded, not having some large rock on the top course as deadmen, not minimizing the size of joints, not avoiding overlapping vertical joints and not ensuring good bedding of courses by using rock in the most horizontal orientation. The walls appear to have been constructed without masonry craftsmanship, leading to poor durability. The walls were built fairly rapidly by laborers prior to the arrival of the CCC labor force (Dolan 2009). Because of this, the majority of the retaining walls have lost integrity (many being barely distinguishable from poured rip rap), and their primary value is to delineate the trail rather than to reinforce the historic character of the trail (Dolan 2009).

10. Visitor Experience

A. Visitor Use Access

Visitation at Lassen Volcanic National Park is highly seasonal, with peak visitation occurring in July and August, but spread out between May and October. The four-month period between June and September typically accounts for over 80 percent of visitors. July and August alone may account for over half the annual visitation. Visitation has also been relatively constant over the last two decades, averaging about 400,000 people per year (approximately 350-470 thousand annual visitors between 1980 and 1999) (GMP 2001). While some cross-country skiing and snowshoeing occurs during the winter, visitation levels do not rise substantially until the main road is opened. And, main road opening and closing dates can vary substantially, depending on snowfall, with the road closing as early as the beginning of October or as late as early December and opening as early as the beginning of May or as late as the middle of July.

Outlying areas (not connected to the main park road) include Butte Lake (northeast portion of park), Juniper Lake (southeast portion of park) and Warner Valley (south central portion of park). These areas are accessed off California Route 44 (Butte Lake), and California Route 36 (Juniper Lake and Warner Valley).

Most (approximately 80 percent) visitors to Lassen Volcanic National Park are from California. The rest of park visitors come from the rest of the United States (15 percent) and from foreign countries (5 percent).

Most park visitation occurs along the main park road, where the majority of the park's recreation facilities and interpretive displays are found. The road also provides ready access to backcountry destinations. Approximately 80 percent of the park visitors enter through the Southwest Entrance. North entries (where there is a small museum with interpretive displays) are highly concentrated on summer weekends, reflecting heavy weekend use by Redding area residents. In contrast, Southwest Entrances reveal significant weekday use, suggesting longer duration trips from areas outside the immediate region. In winter, and during late spring, the road is closed between the two park entrances at Manzanita Lake and the Kohn Yah-mah-nee Visitor Center.

B. Visitor Use Opportunities

Recreational activities available at Lassen Volcanic National Park include auto touring, hiking, backpacking, camping, climbing, horseback riding, fishing, skiing, snowshoeing, ranger talks, and guided walks/tours. Hunting is prohibited within the park boundary.

The park has over 150 miles of maintained hiking trails including 17 miles of the Pacific Crest Trail. Approximately two percent of park visitors stayed overnight in 1999. Lassen Volcanic National Park contains eight regular campgrounds and two group campgrounds with approximately 375 individual sites and 15 group sites which are open from May/June to September/October, depending on weather. Of those who stay in the park, approximately 25 percent stay in developed campgrounds. Stock use by horses, mules, burros, and llamas is permitted in the backcountry areas of the park, although most visitors travel by foot.

Fishing is allowed in all streams and lakes with the exception of Manzanita Creek above Manzanita Lake. The park has extensive backcountry skiing as well as snowshoe use available; however, winter use comprises only about 10 percent of the park's total. Until the road opens, there are occasional overnight excursions to Lassen Peak for spring skiing primarily on weekends. For the first month after the road opens, up to a dozen parties hike part way up the peak and ski down on most days. Because the trail is partially melted out during this time, short-cutting often occurs.

Ranger talks, guided walks/talks, and Junior Ranger and Firefighter programs are scheduled from mid-June through early September. While some of the activities take place only a few days a week, others run up to 7 days a week. They take place in various places across the park: Loomis Museum, Manzanita Lake Amphitheater, the Discovery Center, and the Visitor Center. Other interpretation includes handouts, wayside exhibits and roving interpreters. There is currently no formal personal services interpretation offered on the Lassen Peak Trail. Formal ranger-led hikes occurred every other day beginning in the late 1930s and continued, though much less frequently into the 1900s. Eleven interpretive wayside exhibits focus primarily on providing geologic information about the trail.

C. Lassen Peak Trail Use and Management

The Lassen Peak Trail and the Bumpass Hell Trails are the most popular day use hiking trails in the park. The hike to Lassen Peak is a trip undertaken by many of the park's visitors. The average family can make the five mile round-trip in half a day. Visitors to Lassen Volcanic National Park have been hiking the Lassen Peak trail since the early 1900s, although the formal trail known today was not constructed until the mid-1920s to late 1930s.

In the 1980s the trip to the peak became even more popular from the successful marketing of "Go Hike a Volcano." While the ascent to the top of the Peak ranks high among the most enjoyable activities in the park, it also poses a challenge to park managers in ensuring the preservation of its resources. Trail count data from the 1970's indicates that over 35,000 people per year hiked to the top. Recent trail counter data

from summer 2008, found that just during the period from June 1 to October 7, more than 22,000 people passed the lower counter and more than 15,000 passed the upper trail counter. These data also show that the most popular times for hiking the peak are weekends, with Saturday visitation counts up to 650 people, and an average daily visitation from mid June 1 through October 7 of approximately 200 people a day.

If constructed, under Alternatives C and D, the connector trail would provide access to an area popularly known as Vulcan's Castle. Current, limited use of the Vulcan's Castle area, occurs via a network of social trails. Although the best climbing exists in this area, it receives little use (10-20 parties a summer). Due to snow accumulation, the area is generally inaccessible from July through September but is likely accessed intermittently during that time. Spring and early summer (June) skiing occurs nearby on Ski Heil.

The following issues are among those that have been identified by park staff regarding managing visitor use on the Lassen Peak Trail:

- Visitors want to hike to the top as soon as the road opens in the spring. At this time, the trail is still snow covered in many locations and hikers may wander widely in search of the trail between the intermittent snowfields. Most visitors are not prepared for walking over snow and ice. This may result in frequent injuries due to slips and falls.
- Park staff currently use a wand system to aid hikers in staying on the trail but the results have been less than satisfactory. The existing trail switches back and forth on a vertical ridgeline so that about half of the trail is on a north facing slope where the snow is slow to melt. These areas are of particular concern during shoulder seasons when visitors must choose between staying on the marked trail or taking a safer detour off trail.
- The trail on the top of the Peak terminates in an unlikely spot and hikers are left to find their own route to points that interest them. It is easy to make the wrong choice and wind up scaling hazardous rock outcroppings or climbing out to areas that have unreliable footing and steep consequences. Resource damage occurs from visitors trampling sensitive vegetation in search of where they think they are supposed to go.
- The existing trail is narrow in some sections and it is difficult for two hikers to pass when traveling in opposite directions. Consequently, many hikers decide to take short cuts and go off trail between switchbacks. This activity is dangerous to hikers and causes significant damage to vegetation, the top soil mantle and leads to erosion, including dislodging soil and loose rocks.
- Off trail travel and short cutting causes damage to soil and the rock retaining walls that hold the trail in place on steep hillsides, making trail maintenance that much more difficult.
- There are no restrooms available beyond the Lassen Peak trailhead parking lot. It takes the average person at least 2 hours to hike to the top and an hour to return. If an hour at the top is spent exploring and enjoying the views, the trip tends to exceed most people's comfort zone for a restroom.
- To access the Lassen Peak Trail, visitors have to travel by auto to the Lassen Peak parking lot. There are no interior park trails that lead to the trailhead and no alternative transportation options.

D. Visitor Safety

Volcanic / Seismic Activity: Because Lassen Volcanic National Park has an extensive history of volcanic activity, seismic activity is monitored by a network of nine seismometers located both within and outside the park. These seismometers provide a continuous (24-hours a day) record of seismic activity through their radio and phone line connections to the USGS Earthquake Laboratory in Menlo Park, California. The purpose of continuous monitoring is to detect volcanic activity early and to learn more about earthquake and volcanic phenomena based on background levels of seismicity. This information provides park staff with the means to prepare the most effective warning and evacuation plan if renewed volcanic activity is detected at levels of concern. There is also a network of five GPS base stations, which can detect even minute changes in the earth's surface. These are monitored by the USGS.

Unstable Trail Tread: Maintaining the Lassen Peak trail on the steep unstable slopes of a volcano inherently involves risks to both employees and visitors. Because it is not possible to entirely eliminate hazards, as called for by Management Policies (2006), the NPS would continue to weigh and mitigate risks, where appropriate, and to provide a reasonable measure of safety on this and other park trails. In 1929, NPS choose what was then and is now still considered to be the safest route (southeast ridge) to the summit. The southeast ridge is predominantly dacite bedrock, but bedrock is still affected each winter by the freeze/thaw cycle and natural weathering. The slopes of Lassen Peak, including the southeast ridge are primarily comprised of unconsolidated rock with little soil and vegetation development, especially above 9,500 feet. Some sections of the trail lie alongside areas of large angular and irregular volcanic rock on a loose rock slope that is often at the angle of repose (from which dislodged rocks fall until hitting an obstacle). Small rockslides have been known to occur on the peak, particularly during the shoulder seasons. Rock routinely, however, falls onto the surface of the trail during all seasons from natural causes (melting snow) and impacts from visitors stepping off the trail. Single rocks are dislodged and roll down the slope routinely during most of the summer. This hazard is most acute during snow melt and when the trail is crowded (causing more visitors to leave the trail to pass or avoid other visitors). Since the trail was constructed, there have been a handful of people hit by rocks and many close calls.

11. Wilderness

In October 1972, Congress designated 75% of the park (78,982 acres) as the Lassen Volcanic Wilderness. The 2003 General Management Plan for Lassen Volcanic National Park proposes an additional 25,000 acres be included for wilderness designation. NPS wilderness management policies are based on provisions of the 1916 NPS Organic Act, the 1964 Wilderness Act, and legislation establishing individual units of the national park system. These policies establish consistent service-wide direction for the preservation, management, and use of wilderness and prohibit the construction of roads, buildings and other man-made improvements and the use of motorized vehicles in wilderness. All park management activities proposed within wilderness are subject to review following the minimum requirement concept and decision guidelines (a decision process to determine if the proposed management action is appropriate and necessary for the administration of the areas as wilderness: and, if it is, to select the management method which causes the least amount of impact to the physical resources and experiential qualities (character) of the wilderness). The public purpose of wilderness in national parks includes the preservation of wilderness character and wilderness resources in an unimpaired condition, as well as for the purposes of recreational, scenic, scientific, education, conservation, and historical use.

The wilderness boundary straddles park roads, including the Lassen Volcanic National Park Highway, the Warner Valley Road, the Juniper Lake and Butte Lake roads, where exclusions from wilderness occur that include the park's popular developed areas, including the Lassen Peak Trail.

The park contains 150 miles of hiking trails, most of which are in wilderness, including most of the 17 miles of the Pacific Crest Trail within the park. The Lassen Peak Trail is not located in Wilderness; however, if constructed in Alternatives C and D, most of the Manzanita Creek Connector Trail (5.15 of 5.5 miles) would be located in Wilderness. Although the Lassen Peak Trail does not occur in wilderness, all but the southernmost views from it are toward wilderness.

There is currently a proposal (the Treasured Landscapes Initiative) that would change 13,151 acres of proposed wilderness in Lassen Volcanic National Park to designated wilderness.

12. Park Operations

A variety of ongoing park trail operations occur on the Lassen Peak Trail and to maintain the Lassen Peak Trail Parking Lot and access to it. These include ongoing routine and cyclic maintenance of the trail tread to ensure a smooth trail surface, including removing fallen rocks from the trail, smoothing trail tread, directing water runoff off the trail, and replacing rocks within or occasionally reconstructing deteriorating rock walls.

By spring, the Lassen Peak parking area is plowed and the toilets opened. A variety of seasonal operations are also conducted, including flagging or wanding the trail in spring (before snowmelt) to identify it to visitors able to get to the trailhead when the trail is still covered in snow. Crews are also currently used to cut trenches in the snow through some sections, where it is difficult to find the trail.

Other park operations on the Lassen Peak Trail include periodic roving of the trail by staff from visitor services (interpretation and protection) and ongoing resource management activities on the trail, such as continued repair of the exclosure fencing for the rare plant population, long-term monitoring of the rare plants, and, as funding is obtained, restoration of abandoned trail sections or short-cuts.

Chapter V: Environmental Consequences

Methodology

NEPA requires that environmental documents disclose the environmental impacts of the proposed federal action, reasonable alternatives to that action, and any adverse environmental effects that cannot be avoided should the proposed action be implemented. This section analyzes the environmental impacts of project alternatives on affected park resources. These analyses provide the basis for comparing the effects of the alternatives. NEPA requires consideration of context, intensity and duration of impacts, indirect impacts, cumulative impacts, and measures to mitigate impacts. In addition to determining the environmental consequences of the preferred and other alternatives, *Management Policies* (NPS 2006) and Director's Order-12, *Conservation Planning, Environmental Impact Analysis, and Decision-making* require analysis of potential effects to determine if actions would impair park resources. Impact analysis for historic properties is based on NHPA 36 CFR Part 800 criteria of effect as detailed below.

CONTEXT OF IMPACT: The context is the setting within which impacts are analyzed – such as the project area or region, or for cultural resources – the project area or area of potential effects.

TYPE OF IMPACT: A measure of whether the impact will improve or harm the resource and whether that harm occurs immediately or at some later point in time.

- **Beneficial:** Reduces or improves resource conditions/impact being discussed.
- **Adverse:** Increases or results in impact being discussed. Depletes resources.
- **Direct:** Caused by and occurring at the same time and place as the action, including such impacts as animal and plant mortality, damage to cultural resources, etc.
- **Indirect:** Caused by the action, but occurring later in time at another place or to another resource, including changes in species composition, vegetation structure, range of wildlife, offsite erosion or changes in general economic conditions tied to park activities.

DURATION OF IMPACT

Duration is a measure of the time period over which the effects of an impact persist. For this EA, the following definitions pertain to duration:

Short-term: Often quickly reversible and associated with a specific event such as construction during project implementation, occurring for a period of less than one to five years.

Long-term: Reversible over a much longer period, or may occur continuously based on normal activity, or for more than five years.

Since full implementation of an action alternative often would take place over a number of years, duration frequently assesses the duration of individual actions of the alternative (including removal of structures, site restoration, and construction of new structures) instead of full implementation of the alternative.

AREA OF IMPACT

- **Localized:** Detectable only in the vicinity of the activity.
- **Widespread:** Detectable on a landscape or regional scale.

INTENSITY OF IMPACT

The following definitions are used in the environmental impact analysis.

- **Negligible:** The anticipated degree of change would not be detectable or would be only slightly detectable – localized or at the lowest level of detection.
- **Minor:** There would be a measurable or anticipated degree of change that would have a slight effect, causing a slightly noticeable change of approximately less than 20 percent compared to existing conditions, often localized. It would usually be noticed only by specialists or those familiar with the specific resource. Mitigation measures, if applicable, would be simple to implement and would likely be successful.
- **Moderate:** There would be a measurable or anticipated degree of change is readily apparent and appreciable and would be noticed by most people, with a change likely to be between 21 and 50 percent compared to existing conditions. A moderate effect can be localized or widespread.

Mitigation measures, if applicable, would be necessary to offset adverse impacts and would likely be successful.

- **Major:** The measurable or anticipated degree of change would be substantial, causing a highly noticeable change generally greater than 50 percent compared to existing conditions. The change would be obvious, though some people would not be able to identify what change had occurred. Major changes are often widespread, but could be localized within a large area. More extensive mitigation measures, if applicable, would be needed but their success could not be guaranteed or they would minimize the effect in only a small area.

IMPACT MITIGATION

Impacts have been assessed under the assumption that proposed measures to minimize or mitigate the impact would be implemented. The following terms identify the way to change the intensity of impacts.

Project actions can:

- **Avoid** conducting management activities in an area of the affected resource;
- **Minimize** the type, duration or intensity of the impact to an affected resource; and
- **Mitigate** the impact by:
 - **Repairing** localized damage to the affected resource immediately after an adverse impact;
 - **Rehabilitating** an affected resource with a combination of additional management activities; or
 - **Compensating** a major long-term adverse direct impact through additional strategies designed to improve an affected resource to the degree practicable.

IMPAIRMENT

In addition to determining the environmental consequences of the preferred and other alternatives, *Management Policies* (NPS 2006) and Director's Order-12: *Conservation Planning, Environmental Impact Analysis, and Decision-making*, require analysis of potential effects to determine if actions would impair park resources. The following excerpts from *NPS Management Policies* (NPS 2006) define impairment and highlight the difference between an impact and impairment.

1.4.3 The NPS Obligation to Conserve and Provide for Enjoyment of Park Resources and Values

"The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. This mandate is independent of the separate prohibition on impairment and applies all the time with respect to all park resources and values, even when there is no risk that any park resources or values may be impaired. NPS managers must always seek ways to avoid, or to minimize to the greatest extent practicable, adverse impacts on park resources and values. The laws do give the Service the management discretion, however, to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, so long as the impact does not constitute impairment of the affected resources and values.

The fundamental purpose of all parks also includes providing for the enjoyment of park resources and values by the people of the United States. The enjoyment that is contemplated by the statute is broad; it is the enjoyment of all the people of the United States and includes enjoyment both by people who visit parks and by those who appreciate them from afar. It also includes deriving benefit (including scientific knowledge) and inspiration from parks, as well as other forms of enjoyment and inspiration. Congress, recognizing that the enjoyment by future generations of the national parks can be ensured only if the superb quality of park resources and values is left unimpaired, has provided that when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant. This is how courts have consistently interpreted the Organic Act."

1.4.4 The Prohibition on Impairment of Park Resources and Values

"While Congress has given the Service the management discretion to allow impacts within parks, that discretion is limited by the statutory requirement (generally enforceable by the federal courts) that the Park Service must leave park resources and values unimpaired unless a particular law directly and specifically provides otherwise. This, the cornerstone of the Organic Act, establishes the primary

responsibility of the National Park Service. It ensures that park resources and values will continue to exist in a condition that will allow the American people to have present and future opportunities for enjoyment of them.

The impairment of park resources and values may not be allowed by the Service unless directly and specifically provided for by legislation or by the proclamation establishing the park. The relevant legislation or proclamation must provide explicitly (not by implication or inference) for the activity, in terms that keep the Service from having the authority to manage the activity so as to avoid the impairment.”

1.4.5 What Constitutes Impairment of Park Resources and Values

“The impairment that is prohibited by the Organic Act and the General Authorities Act is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. Whether an impact meets this definition depends on the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts.

An impact to any park resource or value may, but does not necessarily, constitute an impairment. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:

- *necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, or*
- *key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or*
- *identified in the park’s general management plan or other relevant NPS planning documents as being of significance.*

An impact would be less likely to constitute an impairment if it is an unavoidable result of an action necessary to preserve or restore the integrity of park resources or values and it cannot be further mitigated. An impact that may, but would not necessarily, lead to impairment may result from visitor activities; NPS administrative activities; or activities undertaken by concessioners, contractors, and others operating in the park. Impairment may also result from sources or activities outside the park.”

1.4.6 What Constitutes Park Resources and Values

“The “park resources and values” that are subject to the no-impairment standard include: the park’s scenery, natural and historic objects, and wildlife, and the processes and conditions that sustain them, including, to the extent present in the park: the ecological, biological, and physical processes that created the park and continue to act upon it; scenic features; natural visibility, both in daytime and at night; natural landscapes; natural soundscapes and smells; water and air resources; soils; geological resources; paleontological resources; archeological resources; cultural landscapes; ethnographic resources; historic and prehistoric sites, structures, and objects; museum collections; and native plants and animals; appropriate opportunities to experience enjoyment of the above resources, to the extent that can be done without impairing them; the park’s role in contributing to the national dignity, the high public value and integrity, and the superlative environmental quality of the national park system, and the benefit and inspiration provided to the American people by the national park system; and any additional attributes encompassed by the specific values and purposes for which the park was established.”

1.4.7 Decision-making Requirements to Identify and Avoid Impairments

“Before approving a proposed action that could lead to an impairment of park resources and values, an NPS decision-maker must consider the impacts of the proposed action and determine, in writing, that the activity will not lead to an impairment of park resources and values. If there would be an impairment, the action must not be approved.”

In this Environmental Assessment determinations of impairment are provided in the conclusion section under each applicable resource topic for each alternative. Based on policy, however, impairment

determinations are not made for health and safety, visitor use, maintenance, operations, socioeconomic resources and other non-natural or cultural resources topics.

CUMULATIVE IMPACT ANALYSIS

Cumulative impacts are the effects on the environment that would result from the incremental impacts of the action when added to other past, present and reasonably foreseeable future actions. Impacts are considered cumulative regardless of what agency or group (federal or non-federal) undertakes the action.

The Council on Environmental Quality (CEQ) describes a cumulative impact as follows (Regulation 1508.7):

A "Cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

The cumulative projects addressed in this analysis include past and present actions, as well as any planning or development activity currently being implemented or planned for implementation in the reasonably foreseeable future. Cumulative actions are evaluated in conjunction with the impacts of an alternative to determine if they have any additive effects on a particular resource. Because most of the cumulative projects are in the early planning stages, the evaluation of cumulative impacts was based on a general description of the project. These projects are included in the cumulative effects analysis presented in this chapter.

Included in the cumulative impacts analysis are the following projects:

- Rehabilitation of the Lassen Volcanic National Park Highway (2003-2010 in three phases); and
- Construction of the Southwest Visitor Services Facility and the new Entrance Station (2006-2008);

as well as ongoing impacts from park operations.

Mitigation Measures

The mitigation measures identified in Appendix 1 would be implemented as part of the Preferred Alternative. These measures have been developed to lessen the potential adverse effects of the Preferred Alternative. The rehabilitation of the Lassen Peak Trail would occur over approximately three to five seasons, typically from May or June through September, depending on snow conditions. Phasing construction is necessary due to heavy snows, which close the road during the winter. Other general measures include: (1) limiting rehabilitation work within the existing trail prism (area originally affected by construction), (2) using construction materials (design, types, and colors) that blend with the surroundings, and (3) revegetating disturbed areas to blend with the natural environment.

Impact Analysis

1. Impacts to Soils and Geology and from Geological Hazards

Alternative A: Under Alternative A, there would be few impacts to soils and geology except as associated with routine and cyclic trail maintenance. Ongoing impacts to area soils and geology associated with weathering and erosion of the Lassen Peak Trail would continue as would ongoing impacts from natural geological hazards. The trail and historic and non-historic rock walls lay at or about the angle of repose and would continue to be subject to ongoing weathering caused by wind and water erosion (snowmelt). Slumps, soil saturation and seismic induced failure would continue to be rare occurrences that would not be influenced by the selection of this or other alternatives.

Routine and cyclic maintenance would continue to include actions such as removing fallen rocks from the trail, smoothing trail tread, directing water runoff into channels alongside and under the trail, and replacing rocks or occasionally reconstructing deteriorating rock walls. These actions would have localized negligible to minor adverse effects on soils and minor localized adverse effects on geology from excavation and recreating a smooth trail tread. Overall impacts in Alternative A would be short- and long-term, negligible to minor and adverse.

Alternative B: In addition to ongoing impacts from Alternative A, actions in Alternative B that would affect soils and geology would include: rehabilitation of the Lassen Peak Trail [including reducing the overall width of the trail between the trailhead and the summit plateau to a consistent historic width of four feet and linking some shortened switchback corners (about 5-10) to their historic ends]; construction and reconstruction of rock walls and steps; relocation of the repeater; and restoration of short-cuts along the main trail.

Rehabilitating the trail would likely decrease the frequency with which visitors step off the trail because the main trail would be clearer. It is likely, however, that a few visitors would continue to leave the trail and dislodge rocks. Alternative B, as in other alternatives would retain the current route of the Lassen Peak Trail, which is considered to be the safest. Moreover, it is the easiest place to maintain a trail. As in other action alternatives (B, C and D), Alternative B would include rehabilitating most rock walls and bedding down precariously perched rocks, such as those which were set in place by the snow pack. Both actions would decrease inherent hazards associated with rock fall and lead to a safer trail.

Work to connect the trail with some historic switchback corners would involve finding and using the historic bench cut toward the switchback ends and excavating soil and rock which has fallen onto these sections and obscured the trail. Many existing walls would be reconstructed and some new walls would be added. Construction and reconstruction of approximately 66 historic and non-historic rock walls plus construction of new walls, where needed would involve moving approximately 750 cubic yards (1,700 – 2,000 tons) of rock procured from either outside the park and/or the Lake Helen quarry to the worksites, excavating or re-excavating footings and using soil to fill in areas around the wall edges. These actions would take place on steep slopes at or nearly at the angle of repose and would involve stabilization of steep side slopes above and below the trail using accepted techniques of layering (dry-stacking) rock to retain the trailside slopes. Dry-stack walls would contain the following standard features: large first tier rocks half-buried at a batter (angle) calibrated to the rock type and slope, with successively smaller rocks in each tier.

Construction of icy season bypass areas would require additional excavation for steps, where needed, and for routing a new section of trail around the main section of trail in a more stable location (less susceptible to shoulder season icy conditions). Some actions, such as ongoing trail maintenance and rehabilitation would be widely spaced in time, while others, such as reconstruction of rock walls and narrowing or widening trail tread, would occur concurrently.

Together, these actions would have short-term and long-term localized minor to moderate adverse impacts on soils and geology. They would result in soils and rock being compacted, mixed, removed,

moved and replaced and would occur over the length of the Lassen Peak Trail, wherever rehabilitation is needed.

Rock would be used from within the park or imported to fix and/or construct rock walls. If appropriate, deconstruction of historic rock walls would occur, with numbering of stones for replacement in the wall in the same manner. Where new walls were needed to replace failing non-historic mortared walls, the mortared walls would be removed, including salvage of materials if appropriate, then new footings would be dug and the mortared walls replaced with dry-stack rock walls in the same locations. Some dry-stack rock walls may be constructed with new engineered, reinforced concrete bases.

Overall impacts in Alternative B would be localized, minor to moderate and short- to long-term. Negligible to moderate long-term beneficial impacts would occur from rock stabilization, thereby reducing erosion and rock fall hazards.

Alternative C: Actions and impacts would be similar to Alternative B, however, there would be more work done to the trail to connect it with its historic switchback corners (approximately 10-15); to widen the trail in the lower section (below treeline), including more reconstruction of rock walls; to construct turnouts to accommodate groups; and to construct the toilets and Manzanita Lake Connector Trail.

As in Alternative B, actions to define the trail, to bed unstable rocky sections would reduce the potential for rock fall on the trail. Other actions in Alternative C to widen the trail in some sections and to construct shoulder season bypass areas would also minimize the likelihood that visitors would continue to leave the trail to pass, thereby providing some additional diminishment of rock fall hazards.

Impacts to connect the trail with more historic switchback corners would be similar to but greater than in Alternative B, since more corners would be connected. Similarly actions to construct or reconstruct dry-stack rock walls would be greater than in Alternative B (including more disturbance and more rock needed), since more of these would be built. Compared to Alternative B, more existing walls would be reconstructed and more new walls would be constructed. Approximately 1,300 cubic yards (3,000 – 3,400 tons) of rock would be procured from either outside the park and/or from suitable loose rock in the Lake Helen quarry.

Widening the trail in the lower section and constructing turnouts would expand the area impacted by the trail to encompass additional vegetation and rock areas left during original construction, therefore impacting additional soils, since more well-developed soils occur in this lower section of trail. There would also be additional impacts on soils and geology from widening, which would require more robust rock walls and impact new areas. Because the lower section of trail already averages about five feet, this widening would have negligible to minor effects.

Additional impacts would also occur from constructing summit crater area trails and a formal route to the true summit. Constructing a route to the true summit would require drilling holes in rock for the stanchions and moving loose rocks to create a stable trail surface, while constructing summit crater area trails would involve re-designation of trail segments lost from disuse and/or from social trails developing over time in this area. Because these areas (summit crater and true summit) would have less formal trails, impacts would be fewer than from the trail widening below treeline and to construct turnouts to accommodate small groups.

Constructing the toilets would require excavation of a foundation and vault area for the toilet and placement of a concrete pad over this area. Approximately 600 square feet of soils would be covered with impervious surfacing and soils and geology would be affected for the excavation, a long-term, localized minor adverse effect.

Constructing the Manzanita Lake Connector Trail would involve excavation for a full bench cut for the trail surface. Although this trail is intended to be similar to other wilderness trails (24-inches wide), a bench of 3-4 feet would be cut to accommodate its primarily side-hill construction. The tread would be carved and shaped and loose material (soils and rock) side-cast. Although side-casting would be minimized, it would

widen the trail beyond four feet in many sections. To ensure drainage, a 12 percent outslope would be created and the trail surface compacted. In addition, a number of dry-stack rock walls would be needed to stabilize steep sections of trail. This would require an estimated 300 cubic yards of material for 22 dry stack walls. These materials would be sourced from nearby and adjacent areas. The trail would also traverse about four rock piles, where rock steps would be used and two bedrock areas (each approximately 20 feet long) which could require carved steps. Most of these 300 cubic yards will be moved with shovels and rockbars from the high side to the low side of the trail to create a flat walking surface.

Overall impacts to soils and geology in Alternative C would be moderate, localized and short- to long-term. Minor to moderate localized long-term beneficial effects would occur from restoration of more areas than in Alternative B as well as from actions to reduce visitor induced and natural geological hazards.

Alternative D: Impacts would be similar to but more extensive than in Alternative C, with a greater degree of trail widening (including the area in Alternative B, plus the upper section of trail); more toilets (including 0.75-1.0 mile from the parking area and 0.6 miles from the summit plateau); and connection to all of the historic switchback corners (about 30); as well as more formal trails in the summit crater and true summit areas, with more formal interpretation. For many portions of the proposed project, impacts would be the same as in Alternative C, including for construction of one of the toilets and for construction of the Manzanita Lake Connector Trail.

Overall, there would be more impacts to soils and geology than in other alternatives. These would primarily be associated with widening of the trail and with construction of larger group gathering areas and (to a lesser degree) with the formal trail to the true summit. There would also be additional excavation for another toilet and for formal interpretive signs in the summit crater area. Compared to Alternatives B and C, there would be near total rehabilitation of existing rock walls and many new rock walls would be constructed to retain the wider trail. Approximately 1,600 cubic yards (3,000 - 4,000 tons) of rock would be procured from outside the park or from suitable loose rock in the Lake Helen quarry.

Overall impacts in Alternative D would be localized and moderate (greater than in Alternative C), while restoration would have the same minor long-term beneficial effects.

Impact Avoidance, Minimization and Mitigation Strategies

To avoid, minimize or mitigate impacts to soils and geology, the following strategies would be used during or following construction:

- Locating staging areas where they will minimize new disturbance of area soils and vegetation.
- Clearing only those areas where construction would occur.
- Minimizing ground disturbance to the extent possible.
- Delineating clearing limits to minimize the amount of vegetation loss.
- Avoiding construction during heavy precipitation.
- Salvaging topsoil (if any) from excavated areas for use in re-covering source area or other project areas.
- Not piling excavated soil alongside trees to remain, and providing tree protection for trees to remain.
- Reusing (rather than removing) excavated materials from the project area.
- Revegetating project areas through native seeding and/or planting.
- Using material from excavation to fill social trails as part of the obliteration technique.

Cumulative Impacts: Adverse impacts to soils as a result of other past and ongoing actions include compaction, soil mixing, and soil loss from removal and erosion, from development and concentrated visitor use in the park, as well as from areas where soils have been disturbed and revegetation has not occurred naturally or been undertaken by the park. Other impacts include an overall decrease in soil infiltration, where hardening of surfaces (roads, walkways, buildings) has occurred. Some restoration and development projects (e.g. addition of new visitor service facilities, restoration of old roads or building sites) could occur within the park and project vicinity. These projects could contribute additional beneficial and

adverse impacts to soils. Because most of the park continues to be undisturbed by human impacts (approximately 75 percent is designated wilderness), the amount of area affected by past and possible future projects is not substantial and soil impacts therefore are relatively minor. Impacts from the past, present and future actions, together with the impacts of Alternatives A-D, would continue to result in negligible to minor adverse cumulative impacts to soils in the park. Alternatives A and B would contribute negligible cumulative adverse effects while Alternatives C and D would contribute minor effects. Cumulative impacts would remain minor, since most impacts would be associated with an area previously impacted by human activities (the Lassen Peak Trail). Alternatives C and D would contribute a slightly greater degree of cumulative impacts from the construction of the Manzanita Lake Connector Trail.

Conclusion: Overall impacts in Alternative A would be localized, negligible to minor and adverse and primarily short-term. Overall impacts in Alternative B would be localized, minor and short- to long-term. Negligible to minor long-term beneficial impacts would occur from restoration of some denuded areas. Overall impacts to soils and geology in Alternative C would be minor to moderate, localized and short- to long-term. Minor long-term beneficial effects would occur from restoration of more areas than in Alternative B. Overall impacts in Alternative D would be localized and minor to moderate (greater than in Alternative C), while restoration would have the same minor long-term beneficial effects. Rehabilitation and revegetation would reduce the loss of soil through erosion. Natural soil processes would be restored in rehabilitated areas only over the long term, as soil structure slowly returned to a more natural state.

There would be no impairment of park soil or geologic resources as a result of the proposed actions described in this Environmental Assessment.

2. Impacts to Water Resources

A. Impacts to Water Quality

Alternative A: There would continue to be negligible to minor adverse impacts on water quality under Alternative A from ongoing improper disposition of human waste because of the lack of toilets on/near the Lassen Peak Trail. Because the Lassen Peak Trail is not located near any existing water bodies, erosion would continue to primarily occur during storms and snowmelt.

Alternative B: In addition to impacts from Alternative A, limited additional impacts would occur from Lassen Peak Trail rehabilitation in Alternative B. Additional negligible impacts to water quality could occur if unexpected precipitation occurs during the trail rehabilitation project. Other impacts could occur related erosion following the first rains after completion. For the most part, however, it is unlikely that sedimentation would reach area waterways because of the distance to these from the trail. Negligible long-term beneficial effects could occur from stabilization of soils within the existing and new trail tread.

Alternatives C and D: Impacts of Alternatives C and D would be the same as in Alternative B, however in Alternatives C and D, additional negligible to minor impacts to Manzanita Creek could occur from the construction of the connector trail, but would not be anticipated because of the distance of Manzanita Creek from most construction work. Minor impacts where the trail crosses four small perennial drainages and near one ephemeral pond and a wet meadow are also possible. Three of the creek crossings are narrow enough to allow the placement of a few large stable rocks that would allow trail users to easily step across. The creek crossing near the head of Manzanita Creek drainage would be crossed with a simple wooden bridge, likely constructed from local materials. In addition to long-term negligible beneficial effects from trail stabilization as in Alternative B, there would be a potential for additional negligible to minor long-term beneficial effects from the placement of toilets. These beneficial impacts would be slightly greater in Alternative D, which has one additional trailside toilet location.

Impact Avoidance, Minimization and Mitigation Strategies

To avoid, minimize or mitigate water quality impacts, the following strategies would be used during or following construction:

- Covering stockpiled soil and rock throughout the duration of the project with a breathable, water repellent fabric anchored around the perimeter to minimize sedimentation.
- Minimizing the amount of disturbed earth area and the duration of soil exposure to rainfall.

- Minimizing soil disturbance and re-seeding or revegetating disturbed areas as soon as practical.
- Using swales, trenches or drains to divert stormwater runoff away from disturbed areas.
- Outsloping new trail construction.

Cumulative Impacts: Other visitor use and facilities in the park and project area contribute to sediment and pollutants, including oil and other contaminants from motor vehicles as well as litter that can enter drainages and affect water quality. Some restoration and development projects (e.g. addition of new visitor service facilities, restoration of old roads or building sites) could occur within the park and would contribute both beneficial and adverse impacts to water quality. Given the minimal and localized nature of these effects parkwide, impacts on park waters would be negligible. Non-human factors, such as natural erosion of exposed soils can also affect water quality. Impacts of the above actions and factors, in conjunction with the impacts of the no-action alternative, would continue to result in minor adverse cumulative effects on water quality. Alternatives A-D would contribute negligible cumulative impacts on water quality. Long-term beneficial effects would occur from stabilization of soil and rock within the trail tread.

Conclusion: Impacts from Alternatives A-D would be negligible to minor. Slightly more impacts would occur in Alternatives C and D from constructing the Manzanita Creek Connector Trail and slightly more impacts would occur in Alternatives A and B from the lack of toilets, while slightly fewer impacts would occur in Alternative B from less extensive widening of the trail. Long-term minor beneficial effects would occur from stabilization of soil and rock within the trail tread in Alternatives B-D and from the provision of toilets in Alternatives C and D.

There would be no impairment of park water resources (water quality) as a result of the proposed actions described in Alternatives A-D.

B. Impacts to Wetlands

Alternatives A and B: No wetlands would be affected by the implementation of these alternatives since there are no wetlands on or near the Lassen Peak Trail.

Alternatives C and D: Several small palustrine wetlands and riparian communities occur along the proposed Manzanita Creek Connector Trail route. Approximately 300 feet (1 percent) of the 5.5 mile long trail occurs in the vicinity of wetlands. Five small and one medium-sized palustrine wetland would be avoided by the construction of this trail. These include (from south to north) a fairly large wetland where tadpoles were observed, a small tarn, and a small ephemeral pond, a sedge-dominated wet meadow, and a corn-lily/sedge-dominated wet meadow. The trail would also intersect with approximately four perennial drainages, three that support fairly narrow (four-foot wide) riparian zones and one that appears to be an avalanche chute that has, on occasion, carried large flows. These would be bridged or crossed above their origin. No obstruction of water movement would occur. Impacts would likely be negligible to minor and adverse. Because only a few square feet of wetlands would be affected, much less than one acre, no wetlands Statement of Findings would be required.

As noted, other wetlands (including drainages) would be completely avoided by the proposed route of the Manzanita Creek Connector Trail, including the seven acre wet meadow upstream of Soda Lake. Although the trail is located well away from this meadow, it is within easy walking distance and could experience increased use, but likely only if visitors are already familiar with its location, since the trail does not overlook it and will not go near it. The water sustaining this wet meadow originates in the almost permanent snowfields on Ski Heil and Pilot peaks. The meadow itself is a mosaic of small meandering streams, shallow standing ponds, and lush alpine meadow vegetation, this vegetation type is uncommon in the park and is unusual at this location. Monitoring of trail users and potential establishment of way trails would occur to minimize or avoid any potential effects that could affect it.

Impact Avoidance, Minimization and Mitigation Strategies

To avoid, minimize or mitigate wetland impacts, the following strategies would be used during or following construction:

- Avoiding wetlands where possible by trail routing.
- Using bridges rather than culverts to cross ephemeral drainages.

- Not conducting excavation in wet areas.
- Monitoring the development of way trails in the vicinity of the large wetland avoided by Manzanita Creek Connector Trail construction (Alternatives C and D).

Cumulative Impacts: Wetlands and riparian areas throughout the park have been lost or disturbed by a number of past and present actions. Heavy sheep and cattle grazing in the late 1800's and early 1900's reduced or eliminated herbaceous cover in some meadows and riparian areas. Natural drainage patterns and water flow were altered by development and diversions, including the water flume located in the project area that diverted Manzanita Lake to near Crags Campground. The Manzanita Lake dam raised the water level in this natural lake to create a larger water storage area. The Dream Lake Dam also converted natural stretches of creek and riparian habitat into open water. The digging of ditches to drain or redistribute water in Drakesbad Meadow and Warner Valley affected local hydrology and vegetation. In addition, numerous road and stream crossings have been constructed throughout the park, which have channeled water and in some cases reduced the extent of riparian habitat. Overall, in comparison to the total park area originally containing wetlands, the extent of these cumulative impacts has been localized and negligible to minor (ranging to moderate or major where dams have been constructed). There would be no contribution to cumulative effects from Alternatives A and B. Alternatives C and D would contribute negligible adverse cumulative effects.

Conclusion: Alternatives A and B would have no effect and no cumulative effects on wetlands. Alternatives C and D would have negligible to minor localized adverse effects and negligible cumulative adverse effects on wetlands. No wetlands Statement of Findings would be required because much less than one acre of wetlands would be affected.

There would be no impairment of wetlands or values related to them from the implementation of Alternatives A-D.

3. Impacts to Vegetation

The Lassen Peak Trail project area consists primarily of fellfields with a few subalpine trees within the first 1.2 miles, whereas the Manzanita Creek Connector Trail consists primarily of subalpine forest, alpine meadows, and red fir forest. The following plants were among those observed in areas that would be affected by the proposed project on the Lassen Peak Trail – trees (whitebark pine, mountain hemlock), forbs (lupine, fleecyflower (*Polygonum davisiae*), showy sedge, buckwheat). On the Manzanita Lake Connector Trail, the following trees (whitebark pine, red fir, western white pine, mountain hemlock); shrubs (mountain heather, currants, rabbitbrush, pinemat manzanita, chinquapin); forbs (silvery lupine, pine drops, knotweed, pussy toes (*Antennaria*), corn lily and an orchid (*Platanthera sparsiflora*); a fern (*Cryptogramma cascadenis*), as well as a variety of grasses (western needlegrass) and sedges were present and could be affected.

Plants in these high elevation areas have a very short growing season (about 65 days) and though they are small are likely very old and very sensitive to disturbance. Impacts to plant species include both direct effects from trail construction and indirect effects from activities such as the disposal of excess rock and other material.

Alternative A: Ongoing minor repairs and maintenance to the Lassen Peak Trail would continue. These activities would likely include long-term negligible adverse impacts on vegetation from smoothing of trail tread and trimming of adjacent and overhanging vegetation and from periodic repairs to rock walls. Ongoing impacts to whitebark pines from visitors resting on/near them would continue to occur. Ongoing impacts to vegetation from visitor exploration in the crater area on social and way trails and from the scramble to the true summit over loose rocks would continue. Trampling and human waste impacts would also continue as visitors continue to look for privacy behind rocks and beside trees because there would continue to be no toilets.

Long-term negligible to minor localized beneficial effects would continue to occur from periodic ongoing restoration of trail short-cutting areas and from more intensive management strategies directed at reducing trail cutting, such as from the occasional presence of a uniformed NPS staff member.

Under all alternatives (A-D), the whitebark pines growing alongside the Lassen Peak Trail would be protected from disturbance. Up to approximately 10 other trees between two and eight inches in diameter could be damaged or removed. No widening of the trail or ground disturbance would occur near the whitebark pines. In addition, all alternatives would retain the rare plant fence enclosure in the summit crater area to prevent trampling of rare plants on the peak.

Alternative B: There would be minor short- and long-term adverse effects on a variety of low growing herbaceous vegetation alongside the Lassen Peak Trail that would be affected by actions to stabilize the trail; to return some sections to the historic four-foot width; and to reconstruct failing historic and non-historic rock walls. No whitebark pines and no trees greater than eight inches would be removed. As in Alternative A, up to approximately 10 other trees between two and eight inches in diameter could be damaged or removed. Localized, long-term negligible to minor beneficial impacts would result from a reduction in trail short-cutting.

Alternative C: In addition to impacts noted in Alternative B, there would be additional minor adverse impacts from widening the lower section (below treeline) of trail; from constructing a restroom near the mid-point of the trail; and from designating trails in the crater rim and true summit areas. Negligible adverse impacts to vegetation could occur from replacement of some interpretive signs. There would also be negligible to minor beneficial impacts from designating trails in the crater rim and true summit areas.

Approximately 1,200 square feet of trailside area, including some subalpine and alpine vegetation (as noted above) would be affected by the widening and the construction of small flat areas for small groups to gather for interpretation (see the introduction to this section above or Chapter IV: *Affected Environment* for a list of the most common species). Although there is little vegetation in the crater rim area, designating a narrow formal loop trail or spur trails with native rock cairns or similar monuments would impact some alpine vegetation, but would primarily result in improved conditions for vegetation throughout these areas from encouraging visitors to stay on designated trails, rather than to explore outlying areas in the crater or to scramble to the true summit climbing over loose rocks and affecting sensitive alpine plants.

Manzanita Lake Connector Trail: Up to 1.33 acres of vegetation would be lost from the construction of a 5.5 mile long, two-foot wide trail. Another two acres could be affected by the construction effects of the trail, where bench cuts were needed and from side-casting material from the bench cuts. Most of this area, however, does not contain vegetation because it is located on scree side-slopes. Where possible, side-casting of material would be minimized to protect (by avoiding) casting over slow-growing subalpine and alpine plants. The trail would also be routed to avoid wetlands, including seeps and a sedge-dominated wet meadow, although a few crossings of ephemeral streams would occur. No trees larger than eight inches in diameter would be removed. Up to approximately 15 trees from 2-8 inches in diameter could be removed, compared to Alternatives A and B. Another 10-15 could also be affected (damaged).

Restoration would primarily consist of moving rocks and re-contouring the old trail tread. Restoration using vegetation (either seeds or plants) would be unlikely to succeed at this elevation because of the difficulty of establishing these slow-growing plants (Coles 2009).

Alternative D: Impacts to vegetation would be similar to Alternative C, however, there would be more impacts from additional widening of the trail in the upper (as well as the lower) section. Impacts to trees would be the same as in Alternative C. These impacts would include impacts to more trailside vegetation, including for an additional toilet location near the lower end of the trail, as well as to create fairly flat areas that would accommodate larger groups. Compared to Alternative C, where many rock walls would be reconstructed, Alternative D would also include more rockwall reconstruction for walls currently in better

condition, resulting in additional impacts to vegetation alongside the edges of the trail to allow enough space to construct these.

There would also be more impacts than in Alternative C to construct a wider, more formal trail within the summit crater area and toward the true summit. Because vegetation at this high elevation is even more sensitive and takes longer to establish, additional care would be taken to avoid disturbance of plants if possible.

Impact Avoidance, Minimization and Mitigation Strategies

To avoid, minimize or mitigate vegetation impacts, the following strategies would be used during or following construction:

- Narrow limits of construction would be established to avoid impacting sensitive, slow-growing subalpine and alpine plants.
- Rock imported from outside the park would be from approved commercial sources and would be inspected and/or approved by NPS staff prior to importation into the park to avoid inadvertent importation of invasive species.
- Staging areas would be protected from spillover impacts by the placement appropriate barriers and would be returned to pre-construction conditions upon completion of the proposed project.
- Materials used in project work would be transported and stored so as not to acquire noxious weed seeds from adjacent areas.
- Undesirable plant species (exotics) would be monitored and control strategies implemented if such species occur.
- Because vegetation at high elevation is sensitive and takes a long time to establish, care would be taken to avoid disturbance of plants if possible.
- Although most revegetation would include only replacement of rocks, if seeding or planting occurs, only native species, appropriate to the site would be used.
- Where possible, native plants would be salvaged and transplanted.
- The number of plants affected not only by trail construction, but also by disposal of excess dirt and rock (side-casting), or by stockpiling of materials would be minimized.
- Tree protection would be used around trees to be retained, especially those that are within or directly adjacent to the limits of construction.
- No whitebark pines would be removed and no excavation would occur near them.

Cumulative Impacts: Much of the area that the Lassen Peak Trail traverses is rocky, exposed and relatively devoid of vegetation. The proposed Manzanita Creek Connector Trail is less exposed and traverses some mountain hemlock dominated red fir forest and other subalpine forested areas. Volcanic eruptions of Lassen Peak in 1914 and 1915 covered over three square miles of forest. The successional process of reforestation is now taking place, with herbs, shrubs, and finally, trees taking root in the coarse soils of recent lava flows. In some places revegetation is proceeding directly to trees. Human activities, particularly fire suppression, have also altered the structure and composition of forest vegetation. In addition to broad scale changes in vegetation characteristics, relatively small patches and corridors of habitat have been lost in the park in areas that have been developed for facilities, trails, and roads. Impacts from the above actions, in combination with the impacts of Alternative A would result in ongoing long-term negligible adverse cumulative effects on vegetation. Alternative B would contribute additional negligible adverse cumulative effects. Alternatives C and D would contribute additional localized minor to moderate adverse cumulative effects from the construction of a wider Lassen Peak Trail and from the construction of the proposed Manzanita Creek Connector Trail. Alternatives B, C and D would also result in some long-term negligible to minor beneficial effects from restoration, with more likely occurring in Alternatives C and D than B. Alternatives C and D would also have negligible to minor long-term beneficial effects from additional designation of trails where no formal trails now exist in the crater rim and true summit areas.

Conclusion: Alternative A would have ongoing negligible to minor adverse effects and negligible long-term cumulative adverse effects. Alternative B would have negligible to minor adverse effects and negligible long-term cumulative adverse and beneficial effects, with disturbance of approximately 5,000 square feet

(0.11 acre) associated with the Lassen Peak Trail. Alternatives C and D would have minor to moderate adverse effects coupled with long-term negligible to minor beneficial effects and negligible to minor long-term adverse and beneficial cumulative effects. Overall adverse effects would be greater in Alternative D, with effects to nearly 25,000 square feet (0.57 acre) plus the Manzanita Creek Connector Trail (1.33 acres) compared to Alternative C, where effects could occur over 10,000 square feet (0.23 acre) plus the Connector Trail, from additional widening of the Lassen Peak Trail. Much of the disturbance area associated with the Lassen Peak Trail in Alternatives A, B and C would be in areas previously disturbed by the trail. Alternative D would increase the area encompassed by the trail, especially in the upper section.

There would be no impairment of vegetation or values related to it from the implementation of Alternatives A-D.

4. Impacts to Wildlife

Alternative A: Ongoing work to repair the Lassen Peak Trail and ongoing public use of the trail would continue to cause periodic to consistent noise and human presence that would have short-term negligible to minor impacts on wildlife presence. Noise and human presence would diminish in winter and during shoulder seasons, as well as at night and/or when work was completed. Overall ambient noise is low. Some reptiles and small mammals could be disturbed by routine and ongoing maintenance actions, including repair of failing rock walls, however few reptiles or mammals are seen on the trail.

Alternative B: Ongoing impacts from Alternative A would continue. There would be no new wildlife habitat removal as a result of the implementation of Alternative B. Impacts would remain within the four-foot corridor (which has since been expanded in some areas near the trailhead) affected by original construction of the trail. As with the original construction, however, there would be impacts to construct or reconstruct rock walls that impact areas outside this narrow band to allow for construction limits, including the excavation of footings and placement of large rocks. Although no new habitat loss would occur in previously unaffected areas, new impacts would occur from short-term noise and activity in some areas associated with rehabilitation actions and from impacts in areas that have recovered from disturbance (such as some switchback ends) and in areas adjacent to reconstructed rock walls.

Above ambient noise and activity during project implementation would coincide with the peak visitor use season, during the heaviest use of the Lassen Peak Trail. The noise and activity associated with the construction would generally be similar to and periodically louder than the visitor activity, particularly when rock wall work or materials transport by trail cart or helicopter is occurring. Although few wildlife species are seen in summer, those that would occur would tend to avoid the construction area during daylight hours when project work was occurring. In the evening and on weekends when work would generally cease, wildlife would be expected to return to the project areas. Some species, such as birds and squirrels might also be seen throughout the day. Since trail impacts would be localized alongside an already highly modified corridor and a great deal of suitable habitat for wildlife would continue to be present in the vicinity, these impacts would be short-term and minor.

Alternatives C and D: Alternatives C and D would have similar but greater impacts than Alternative B. These greater impacts would come from trail widening, from constructing or reconstructing more rock walls and from extending the trail to connect to more historic switchback corners (about 20), from construction of the Manzanita Creek Connector Trail, and from construction of one (Alternative C) or two restrooms (Alternative D).

This additional or expanded construction would result in longer-term noise and activity on the Lassen Peak Trail. In addition there would be new wildlife habitat removal associated with trail widening in these alternatives. Overall impacts would be greater in Alternative D than in Alternative C due to more construction and widening.

New impacts to wildlife habitat, including noise and construction, but also habitat removal would occur under these alternatives from the construction of the Manzanita Lake Connector Trail. As noted above, these effects would have permanent impacts on 1.33 acres of trail tread and long-term impacts on an

additional two acres from construction impacts. Impacted areas would include both wet and dry meadows, red fir and mountain hemlock forest, rocky areas, and ephemeral stream channels. This habitat modification (including food and cover), with some isolated vegetation removal and some tree removal on the Connector Trail, would preclude short and long-term return to the former level of use in some areas by some species of wildlife, particularly perching birds, who used the formerly present trees for food or roosting. No trees larger than eight inches in diameter, however, would be removed. Short-term disturbance would include occasionally loud rock “slabbing” and chiseling for creation of retaining walls and steps. Although most impacts would be short-term, there would be incremental loss of a few trees that were used for perching or food and relocation of rocks in scree areas to create a level trail tread.

Impact Avoidance, Minimization and Mitigation Strategies

In addition to the strategies listed above under Vegetation, to avoid, minimize or mitigate wildlife impacts, the following additional measures would be used during proposed implementation:

- Above ambient noises from trail repair would coincide with the busy summer season.
- Manzanita Lake Connector Trail construction would be modified if active nesting of a sensitive species was found (see below).
- Rock work in occupied pika habitat would be minimized or avoided.

Cumulative Impacts: The combined effects of development in the park and in the surrounding area over time coupled with the purposeful eradication of many predator species during the 1800s and early 1900s have contributed to low level or extirpated wildlife populations of some key species in the park. While there are no major development projects planned for the park that would result in additional cumulative effects to wildlife, the cumulative effects of existing development continue to take a toll on wildlife from the effects of collisions on the road as well as from occasional wildlife-human interactions. The existence and maintenance of the road and park developed areas would continue to contribute to a long-term negligible to minor adverse effect on wildlife increasing some species while decreasing the presence of others. All alternatives would contribute cumulative impacts, ranging from negligible in Alternatives A and B to minor in Alternatives C and D.

Conclusion: There would continue to be short-term negligible to minor noise impacts on wildlife from the implementation of Alternative A. Impacts under Alternative B would be short- and long-term and negligible to minor. Loss of habitat and noise impacts from Alternatives C and D would be short- and long-term and minor to moderate.

There would be no impairment of wildlife or wildlife values from the implementation of Alternatives A-D.

5. Impacts to Special Status Species: Plants and Wildlife

(Note: Reasoning for the conclusions below is provided within Chapter V: Special Status Species section.)

Alternative A: There would be no additional impacts (no effect) on any federal or state listed or proposed special status species or other species considered sensitive by the USFWS, state or park.

Alternative B-D: There would be no effect on any federal or state listed or proposed species or other species considered sensitive by the USFWS, state or park. No special status plants, except for those associated with the fencing enclosure have been identified on or near the Lassen Peak Trail. Because expansion of the fencing enclosure would further protect rare plants located there, there would be no additional effects on rare, threatened or endangered plants.

Although a few listed wildlife species may occur in proximity to the proposed Manzanita Creek Connector Trail, none would be affected by the construction of that trail.

Impact Avoidance, Minimization and Mitigation Strategies

To avoid, minimize or mitigate special status species impacts, the following strategies would be used during or following construction:

- Additional surveys would be undertaken rare species prior to the construction of the Manzanita Creek Connector Trail (Alternatives C and D). If rare species were found in new construction areas for either the Manzanita Creek Connector Trail (Alternatives C and D) or in the Lassen Peak crater rim or summit areas, project implementation would be modified to avoid potential effects.
- If nesting peregrine falcons are found, a limited operating period from February to July would be instituted if work would be within 0.5 miles of a nest site. During this time hand tools could be used, but power tools would not be used.
- No whitebark pines would be removed as part of either the Lassen Peak Trail rehabilitation (Alternatives B-D) or as part of the Manzanita Creek Connector Trail construction (Alternatives C and D).
- The fencing enclosure on the top of Lassen Peak would be expanded to ensure protection for rare plants at that location.
- Additional surveys would be undertaken for rare plants known from Lassen Peak prior to the implementation of work in the crater rim or summit areas. If rare species were found, project implementation would be modified to avoid potential effects.

Cumulative Impacts: Most of the special status species have not been verified to occur within the park and suitable habitat is limited or does not exist. Habitat modification within the park includes broad scale changes in vegetation characteristics due to fire suppression, grazing, water resources alteration, and the loss of comparatively small patches and corridors where park land has been developed for facilities, trails, and roads. This has resulted in a reduction of habitat available for use by special status species that occur within the park. Because the alternatives would have no effect on special status species, there would be no contribution to cumulative effects.

Conclusion: Because no habitat for any listed, rare, or sensitive species would be affected by the proposed actions and because many of those species also do not occur in the vicinity of the project area, there would be no effect on any listed, candidate, rare or sensitive wildlife.

There would be no impairment of special status species under the alternatives discussed in this Environmental Assessment.

6. Impacts to Prehistoric and Historical Archeology

Alternative A: There would be no additional impacts (no effect) on known archeological resources as a result of the implementation of this alternative. Routine, ongoing maintenance of the trail prism (area originally affected by construction activities) would result in additional ground disturbance in previously disturbed areas. Future trail projects would have the potential for disturbing previously unknown or undiscovered archeological resources. Because the discovery of these resources would employ mitigation measures noted below and because it is unlikely that archeological resources would be discovered from these activities, there would be no adverse effect.

Alternative B: Work to rehabilitate the Lassen Peak Trail to a consistent width of four feet would be primarily contained within the existing trail prism (including cut and fill slopes) and the Lassen Peak Trail, crater rim and true summit areas have been surveyed for archeological resources. Because, however, archeological resources protection laws were not in place during the trail's initial construction period and some subsequent rehabilitation, it is unknown whether these were encountered. As a result, there would be a potential to encounter subsurface archeological resources during rehabilitation of the existing trail prism. Because mitigation measures would be employed (see below) there would be no adverse effect on archeological resources from the implementation of this alternative.

Alternative C-D: There would be a greater potential for possible discovery of subsurface archeological resources in Alternatives C and D from the widening of the Lassen Peak Trail and from the proposed designated trails or routes in the crater rim and true summit areas. Similarly, although surveys have been completed for the proposed Manzanita Creek Connector Trail, because this trail would traverse a

previously undisturbed area along high elevation ridges, there would be a potential for archeological resources to be found. Because mitigation measures, however, would be employed, there would be no adverse effect on archeological resources.

Impact Avoidance, Minimization and Mitigation Strategies

To avoid, minimize or mitigate archeological resources impacts, the following strategies would be used during or following construction:

- Should presently unidentified archeological resources be discovered during construction, work in that location would be halted, the park Cultural Resources Program Manager contacted, the site secured, and the park would consult according to 36 CFR 800.11 and, as appropriate, provisions of the Native American Graves Protection and Repatriation Act of 1990. Any archeological site would be properly recorded by an archeologist and evaluated under the eligibility criteria of the *National Register of Historic Places*.
- If the resources are determined eligible, appropriate measures would be implemented either to avoid further resource impacts or to mitigate their loss or disturbance (e.g., by data recovery excavations or other means) in consultation with the California State Historic Preservation Office.
- In compliance with the Native American Graves Protection and Repatriation Act of 1990, the NPS would also notify and consult concerned Native American representatives for the proper treatment of human remains, funerary and sacred objects, should these be discovered during the course of the project.

Cumulative Impacts:

Archeological resources in Lassen Volcanic National Park have likely been adversely affected to varying degrees from past construction-related disturbances (prior to the advent of archeological resources protection laws); visitor impacts and vandalism; and erosion and other natural processes. Because mitigation measures would be employed to avoid or minimize impacts to potentially unidentified cultural resources in other proposed and future park projects, it is likely that these would protect archeological resources from additional impacts. There would be no construction-related contributions that would affect known eligible archeological resources and therefore no cumulative impacts from Alternatives A-D. There is a slight possibility; however, that future proposed work could affect currently unidentified cultural resources. Because mitigation measures would be implemented as noted above, Alternatives A-D would not be expected to contribute to cumulative effects on archeological resources.

Conclusion: Because no known archeological resources are located in areas that would be affected by the implementation of the alternatives (A-D) in this Environmental Assessment and because mitigation measures would be employed during project implementation, there would be no adverse effect and no contribution to cumulative effects on archeological or ethnographic resources.

There would be no impairment of archeological resources or values from the actions in Alternatives A-D.

7. Impacts to Traditional Cultural Resources / Ethnography

Alternative A: There would be no impacts to known ethnographic resources from the ongoing implementation of Alternative A. Although Lassen Peak itself is considered an ethnographic resource of historic and contemporary value to Native American Indian tribes, existing conditions would not change from the implementation of Alternative A. The park is in the early stages of acquiring and documenting traditional and current use information from the local American Indian communities. No specific suggestions regarding contemporary use of Lassen Peak or the Lassen Peak Trail were offered in the recent ethnographic study (Deur 2004).

Alternative B: For the same reasons as noted above under Alternative A, there would be no additional impacts to known ethnographic resources as a result of the implementation of Alternative B. Alternative B focuses on rehabilitation, including a return to the historic four-foot width of the Lassen Peak Trail, with minimal new features.

Additional Impacts of Alternatives C-D: Although there would be additional impacts to the crater rim and true summit areas, in Alternatives C and D from the construction of formal trails or a route, these improvements would have few impacts over existing conditions, where visitors are able to wander anywhere within the crater rim area and where visitors take a variety of routes over loose rock to access the true summit. With designated trails or routes in these areas, deteriorating conditions associated with social and way trails and trampling of sensitive alpine plants would be reduced and social and way trails rehabilitated, improving conditions on the peak. If sensitive areas were later identified, these could be avoided by designation of the route(s). Because the Deur study notes that places with views of Lassen Peak were important to tribal consultants, there could be some slight beneficial impacts from establishment of the Manzanita Creek Connector Trail under Alternatives C and D.

Impact Avoidance, Minimization and Mitigation Strategies

Strategies would be the same as listed under Archeology above plus:

- Sensitive areas, if identified later, could be avoided in the crater rim and true summit areas.

Cumulative Impacts: Native American Indian, including contemporary, use of Lassen Volcanic National Park has changed over time. Use has changed broadly from intensive use and management of areas in and surrounding the park by Native Americans to a period of time where Native Americans were discouraged from using and sometimes even visiting the park, to a period of more openness toward restoring historic relationships with the park, including permitting some traditional uses. For instance, the park now has a fee waiver for Native Americans historically associated with the park and the NPS supports the use of the park for traditional uses, such as vision quests and interpretation of past and current cultural practices linked to the park. Alternative A would continue to contribute negligible to minor adverse effects from ongoing visitor use that interfered with Native American use of ethnographic resources, while Alternatives B-D could have some short-term negligible to minor adverse effects during construction and the same negligible to minor long-term adverse effects coupled with long-term beneficial effects (particularly in Alternatives C and D) following rehabilitation.

Conclusion: Alternatives A-D would have negligible to minor adverse effects (no adverse effect) on ethnographic resources. Alternatives C and D could also have some long-term negligible beneficial effects.

There would be no impairment of known ethnographic resources or values from the actions in Alternatives A-D.

8. Impacts to Historic Structures/Cultural Landscapes

As noted in the Background section (*Chapter II: Purpose and Need*) and *Chapter IV: Affected Environment*, a nomination to the National Register of Historic Places for the Lassen Peak Trail has been prepared to add the Lassen Peak Trail and the Bumpass Hell Trail to the existing Lassen Volcanic National Park Highway Historic District. These trails were constructed in conjunction with the road to provide visitor access to the park's key resources. Although portions of both trails have been reconstructed by the NPS since the period of significance, along with negligible realignment, these changes on the Lassen Peak Trail have been dictated by the steep climb on loose cinder, particularly in the alpine zone. Most changes were confined to periodic reconstruction of retaining walls on or near switchbacks as part of stabilizing the route (NPS 2009).

Like roads, trails may possess similar character-defining features, such as alignment, width, gradient, curvature, tread surface, and components like retaining walls, revetments or fills, steps, benches, riprap, guardrails, switchbacks, signs, and bridges.

As noted in *Chapter IV: Affected Environment*, the width and alignment, including the way the Lassen Peak Trail lies on the peak and its switchbacks and use of native materials are considered contributing characteristics to the eligibility of the Lassen Peak Trail for it to be added to the National Register as part of the Lassen Volcanic National Park Highway Historic District. Of these features, the alignment is considered the primary character-defining feature.

Rock walls do not convey as much of the historic character because they were constructed variously beginning in the 1930s using end-dump and hand-placed construction techniques. The former technique resulted in rock walls that were originally stable, but which due to ongoing instability of the surrounding slopes and erosion from weathering and use, have deteriorated over time. Where the rock walls were constructed with professional techniques using unmatched corners, they remain fairly stable, but because they have not been maintained consistently, they are in need of reconstruction or repair. On a continuum of construction techniques are the non-historic mortared rock walls, constructed several decades ago, which lie on top of the slope and which have become among the most unstable constructed features on the Lassen Peak Trail.

Alternative A: Under Alternative A, the Lassen Peak Trail would not be rehabilitated, however, ongoing maintenance of the trail, including periodic work on rock walls, would continue. Instead of actions to rehabilitate the trail occurring in one complete project, they would continue to occur widely spaced in time, with staffing and funding and need dictating maintenance, reconstruction or replacement priorities. These actions would have no effect on the contributing characteristics of the Lassen Peak Trail to the Historic District if the trail is added to the National Register.

Alternative B: Under Alternative B, the Lassen Peak Trail would be rehabilitated in the same alignment to its original width of four feet, non-historic wet mortar rock walls would be reconstructed as dry-stack rock walls and existing historic or compatible dry-stack rock walls would be repaired or reconstructed. Reconstruction of dry-stack rock walls would use original rock if possible, but would also need imported rock. Some new dry-stack rock walls would also be constructed. Of the approximately 75 rock wall features on the Lassen Peak Trail, approximately more than half would be repaired or reconstructed. Another approximately six historic switchback corners, where foreshortening has occurred because of slides and trail-cutting over time, would be recaptured as part of the trail rehabilitation. Although there were originally toilets located alongside the trail, these would not be replaced because of the ongoing difficulty in maintaining them in this harsh environment. In addition, there would be no enhancement of the non-contributing crater rim or true summit area way trails. These actions would constitute long-term minor to moderate beneficial effects, coupled with short- and long-term minor adverse effects.

The rehabilitation project for the Lassen Peak Trail which rebuilds both the contributing and non-contributing retaining walls using durable engineering principles and compatible craftsmanship details from the rustic period would greatly enhance the condition, safety and rustic character of the trail and would serve as a compatible alteration, rather than an adverse effect, because this alternative preserves the historic alignment of the trail and does not call for widening the uppermost section. Because the trail would retain its historic alignment, be reconstructed to its historic width and would retain other character-defining features by retaining or reconstructing historic rock walls and replacing non-historic rock walls with dry laid techniques as well as by capturing some of its historic switchback corners, Alternative B would have *no adverse effect* on its contribution to the Lassen Volcanic National Park Highway Historic District.

Alternative C: Under Alternative C, the Lassen Peak Trail would be rehabilitated to a six-foot wide alignment in the lower section (which now varies from four to eight feet) and to its historic four-foot width in the upper section. As in Alternative B, non-historic wet mortar rock walls would be reconstructed as dry-stack rock walls and existing historic or compatible dry-stack rock walls would be repaired or reconstructed. As in Alternative B, reconstruction of dry-stack rock walls would use original rock if possible, but would also need imported rock. Some new dry-stack rock walls would also be constructed. Of the approximately 75 rock wall features on the Lassen Peak Trail, approximately three-fourths would be repaired or reconstructed (more than in Alternative B). Since many of these are located on the edge of the trail, it is likely that they would need to be reconstructed for widening to occur in the lower section. Because, however, this widening would occur in an area where the trail is in many cases wider than its originally constructed width, it is likely that this has generally occurred and would therefore have minimal effects on any potential original rock walls. Similarly, most historic switchback corners (30-40), where foreshortening has occurred because of slides and trail-cutting over time, would be recaptured as part of the trail (more than in Alternative B). These actions would constitute long-term minor to moderate

beneficial effects from restoring rock walls to good condition and short- to long-term minor to moderate adverse effects from construction and from additional widening of a portion of the trail.

Although the trail would be widened slightly in the lower section, it would retain its historic alignment, be reconstructed to its historic width in the upper section and would retain other character-defining features by retaining or reconstructing more historic rock walls and replacing non-historic rock walls with dry laid techniques as well as by capturing more of its historic switchback corners. For the same reasons as identified above in Alternative B, Alternative C would therefore have *no adverse effect* on the contribution of the trail to the Lassen Volcanic National Park Highway Historic District. No historic properties would be affected by constructing a formal crater rim trail, summit route, and restroom because these features do not contribute to the historic district.

Alternative D: Impacts associated with Alternative D would be similar to Alternative C for the lower section of trail. Although widening of the upper section of trail is proposed, necessitating more reconstruction of dry-stack rock walls and the addition of new retaining walls, it is likely that portions of this area would remain true to the historic width due to terrain constraints. Since the new walls are, in general, at the edge of the trail, it is likely that nearly all of them would need to be moved and completely reconstructed to allow for widening of the trail. Unlike the widening on the lower section, because the upper section of trail has generally been retained at its historic width this widening would be less compatible with the character of the trail. Because all or nearly all historic or compatible dry laid rock walls are in fair or poor condition and would need to be reconstructed, however, the extent of this effect would be limited.

Although the trail would be widened approximately two feet throughout, it would retain its historic alignment, and would retain other character-defining features by retaining rock from and reconstructing more historic rock walls and replacing non-historic rock walls with dry laid techniques as well as by capturing more of the historic switchback corners. For the same reasons as identified above in Alternative B, Alternative D would therefore have *no adverse effect* on the contribution of the trail to the Lassen Volcanic National Park Highway Historic District. As in Alternative C, no historic properties would be affected by constructing a formal crater rim trail, summit route, or restrooms (two in Alternative D), because these features do not contribute to the expanded historic district.

Impact Avoidance, Minimization and Mitigation Strategies

To avoid, minimize or mitigate historic structures / cultural landscape impacts, the following strategies would be used:

- Retain historic alignment.
- Retain or reconstruct historically compatible dry-stack rock walls.
- Capture some (Alternatives B and C) or all (Alternative D) historic switchback corners.
- Any historic contributing feature that is to be modified or removed would be documented before and after construction to HABS/HAER standards.
- Document modifications prior to construction to ensure as much as possible is known about the historic resources and the non-historic additions.
- Conform to the *Secretary of the Interior's Standards for the Treatment of Historic Properties* in rehabilitation and new construction affecting historic resources.

Cumulative Impacts: Because there have been few major rehabilitation projects on the Lassen Peak Trail, because the trail is in the best location given the unstable rock and cinder on the northeast face with the late season melt-out of the trail, and because the alignment of the trail has been retained with small ongoing changes to rock walls, especially near switchbacks to keep the trail in place on the steep slopes of the volcano, cumulative impacts to the contribution of the trail on the proposed expansion of the Lassen Volcanic National Park Highway Historic District have been minimal. Alternative A would contribute additional cumulative negligible impacts, while Alternatives B-D would contribute additional cumulative minor to moderate impacts and long-term beneficial effects on maintaining the current alignment and from rehabilitation that allows the trail and its features to be retained in good condition.

Conclusion: Alternative A would have no adverse effect and negligible cumulative effects on the contribution of the Lassen Peak Trail to the proposed expanded Lassen Volcanic National Park Highway Historic District. Over time, however, under Alternative A, there would be continued deterioration of the trail that would likely outpace the ability to repair it. This would have a long-term minor to moderate adverse effect on the contribution of the trail to the District. Alternatives B-D would allow the Lassen Peak Trail to be retained in its current alignment, would improve construction techniques for the historic rock walls and other contributing features, and would eliminate non-contributing features. Therefore these alternatives would have *no adverse effect* on the Historic District. Minor to moderate cumulative adverse effects from reconstructing historic contributing features would be coupled with the long-term beneficial effects of retaining the trail.

There would be no impairment of cultural landscape resources or values from the actions in Alternatives A-D.

9. Impacts to Visitor Experience

A. Impacts to Visitor Use Access/Opportunities

Alternative A: Alternative A would retain existing visitor use access and opportunities for the foreseeable future, however, without major rehabilitation the condition of the Lassen Peak Trail, conditions would continue to deteriorate resulting in a long-term minor to moderate adverse effect on visitor access and opportunities (such as from longer term trail closures). There would also continue to be minor to moderate adverse effects on visitor comfort from the lack of restrooms along the trail.

Alternative B: Alternative B would also retain existing visitor use access and opportunities. Unlike Alternative A, however, rehabilitation of the Lassen Peak Trail would retain long-term visitor use access and opportunities, a minor to moderate beneficial impact. During rehabilitation closure of portions of the trail during the week to reconstruct the most dangerous sections or rerouting of visitors around construction areas would result in short-term minor adverse effects, since the trail could be unavailable to visitors or because there would be delays or changes in access from rehabilitation actions. As in Alternative A, there would also continue to be minor to moderate adverse effects on visitor comfort from the lack of restrooms along the trail. The shuttle, if implemented could change access to the Lassen Peak Trailhead from some other park areas and provide a new visitor use opportunity and could result in some reduction in traffic on the main park road and at key visitor use parking areas, such as at the Lassen Peak Trailhead.

Alternatives C-D: In addition to the improved trail that would result from rehabilitation (similar to but improved over Alternative B), these alternatives would result in expanded visitor use opportunities from the proposed Manzanita Creek Connector Trail and from the new restroom (Alternative C) or restrooms (Alternative D) along the trail, and from the improved trails in the crater rim and true summit areas which would likely reduce the tendency for hikers to wander off the poorly established route and help to protect sensitive plants. There would also be potential expanded opportunities if a shuttle was implemented to connect the Manzanita Creek Developed Area with the Lassen Peak Parking Lot. If this occurred, visitors could hike the peak via the connector trail and ride the shuttle back to camp or vice versa. It could also reduce the trip generation (number of vehicle trips made) so that there would be slightly less traffic encountered for other visitors driving the Lassen Volcanic National Park Highway, however it is likely that most visitors would continue to drive to the closest place to begin their hike.

Overall, Alternatives C and D would result in minor to moderate long-term beneficial impacts on visitor access and opportunities from trail rehabilitation, the proposed shuttle and from the construction of the Manzanita Creek Connector Trail. Improvements in interpretation would contribute minor long-term beneficial effects, while overall improvements could attract additional visitors to the area. Depending on the extent to which visitor use increased, and whether these increases occurred on/during peak use days or times and depending on the visitor, this would be a long-term negligible beneficial or adverse effect.

B. Impacts to Visitor and Employee Safety

Alternative A: There would be negligible to minor localized improvements to visitor and employee safety under Alternative A. Periodic trail maintenance and repair of rock walls would improve trail conditions somewhat, but without overall rehabilitation, the Lassen Peak Trail would continue to deteriorate over time, causing potential impacts to visitor and employee safety from ongoing instability related to the trail's location on the steep, unstable slopes of a volcano, where unconsolidated rock and cinders predominate. In addition, without repair or rerouting, shoulder season visitors would continue to go off-trail to avoid steep icy sections. Because there would continue to be undesignated way trails and routes in the crater rim and true summit areas, there would continue to be a potential for visitors to become disoriented and/or to lose their footing on these unstable surfaces. Because comprehensive rehabilitation would not take place, employees would likely find themselves repairing sections of trail that had deteriorated more than desired and where, therefore, safety conditions were less than ideal for repair. It would take many years to effectively rehabilitate the trail without a single concerted project. As a result, Alternative A would involve longer term risks than Alternatives B, C and D, where the rehabilitation of the Lassen Peak Trail would be undertaken in a single, complete project.

Alternative B: All action alternatives would improve trail safety and lessen the need for visitors to step off the trail to pass or to avoid other visitors. As in other alternatives, the Lassen Peak Trail would be retained in its current location, considered the safest route. Because the slope angle of the Lassen Peak Trail, cannot be changed, ongoing rock fall hazards would be reduced by rehabilitation, but cannot be eliminated.

Minor to moderate comprehensive improvements to visitor and employee safety on the Lassen Peak Trail would occur from rehabilitating the trail, including dismantling and reconstructing rock walls in poor condition. Correctly built, dry-stack rock walls would also withstand moderate earthquake activity. Because rehabilitation of rock walls would ensure key features of rock wall construction are used, including partial burial of the first tier of rocks, unmatched joints between layers, construction at an angle calibrated to the rock type and slope and successively smaller rocks in each tier, with larger rocks holding the wall in place, all alternatives would result in long-term improvements to visitor safety by keeping the trail tread in place. The trail would be stabilized, improving hiking conditions. In addition to rebuilding rock walls, large rocks would be "bedded" down to minimize accidental dislodging. Construction of shoulder season bypass areas, where steep, icy sections persist into the busy visitor use season, would allow visitors to more safely traverse these areas by staying on the trail, rather than skirting it to avoid these icy sections. Because it has been so long since comprehensive rehabilitation of the trail has occurred, it is likely that employees would encounter less than ideal working conditions that would need to be mitigated more than expected to ensure worker and visitor safety during repair of the trail. In addition, there are inherent risks associated with equipment use to rehabilitate the trail, including the use of helicopters to transport materials. Overall, however, the proposed rehabilitation would result in long-term moderate improvements (beneficial effects) on visitor and employee safety on the Lassen Peak Trail.

Alternatives C and D: As in Alternative B, these alternatives would improve visitor and employee safety on the Lassen Peak Trail. Alternatives C and D would offer increased benefits to visitor safety from widening in one (Alternative C) or both (Alternative D) sections of the trail from making it less likely that visitors would need to leave the trail to pass each other (as sometimes occurs in narrower sections). As in Alternative B, there would continue to be increased risks for employees (and also potentially to visitors) during construction that would be mitigated by adherence to safety standards for equipment operation and by periodic closure or temporary rerouting of the trail around construction areas. Additional negligible beneficial impacts could occur from widening the trail in the lower section (Alternatives C and D) where the greatest degree of visitor use on the trail occurs and from widening the upper section of trail (Alternative D).

Construction of the Manzanita Creek Connector Trail would result in minor beneficial safety impacts on a small number of visitors who would now follow a designated trail, rather than a cross-country route over the same area.

Impact Avoidance, Minimization and Mitigation Strategies

To avoid, minimize or mitigate visitor experience impacts (including safety), the following strategies would be used during or following construction:

- Press releases to local media and signs in the park would inform visitors about trail conditions in the park during the projects.
- During construction, signs would inform visitors of the construction activities on the trail and of potential closures or delays. Barriers and barricades, signs and flagging, as necessary or appropriate, would be used to clearly delineate work areas and provide for safe pedestrian travel through the construction area (if appropriate).
- Weekend and holiday work would not occur.
- Materials deliveries would (to the degree possible) take place in the early morning and late evening hours and would proceed along the shortest route possible.
- Before work on reconstruction of rock walls commenced, area surveys would occur to ensure a stable working environment. As appropriate, the work area would be reinforced to minimize the potential to trigger a rockslide during excavation.
- Personal protective equipment (PPE), such as helmets, would be worn by personnel during rock work.
- Standard Operating Procedures or assessment techniques to determine when the Lassen Peak Trail is safe to open would be developed. Informal trail assessments, which have routinely been done each spring, would be more formal and rigorous. Additional trail safety assessments would also occur in summer.
- Immediately before the road opens to the public, trails staff would assess and mitigate safety hazards in the snow-free sections (approximately 1/2 the trail is usually snow free when the road opens). Once this inspection is complete and visible hazards are mitigated the trail would open with a "hazardous conditions" sign at the bottom because snowfields on the trail are commonly still present.
- Prior to the July 4th weekend, newly melted out sections would be reassessed to determine if new hazards have developed. Snowfields which cannot be easily bypassed would be trenched (to define the route and to improve safety conditions). If, during the second assessment, the trail is deemed safe, hazardous conditions signage could be removed. If additional hazards, however, are discovered that need repair, the trail could be closed until repairs are made.

Cumulative Impacts: *Visitor Access and Opportunities:* Visitor access and opportunities in the park have largely expanded over the years. Recent opening of a major new visitor center has resulted in a more obvious and better source of information for park visitors. There would be no contribution to adverse cumulative impacts on visitor experience from Alternatives B-D. Long-term beneficial impacts could result from Alternatives C and D from reducing the tendency for hikers to wander off the poorly delineated routes in the crater rim and true summit areas. Both of these opportunities could also result in a more informed public if interpretive opportunities are expanded. Alternative A could result in minor, short- to long-term cumulative impacts if trail closure occurred over a long period. *Visitor Safety:* There would be minimal changes in visitor and employee safety under Alternative A. Long-term beneficial impacts to visitor safety would occur from the implementation of a rehabilitated trail in Alternatives B-D. Negligible additional benefits would result from sections of wider trail in Alternatives C and D, while similar negligible beneficial effects could result from construction of the Manzanita Creek Connector Trail. There would be a potential for minor to moderate adverse impacts on employee and visitor safety during trail rehabilitation and construction, with additional long-term negligible to moderate beneficial impacts on employee safety once the trail was completed.

Conclusion: Alternative A would have negligible beneficial effects on visitor access and opportunities and negligible to minor localized long-term beneficial impacts on visitor safety. Because comprehensive rehabilitation would not occur and the rehabilitation that did occur would take longer than in other alternatives, there would also be a potential for short-term negligible to moderate adverse effects on visitor and employee safety. Alternatives B-D would have negligible to moderate long-term beneficial effects on visitor access and opportunities and short-term, localized minor to moderate adverse effects. Alternatives B-D would also have moderate long-term beneficial effects on visitor safety. Alternatives C

and D would have additional minor long-term beneficial effects from improving visitor access and opportunities and from improving visitor and employee safety on the crater rim, true summit and Manzanita Creek trails.

10. Impacts to Wilderness

Alternative A: There would be no new impacts to wilderness under Alternatives A or B because the Lassen Peak Trail is not located in wilderness. Proposed actions in these alternatives, including noise associated with use and maintenance of the Lassen Peak Trail, would have minimal effects on wilderness from transport of a small quantity of rock needed to fix sections of the trail over time. Opportunities to experience primeval character and influences or “naturalness,” opportunities for solitude, opportunities for primitive unconfined recreation and physical and mental challenge, and opportunities for scientific study, education, stimulation and inspiration would be minimally affected by this Alternative.

Alternative B: There would be minor short-term adverse impacts to wilderness experience from helicopter materials deliveries (needed to import rock to rehabilitate the rock walls) that would disrupt the wilderness experience of some visitors who might be in the vicinity of the trail or flight path at the time of delivery. As noted, the Lassen Peak Trail, however, is not located in wilderness.

Without helicopters, pack stock would need to be used to carry in the materials. This would result in many additional impacts to park operations and trails and consequently less time spent on resource protection. Humans could not safely move the 200 lbs rocks required for the first tier of the walls, while pack stock transport would require stabilizing the trail before pack stock were used. Although the Lassen Peak Trail initially accommodated pack stock, this use was soon discontinued due to trail damage and extensive needs for repair in its early years and conflicts with hikers using the trail.

Helicopters have been determined to be the minimum tool to ferry in equipment over wilderness in part to this non-wilderness location. Hundreds of helicopter flights could occur over wilderness over a period of several years during trail reconstruction. Alternative B would require approximately 1,700 – 2,000 tons of imported rock. Large or heavy lift helicopters would be used to minimize the number of trips and flights that would likely occur in the fall. Equipment to be used on the Lassen Peak Trail includes motorized trail carts, punjars, compressors, generators and other materials, and rock (since, for the most part, no sizable or suitable source of rock is available locally without potentially serious safety concerns from transport across steep, unstable scree slopes).

Alternative C-D: Noise impacts would be similar to Alternative B regarding the use of helicopters to transport rock and materials to rehabilitate the Lassen Peak Trail. These impacts would be greater in Alternative C than B and greater in Alternative D than C because more rock walls would likely be reconstructed in these alternatives due to the wider trail. Alternative B would require approximately 3,000-3,400 tons of imported rock, while Alternative D would require 3,500-4,000 tons of rock. As in Alternative B, large or heavy lift helicopters would be used to minimize the number of trips and flights that would likely occur in the fall. There would also be additional impacts from the construction of one (Alternative C) or two (Alternative D) toilets alongside the trail. These impacts would include short-term effects of bringing in construction materials and supplies via helicopter and long-term minor impacts from annual flying out of the human waste contained in them (approximately one to two days of helicopter flights each year).

Construction of a new trail in wilderness – the Manzanita Creek Connector Trail – would also occur under Alternatives C and D. This proposed 5.5 mile long trail would be constructed in conformance with wilderness standards as a two-foot wide trail primarily using materials found adjacent to it. There would be no helicopter use associated with the construction of wilderness sections on this trail. The proposed trail would provide for additional public access to park wilderness, including to the popular Vulcan’s Castle area. Access in this area is now provided by social /way trails extending from the Manzanita Creek Trail and from the Lassen Peak parking area to the Vulcan’s Castle area.

In addition to the short-term noise impacts from Alternative B, Alternatives C and D would have long-term negligible to minor beneficial impacts on the wilderness values of opportunities for scientific study, education, stimulation and inspiration because more access to wilderness would be provided.

Although trail construction activities would disrupt general wilderness character and experience in these alternatives, once the trail is in place, the effect of this new trail on the whole of the wilderness value and character at Lassen Volcanic National Park would be minor (5.5 miles compared to over 140 miles of maintained trails in wilderness). Maintained trails have a minimal effect on the visitor experience of primeval character and influences or “naturalness.” Rather, the experience of trails serves to facilitate the experience of a primitive unconfined wilderness experience by facilitating access into wilderness where few human signs are present. Off the trail in surrounding wilderness, these experiences would continue to be easily available. There would continue to be abundant opportunities for experiencing both the primitive nature of wilderness, its natural state and solitude.

During trail construction, however, there would be a few months (over approximately two years) of disruption of the wilderness experience due to human activity associated with construction. The human activity would likely include, initially, the use of power tools, such as chainsaws and earth compacting equipment. These tools have been determined to be the minimum tools through the park’s wilderness minimum requirement analysis process. In addition, blasting could occur for stump or rock removal. Although hazard tree removal does not occur, as a rule, in wilderness, and there are very few large trees within the first two miles of trail, in the last two miles, the proposed trail winds through mature forest, and it is possible that, over time, a few trees could be removed if they became obvious hazards. The draft minimum requirement analysis for Alternatives C and D can be found in Appendix 2.

Impact Avoidance, Minimization and Mitigation Strategies

To avoid, minimize or mitigate wilderness impacts, the following strategies would be used during or following construction:

- Helicopter materials deliveries would be conducted during times of lower visitor use and would be limited to the minimum number possible.
- Helicopter trips to service toilets would be limited to one to two days each year.
- Permanent toilets would be designed to withstand a season of visitor use to minimize the number of helicopter flights that would be required to fly out waste.

Cumulative Impacts: Nearly 75 percent of Lassen Volcanic National Park is designated wilderness. Over time, there have been additional trails designated and additional visitor use, yet opportunities to experience primeval character and influences or “naturalness,” opportunities for solitude, opportunities for primitive unconfined recreation and physical and mental challenge, and opportunities for scientific study, education, stimulation and inspiration abound. Alternative A would have no contribution to cumulative impacts on wilderness. Alternative B-D would contribute short-term minor impacts on wilderness solitude by increasing noise. Alternatives C and D would also have long-term minor adverse impacts on wilderness from decreasing primeval character and naturalness as a result of locating the Manzanita Creek Connector Trail in an area now without designated trails between Manzanita Creek Campground and the Lassen Peak Trailhead parking lot. This trail, however, would increase access and opportunities to experience other wilderness values, a long-term minor beneficial effect.

Conclusion: Alternative A would have no effect because there would be no new actions in wilderness. Alternatives B-D would result in short-term minor to moderate and short-term minor cumulative impacts on wilderness values. Alternatives C and D would have additional long-term minor to moderate adverse impacts on primeval character and long-term minor beneficial effects on improving opportunities to experience other wilderness values.

There would be no impairment of wilderness resources or values as a result of Alternatives A-D.

11. Impacts to Park Operations

Alternative A: There would be no new impacts to park operations from the implementation of Alternative A. Ongoing minor to moderate impacts would occur from conducting trail maintenance operations and repair of the existing Lassen Peak Trail, including from periodic repair and reconstruction of failing rock walls. Ongoing operations in spring would continue to consist of marking the Lassen Peak Trail route with wands and occasionally trenching the trail into the snow to help visitors find the route. There would also continue to be periodic roving of the trail by park staff to assist visitors. No action would result in a steadily increasing maintenance workload just to keep the trail open and safe for travel. Over time there would be an accelerated rate of decline in the condition of the trail. Eventually staff would be unable to keep up with the repairs necessary to address the high hazard threats.

Alternatives B-D: Under Alternatives B-D, rehabilitation of the Lassen Peak Trail would require key inputs of staff, time, and money to implement. Because the trail is one of the key visitor attractions, rehabilitation actions would likely require the involvement of park staff from numerous disciplines, including maintenance, interpretation, other visitor use, resource management and administrative staff. Unless the project was contracted, it would likely divert management for several years due to the short season available for work on the trail, which would generally be the same as the visitor use season. Ongoing coordination would be required to both carry out and fund the project. These and other implementation requirements would have short-term minor to moderate adverse impacts on park operations.

Upon completion of the proposed project under any of these alternatives, the Lassen Peak Trail would be in good condition for years to come. Short-term minor to moderate adverse impacts on park operations would merge into long-term minor to moderate beneficial impacts as park staff refocused their attention on funding and implementing other key resource protection projects.

Alternatives C and D would result in additional impacts on park operations from the longer construction periods needed to widen approximately half (Alternative C) or all (Alternative D) of the trail and to therefore also reconstruct more rock walls, resulting in importation of more rock. These alternatives would also result in negligible to minor long-term beneficial effects and minor adverse effects from changing the way human waste is managed on the trail, from operating and maintaining toilets at high elevation.

Under Alternatives C and D, there would be additional long-term beneficial effects from having designated trails or routes in the crater rim and true summit areas, where visitors tend to wander and disturb sensitive plants and rocks. There could, however be problems in the future, depending on weather conditions from trying to maintain a trail in the summit crater area since a snowfield may persist there well into late summer during colder weather patterns.

Additional short-term minor to moderate adverse impacts on park operations, primarily maintenance staff would occur from in-house construction of the Manzanita Creek Connector Trail. Similar to rehabilitation of the Lassen Peak Trail, construction of the Connector trail could take several years to implement and would be affected by weather conditions, such as extreme winters or early fall snowstorms.

Impact Avoidance, Minimization and Mitigation Strategies

To avoid, minimize or mitigate park operations impacts, the following strategies would be used during or following construction:

- Efforts would be made to stage materials together and to combine helicopter trips for various construction projects to minimize the need for additional helicopter flights and therefore expenses associated with these.
- When possible employees would travel together and stay near the work site to minimize travel time.
- As possible, needed materials would be purchased and transported in bulk to minimize costs and trip generation associated with the project.
- Additional staff would be used to accomplish the proposed trail project(s).

Cumulative Impacts: Annual park operating costs are supplemented by project money. Ongoing projects require the park to dedicate staff time and funds to project implementation. As noted above, this usually affects the full complement of park employee disciplines, including management, administration, resources management, interpretation, visitor services and maintenance staff. Alternative A would contribute negligible to minor cumulative impacts to park operations since staffing and materials costs would be funded primarily from operations funding. Alternatives B-D would result in the need for specific project implementation funding to purchase materials and supplies and to hire staff. Costs would increase across the alternatives, with Alternative A being the least expensive and Alternative D being the most expensive (including for both materials and supplies and staffing).

Conclusion: Alternative A would have ongoing minor impacts on park operations. Alternatives B-D would result in both short- and long-term minor to moderate adverse effects (but these would be offset by new funding and additional employees) and minor to moderate long-term beneficial effects.

TABLE V-1: IMPACT COMPARISON CHART

Note: There would be no impairment of park resources as a result of the implementation of Alternatives A-D.

	Alternative A	Alternative B	Alternative C	Alternative D
Soils and Geology	Localized, short- and long-term negligible to minor adverse impacts.	Localized, minor to moderate short- to long-term adverse impacts. Negligible to minor long-term beneficial impacts.	Localized, moderate short- to long-term adverse impacts. Minor long-term beneficial impacts from more restoration than Alternative B.	Localized, moderate, short- to long-term adverse impacts (more than Alternative C). Minor long-term beneficial impacts same as Alternative C.
Cumulative Impacts	Alternative A would contribute negligible cumulative adverse effects while Alternatives B-D would contribute minor effects. Cumulative impacts would remain minor, since most impacts would be associated with an area previously impacted by human activities (the Lassen Peak Trail). Alternatives B and C would contribute a slightly greater degree of cumulative impacts from the construction of the Manzanita Lake Connector Trail.			
Water Resources: Water Quality	Negligible to minor short- and long-term adverse impacts.	Negligible to minor short-term adverse impacts. Long-term minor beneficial effects would occur from stabilization of soil and rock within the trail tread and from providing toilets. Slightly more impacts would occur in Alternatives C and D from constructing the Manzanita Creek Connector Trail.		
Cumulative Impacts	Alternatives A and B would continue to contribute negligible cumulative impacts on water quality.		Alternatives C-D would contribute negligible to minor beneficial cumulative impacts on water quality.	
Water Resources: Wetlands	No wetlands would be affected by the implementation of these alternatives since there are no wetlands on or near the Lassen Peak Trail.		Alternatives C and D would have negligible to minor localized adverse effects. No wetlands statement of findings would be required.	
Cumulative Impacts	There would be no contribution to cumulative effects from Alternatives A and B.		Alternatives C and D would contribute negligible adverse cumulative effects.	
Vegetation	Ongoing negligible to minor short- and long-term adverse effects	Same as Alternative A plus additional negligible to minor adverse effects.	Alternatives C and D would have localized minor to moderate short- and long-term adverse effects coupled with long term negligible to minor beneficial effects.	
Cumulative Impacts	Alternative A would result in ongoing long-term negligible adverse cumulative effects on vegetation.	Alternative B would contribute additional negligible adverse cumulative effects. Some long-term negligible to minor beneficial effects from restoration.	Alternatives C and D would contribute additional minor to moderate adverse cumulative effects from the construction of a wider Lassen Peak Trail and from the construction of the proposed Manzanita Creek Connector Trail. Some long-term negligible to minor beneficial effects from restoration plus negligible to minor long-term beneficial effects from additional designation of trails where no formal trails now exist.	
Wildlife	Short-term negligible to minor impacts on wildlife presence.	Short-term minor adverse impacts from noise and disturbance and negligible long-term impacts from habitat loss.	Short and long-term minor to moderate adverse impacts from noise and disturbance and from localized habitat loss.	
Cumulative Impacts	Negligible cumulative adverse impacts.		Minor cumulative adverse impacts.	
Special Status Species	There would be no additional impacts (no effect) on any federal or state listed or	There would be no effect on any federal or state listed or proposed species or other species considered sensitive by the USFWS, state or park. No special status plants, except for those associated with the fencing enclosure have been identified on or near the Lassen Peak Trail.		

	Alternative A	Alternative B	Alternative C	Alternative D
	proposed special status species or other species considered sensitive by the USFWS, state or park.			
Cumulative Impacts	Because the alternatives would have no effect on special status species, there would be no contribution to cumulative effects.			
Prehistoric and Historic Archeology	No additional impacts (no effect) on known archeological resources.	Potential to encounter subsurface archeological resources. Because mitigation measures would be employed there would be no adverse effect on archeological resources.	Greater potential to encounter subsurface archeological resources. As in Alternative B, because mitigation measures would be employed, there would be no adverse effect on archeological resources.	
Cumulative Impacts	There would be no construction-related contributions that would affect known eligible archeological resources and therefore no cumulative impacts from Alternatives A-D. There is a slight possibility; however, that future proposed work could affect currently unidentified cultural resources. Because mitigation measures would be implemented as noted above, Alternatives A-D would not be expected to contribute to cumulative effects on archeological resources.			
Ethnographic Resources	No impacts to known ethnographic resources		Same as Alternatives A-B plus potential for negligible beneficial effects from construction of Manzanita Creek Connector Trail.	
Cumulative Impacts	Alternative A would continue to contribute negligible to minor adverse effects from ongoing visitor use that interfered with Native American use of ethnographic resources, while Alternatives B-D could have some short-term negligible to minor adverse effects during construction and the same negligible to minor long-term adverse effects coupled with long-term beneficial effects (particularly in Alternatives C and D) following rehabilitation.			
Historic Structures / Cultural Landscapes	No effect and negligible cumulative effects on the contribution of the Lassen Peak Trail to the proposed expanded Lassen Volcanic National Park Highway Historic District.	<i>No adverse effect</i> on the Historic District. Minor to moderate cumulative adverse impacts from reconstructing historic contributing features would be coupled with the long-term beneficial impacts of retaining the trail.		
Cumulative Impacts	Negligible cumulative adverse impacts.	Minor to moderate cumulative adverse impacts and moderate long-term beneficial impacts from rehabilitation.		
Visitor Experience: Visitor Access and Opportunities and Visitor Safety	Minor to moderate adverse effects on visitor access and opportunities as temporary trail closures become more frequent. Long-term negligible to moderate adverse effects on visitor and employee safety.	Minor long-term beneficial effects on visitor access opportunities and safety due to a rehabilitated peak trail. Short-term minor adverse effects to access during rehabilitation.	Alternatives C and D have moderate long-term beneficial effects to visitor access and opportunities from the addition of the crater loop, the true summit trail, the connector trail and a restroom. Minor to moderate beneficial effects to safety would be realized from the rehabilitation of the peak trail and the designation of a true summit trail. Short-term minor adverse effects to access during rehabilitation.	
Cumulative Impacts	Minor, short- to long-term cumulative impacts if trail closure occurred over a long period.	There would be no contribution to adverse cumulative impacts on visitor experience from Alternatives B-D. Long-term beneficial impacts could result from Alternatives C and D from reducing the tendency for hikers to wander off the poorly delineated routes in the crater rim and true summit areas.		

	Alternative A	Alternative B	Alternative C	Alternative D
Wilderness	Ongoing minimal impacts on wilderness if helicopter support is needed to fix broken sections of the trail.	Alternatives B-D would result in short-term minor to moderate and short-term minor cumulative impacts on wilderness values. Alternatives C and D would have additional long-term minor to moderate adverse impacts on primeval character and long-term minor beneficial effects on improving opportunities to experience other wilderness values.		
Cumulative Impacts	No contribution to cumulative impacts on wilderness.	Short-term minor impacts on wilderness solitude by increasing noise. Alternatives C and D would also have long-term minor adverse impacts on wilderness from decreasing primeval character and naturalness as a result of locating the Manzanita Creek Connector Trail in an area now without designated trails between Manzanita Creek Campground and the Lassen Peak Trailhead parking lot. This trail, however, would increase access and opportunities to experience other wilderness values, a long-term minor beneficial impact.		
Park Operations	No new impacts. Ongoing minor to moderate impacts from maintaining and managing the Lassen Peak Trail.	Alternatives B-D would result in both short- and long-term minor to moderate adverse effects and minor to moderate long-term beneficial effects.		
Cumulative Impacts	Alternative A would contribute minor cumulative impacts to park operations since staffing and materials costs would be funded primarily from operations funding. Alternatives B-D would result in the need for specific project implementation funding to purchase materials and supplies and to hire staff. Costs would increase across the alternatives, with Alternative A being the least expensive and Alternative D being the most expensive (including for both materials and supplies and staffing).			

Chapter VI: Consultation and Coordination

Lassen Volcanic National Park conducted both internal scoping with appropriate NPS staff and external scoping with the public and interested and affected groups, agencies, and tribes to determine the range of issues to be discussed in this Environmental Assessment. Staff of Lassen Volcanic National Park and resource professionals of the NPS Pacific West Region conducted internal scoping. This interdisciplinary process defined the purpose and need, identified potential actions to address the need, determined the likely issues and impact topics, and identified the relationship of the preferred alternative to other planning efforts in the park. Scoping was also conducted with Lassen National Forest regarding removal and relocation of the radio repeater site.

Public scoping was conducted through a press release was issued on August 1, 2008, questionnaires offered to visitors at the trailhead and meetings with the park's cooperating association. The formal public scoping period for this Environmental Assessment occurred from August 1, 2008 to September 15, 2008. A summary of comments during public scoping is found in Chapter II: Purpose and Need. The press release was sent to the following newspapers: Red Bluff Daily News, Redding Searchlight, Chester Progressive, Intermountain News, Los Angeles Times, Lassen County Times, Westwood Pines Press, Enterprise Record (Chico, California), and Ridge Rider News. It was published in at least two of these.

California State Historic Preservation Office

A letter notifying the California State Historic Preservation Officer of the project was sent on August 18, 2008. A meeting with the California State Historic Preservation Officer regarding the proposed project and other Lassen Volcanic National Park projects occurred on February 26, 2009. No comments on the proposed project were received. Follow-up consultation, noting determinations of effects on cultural resources will be sent pending the release of this Environmental Assessment.

U.S. Fish and Wildlife Service

The most recent species list obtained from the USFWS to facilitate consultation under Section 7 of the Endangered Species Act for the Lassen Peak Trail Rehabilitation project is dated May 4, 2009. Because there would be no effect on listed or candidate species from the alternatives in this Environmental Assessment, no further Section 7 (Endangered Species Act) consultation with the USFWS is necessary for the proposed project.

Native American Indian Tribes

There are ten federally recognized tribes in the Lassen area. They are: Berry Creek Rancheria, Enterprise Rancheria, Greenville Rancheria, Mechoopda Indian Tribe of the Chico Rancheria, Mooretown Rancheria, Redding Rancheria, Susanville Rancheria, Round Valley Indian Tribe, Pit River Tribe, and United Auburn Indian Community.

Five of the ten recognized tribes are routinely consulted with regarding park proposed actions. These tribes are Greenville Rancheria, Mooretown Rancheria, Redding Rancheria, Pit River Tribe and the Susanville Indian Rancheria. These five tribes were sent letters on August 18, 2008 noting the likely undertaking in the proposed project area. No comments have been received. The project was also discussed at the Redding Rancheria Tribal Council Meeting on August 18, 2009 and during a site visit on September 29, 2009. No comments were received. Ongoing efforts to meet in person with other Rancherias are continuing.

This Environmental Assessment is available for a **thirty-day** public review period (the exact dates will be determined by the document printing date). At that time, a press release will be distributed to people and businesses who have expressed an interest in the road rehabilitation. The press release will also be mailed to a list of persons and agencies that have expressed interest in Lassen Volcanic National Park proposed actions and events. Included will be organizations such as The Wilderness Society, Sierra Club, etc. The Environmental Assessment will also be mailed to local libraries, organizations and individuals that have requested to receive a copy of the Environmental Assessment as well as others who request copies during the review period. The Lassen Peak Trail Rehabilitation Environmental Assessment will also be available on the Planning, Environment and Public Comment (PEPC) website at <http://parkplanning.nps.gov/lavo> and on the park's website at <http://www.nps.gov/lavo/parkmgmt/index.htm>.

Comments on this Environmental Assessment should be directed to:

Superintendent
Lassen Volcanic National Park
P.O. Box 100
Mineral, California 96063

If reviewers do not identify substantial environmental impacts, this Environmental Assessment will be used to prepare a Finding of No Significant Impact (FONSI), which will be sent to the National Park Service Pacific West Regional Director for signature.

During the public review period, additional consultation will occur to affirm determinations of effect with the California State Historic Preservation Office. Notice of the concurrence with the determinations of effect for historical resources will be identified in the FONSI for this Environmental Assessment, if prepared (see above).

For more information concerning this Environmental Assessment, please contact park Compliance Program Manager, Sean Eagan at (530) 595-4444, extension 5176 or park Chief of Resources Management, Louise Johnson at extension 5170. For a copy of this document, please call Lassen Volcanic National Park at (530) 595-4444, extension 5176.

The following people and agencies were consulted during the preparation of this Environmental Assessment:

National Park Service, Lassen Volcanic National Park

P.O. Box 100, Mineral, California 96063-0100

John Arroyo, Maintenance Mechanic

Janet Coles, Plant Ecologist

Sean Eagan, Environmental Protection Specialist (Preparer)

Karen Haner, Chief of Interpretation and Education

David Harry, Supervisory Facility Management Specialist

Dan Jones, Chief of Maintenance

Louise Johnson, Chief of Natural and Cultural Resources

Cari Kreshak, former Cultural Resources Program Manager

Darlene Koontz, Superintendent

Leigh Lisak, Chief of Administration

Mike Magnuson, Wildlife Biologist

Nancy Nordensten, Inventory and Monitoring Biologist

Joe Pettegrew, Maintenance Worker – Trails and Grounds

John Roth, Chief Ranger

Michael Slobodian, former Supervisory Revenue and Fee Business Analyst

Laura Stevenson, Superintendent's Secretary / Budget Technician

Russell Virgilio, Interpretation Specialist

National Park Service, Pacific West Regional Office (Oakland)

1111 Jackson Street, Suite 700, Oakland, California 94607

Kimball Koch, Historical Architect

Alan Schmierer, Environmental Coordinator

National Park Service, Pacific West Regional Office (Seattle)

909 First Avenue, Seattle, Washington 98104

Cortney A. Cain, Historical Landscape Architect

Susan Dolan, Historical Landscape Architect

c/o Craters of the Moon National Monument and Preserve, P.O. Box 29, Arco, Idaho 83213

Rose Rumball-Petre, Environmental Protection Specialist (Preparer)

National Park Service, Crater Lake National Park

P.O. Box 7, Crater Lake, Oregon 97604

Steven R. Mark, Historian

National Park Service, Golden Gate National Recreation Area

Fort Mason, Building 201, San Francisco, CA 94123-0022

Steve Griswold, Landscape Architect

California Department of Parks and Recreation

William Penn Mott Jr. Training Center

P.O. Box 699, Pacific Grove, CA 93950

Karl Knapp, Trail Designer

Don Beers, Trail Designer

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Appendix 1: Summary of Impact Avoidance, Minimization and Mitigation Measures

The mitigation measures identified in Appendix 1 would be implemented as part of the Preferred Alternative. These measures have been developed to lessen the potential adverse effects of the Preferred Alternative. The rehabilitation of the Lassen Peak Trail would occur over approximately five seasons, typically from May or June through September, depending on snow conditions. Phasing construction is necessary due to heavy snows, which close the road during the winter. Other general measures include: (1) limiting rehabilitation work within the existing trail prism (area originally affected by construction), (2) using construction materials (design, types, and colors) that blend with the surroundings, and (3) revegetating disturbed areas to blend with the natural environment.

Soils, Geology and Geological Hazards

To avoid, minimize or mitigate impacts to soils and geology, the following strategies would be used during or following construction:

- Locating staging areas where they will minimize new disturbance of area soils and vegetation.
- Clearing only those areas where construction would occur.
- Minimizing ground disturbance to the extent possible.
- Delineating clearing limits to minimize the amount of vegetation loss.
- Avoiding construction during heavy precipitation.
- Salvaging topsoil (if any) from excavated areas for use in re-covering source area or other project areas.
- Not piling excavated soil alongside trees to remain, and providing tree protection for trees to remain.
- Reusing (rather than removing) excavated materials from the project area.
- Revegetating project areas through native seeding and/or planting.
- Use material from excavation to fill social trails as part of obliteration technique.

Water Quality

To avoid, minimize or mitigate water quality impacts, the following strategies would be used during or following construction:

- Covering stockpiled soil and rock throughout the duration of the project with a breathable, water repellent fabric anchored around the perimeter to minimize sedimentation.
- Minimizing the amount of disturbed earth area and the duration of soil exposure to rainfall.
- Minimizing soil disturbance and re-seeding or revegetating disturbed areas as soon as practical.
- Using swales, trenches or drains to divert stormwater runoff away from disturbed areas.
- Outsloping new trail construction.

Wetlands

To avoid, minimize or mitigate wetland impacts, the following strategies would be used during or following construction:

- Avoiding wetlands where possible by trail routing.
- Using bridges rather than culverts to cross ephemeral drainages.
- Not conducting excavation in wet areas.

Vegetation

To avoid, minimize or mitigate vegetation impacts, the following strategies would be used during or following construction:

- Narrow limits of construction would be established to avoid impacting sensitive, slow-growing subalpine and alpine plants.
- Rock imported from outside the park would be from approved commercial sources and would be inspected and/or approved by NPS staff prior to importation into the park.
- Staging areas would be protected from spillover impacts by the placement appropriate barriers and would be returned to pre-construction conditions upon completion of the proposed project.
- Materials used in project work would be transported and stored so as not to acquire noxious weed seeds from adjacent areas.
- Undesirable plant species (exotics) would be monitored and control strategies implemented if such species occur.
- Because vegetation at high elevation is sensitive and takes a long time to establish, care would be taken to avoid disturbance of plants if possible.
- Although most revegetation would include only replacement of rocks, if seeding or planting occurs, only native species, appropriate to the site would be used.
- Where possible native plants would be salvaged and transplanted.
- The number of plants affected not only by trail construction, but also by disposal of excess dirt and rock (side-casting), or by stockpiling of materials would be minimized.

- Tree protection would be used around trees to be retained, especially those that are within or directly adjacent to the limits of construction.
- No whitebark pines would be removed.

Wildlife

In addition to the strategies listed above under Vegetation, to avoid, minimize or mitigate wildlife impacts, the following additional measures would be used during proposed implementation:

- Manzanita Lake Connector Trail construction would be modified if active nesting of a sensitive species was found (see below).

Special Status Species: Plants and Wildlife

To avoid, minimize or mitigate special status species impacts, the following strategies would be used during or following construction:

- Additional surveys of rare species would be undertaken prior to the construction of the Manzanita Creek Connector Trail (Alternatives C and D). If rare species were found in new construction areas for either the Manzanita Creek Connector Trail (Alternatives C and D) or in the Lassen Peak crater rim or summit areas, project implementation would be modified to avoid potential effects.
- If nesting peregrine falcons are found, a limited operating period from February to July would be instituted if work would be within 0.5 miles of a nest site. During this time hand tools could be used, but power tools would not be used.
- No whitebark pines would be removed as part of either the Lassen Peak Trail rehabilitation (Alternatives B-D) or as part of the Manzanita Creek Connector Trail construction (Alternatives C and D).
- The fencing enclosure on the top of Lassen Peak would be expanded to ensure protection for rare plants at that location.

Archeological / Ethnographic Resources

To avoid, minimize or mitigate archeological resources impacts, the following strategies would be used during or following construction:

- Should presently unidentified archeological resources be discovered during construction, work in that location would be halted, the park Cultural Resources Program Manager contacted, the site secured, and the park would consult according to 36 CFR 800.11 and, as appropriate, provisions of the Native American Graves Protection and Repatriation Act of 1990. Any archeological site would be properly recorded by an archeologist and evaluated under the eligibility criteria of the *National Register of Historic Places*.
- If the resources are determined eligible, appropriate measures would be implemented either to avoid further resource impacts or to mitigate their loss or disturbance (e.g., by data recovery excavations or other means) in consultation with the California State Historic Preservation Office.
- In compliance with the Native American Graves Protection and Repatriation Act of 1990, the NPS would also notify and consult concerned Native American representatives for the proper treatment of human remains, funerary and sacred objects, should these be discovered during the course of the project.

Historic Structures / Cultural Landscapes

To avoid, minimize or mitigate historic structures / cultural landscape impacts, the following strategies would be used:

- Retain historic alignment.
- Retain or reconstruct historically compatible dry-stack rock walls.
- Capture some (Alternatives B and C) or all (Alternative D) historic switchback corners.
- Any historic contributing feature that is to be removed would be documented before and after construction to HABS/HAER standards.
- Documentation of modifications would occur prior to construction to ensure as much as possible is known about the historic resources and the non-historic additions.
- Rehabilitation and new construction affecting historic resources would be done in conformance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Visitor Experience

To avoid, minimize or mitigate visitor experience impacts, the following strategies would be used during or following construction:

- Press releases to local media and signs in the park would inform visitors about trail conditions in the park during the projects.
- During construction, signs would inform visitors of the construction activities on the trail and of potential closures or delays. Barriers and barricades, signs and flagging, as necessary or appropriate, would be used to clearly delineate work areas and provide for safe pedestrian travel through the construction area (if appropriate).
- Weekend and holiday work would not occur.

- Materials deliveries would (to the degree possible) take place in the early morning and late evening hours.
- Before work on reconstruction of rock walls commenced, area surveys would occur to ensure a stable working environment. As appropriate, the work area would be reinforced to minimize the potential to trigger a rockslide during excavation.
- Personal protective equipment (PPE), such as helmets, would be worn by personnel during rock work.
- Standard Operating Procedures or assessment techniques to determine when the Lassen Peak Trail is safe to open would be developed. Informal trail assessments, which have routinely been done each spring, would be more formal and rigorous. Additional trail safety assessments would also occur in summer.
- Immediately before the road opens to the public, trails staff would assess and mitigate safety hazards in the snow-free sections (approximately 1/2 the trail is usually snow free when the road opens). Once this inspection is complete and visible hazards are mitigated the trail would open with a “hazardous conditions” sign at the bottom because snowfields on the trail are commonly still present.
- Prior to the July 4th weekend, newly melted out sections would be reassessed to determine if new hazards have developed. Snowfields which cannot be easily bypassed would be trenched (to define the route and to improve safety conditions). If, during the second assessment, the trail is deemed safe, hazardous conditions signage could be removed. If additional hazards, however, are discovered that need repair, the trail could be closed until repairs are made.

Wilderness

To avoid, minimize or mitigate wilderness impacts, the following strategies would be used during or following construction:

- Helicopter materials deliveries would be conducted during times of lower visitor use and would be limited to the minimum number possible.
- Helicopter trips to service toilets would be limited to one to two days each year.
- Permanent toilets would be designed to withstand a season of visitor use to minimize the number of helicopter flights that would be required to fly out waste.

Park Operations

To avoid, minimize or mitigate park operations impacts, the following strategies would be used during or following construction:

- Efforts would be made to stage materials together and to combine helicopter trips for various construction projects to minimize the need for additional helicopter flights and therefore expenses associated with these.
- When possible employees would travel together and stay near the work site to minimize travel time.
- As possible, needed materials would be purchased and transported in bulk to minimize costs and trip generation associated with the project.
- Additional staff would be used to accomplish the proposed trail project(s).

Appendix 2: Draft Minimum Requirement Analysis for Manzanita Creek Connector Trail Construction

MINIMUM REQUIREMENT ANALYSIS WORKSHEET

Lassen Volcanic National Park

Project Title: *Reach the Peak* – Lassen Peak Trail Rehabilitation Environmental Assessment

Start Date: Fiscal Year 2010

Prepared by: Louise Johnson

Step 1: Determine whether the proposed action takes place in designated wilderness, proposed wilderness, or winter backcountry areas within Lassen Volcanic National Park.

The proposed actions included in the Lassen Peak Trail Rehabilitation Project Environmental Assessment encompass two areas within the park, designated and proposed wilderness (treated as one area) and the scenic drive management zones. This Project includes three distinct trails: existing Lassen Peak Trail, the proposed crater loop and the proposed connector trail to Manzanita Lake. The Lassen Peak Trail and the crater loop are within the scenic drive (summer) and the winter backcountry zones. Neither the existing Lassen Peak Trail nor the proposed crater loop is within designated or proposed wilderness (Figure 1).

The proposed Manzanita Lake connector trail would have 5.15 miles within designated or proposed wilderness and 0.35 miles within the scenic drive (summer) zone (Figures 1 and 2).

The entire project is within the winter backcountry zone which is managed as wilderness when the main park road is closed for the winter season.

Step 2: Provide a description of the proposed action. The following overall goals guided development of the alternatives for the Lassen Peak Trail Rehabilitation Project:

- Improving public health and safety;
- Improving visitor access and enjoyment within the project area;
- Improving or maintaining park natural and cultural resources conditions in the project area,

In addition, the following objectives were identified to improve resource conditions and visitor experience in the project area:

- Address threats to public health and safety;
- Improve the condition of the Lassen Peak Trail;
- Address human waste management issues;
- Increase the consistency of interpretation;
- Consider accommodating more visitors;
- Consider designation / delineation of summit area trails; and
- Consider a trail to connect the Manzanita Lake area to the Lassen Peak parking area.

Using the above goals and objectives as guides, Park staff developed the following four management alternatives for the rehabilitation of the Lassen Peak Trail:

Alternative A: No Action (Continue Current Management)

Alternative B: Minor Changes in Lassen Peak Trail Visitor Experience

Alternative C: Modest Improvements in Lassen Peak Trail Visitor Experience

Alternative D: Lassen Peak Trail Visitor Use Accommodation

Alternative C, *Modest Improvements in Lassen Peak Trail Visitor Experience*, is the preferred alternative and includes the following proposed actions. The lower section of trail (approximately 1.2 miles to tree line) would be widened to approximately six feet, while the upper section would remain at its historic width of approximately four feet. A restroom would be provided at a wide area approximately 0.6 miles from the summit. Approximately 6-8 new turnouts would be constructed alongside the trail to accommodate groups of 10-15 people. There would be designated loop and/or spur trails in the summit crater area and a designated route with stabilized tread and a cable with stanchions leading to the true summit, where the summit register would be identified. All of these actions would take place outside of both designated and proposed wilderness.

A 5.5 mile trail connecting the Manzanita Creek Trail to the Lassen Peak Trail would be constructed primarily within wilderness. This trail would be built to NPS backcountry trail standards (24 inches wide) and would not require any major bridges or other large constructed features. There will be several short sections with rock steps.

Tools proposed to be used

chainsaws
mechanical tamper
punjar
Hand tools (shovels, Polaski, rockbar, etc)

Helicopter will be used to move material to the Lassen Peak Trail
Motorized Trail carts will be used to move material on the Lassen Peak Trail

Step 3: Determine whether the proposed action is required for the administration of the Lassen Volcanic Wilderness. Why is this action necessary? Does the purpose of the action meet Minimum Requirements, that is, does it achieve Resource Protection and one or more of the following: a) Visitor Enjoyment and Recreation, b) Visitor Management, c) Research, or d) Ecosystem Restoration?

The proposed action is not required for the administration of wilderness, however it does meet the Minimum Requirements. Alternative C will help achieve Resource Protection and promote Visitor Enjoyment and Recreation. To a lesser extent it will help the park with visitor management, Research, and Ecosystem Restoration. This action follows direction spelled out in NPS directives "Trails will be permitted within wilderness when they are determined to be necessary for resource protection and/or for providing for visitor use for the purposes of wilderness"(NPS Reference Manual #41). This action is necessary for providing visitors with a full array of experience and the ability to use the wilderness.

Step 4: Determine if the objectives of the proposed action can be met with actions outside of wilderness, proposed wilderness, or winter backcountry zones.

Two of the three overall goals of the Lassen Peak Trail Rehabilitation Project Environmental Assessment can and will be met outside of wilderness. The first six objectives will also be met outside of wilderness. The Lassen Peak Trail is not within designated or proposed wilderness. The toilets, crater loop trail, and interpretive exhibits are also outside of wilderness.

The second goal, providing access to the project area which includes the Vulcan's Castle area, can not be met outside of wilderness. Since one cannot drive, boat or fly to the Vulcan's Castle area a narrow foot trail will allow access for visitors who do not possess the skill or strength for cross country travel. Visitors will be able to day hike to this area from either the Lassen Peak parking lot or Manzanita Lake Developed Area. Since Vulcan's castle area is within wilderness, the trail needs to be located in wilderness.

The final objective, consider a connector trail, is designed to allow people at Manzanita Lake to reach the Lassen Peak/ Bumpass Hell area without driving. If park staff located a connector trail without entering wilderness it would be approximately 20 miles long and would not achieve the goal of this project. Therefore the intent of this objective can only be realized by routing the trail through wilderness (Figure 2).

All physical actions will happen when the road is open and when the winter backcountry zone is not in effect. All three trails will be in the winter backcountry zone but they will be covered in snow and will not detract from the visitor's experience. The toilet will be in place during the winter and might detract from the experience for the very few visitors who climb Lassen during the winter.

Step 5: Develop a list of alternatives to meet the objective of the proposed action. Include ways to reduce or mitigate the impacts of each alternative.

Alternative A: No Action (Continue Current Management)

The Lassen Peak Trail would retain its current rugged hiking experience. Existing management, including ongoing maintenance and occasional reconstruction of the non-wilderness Lassen Peak Trail, would continue. There would continue to be no trailside toilets and human waste disposal problems would therefore continue. Social / way trails would continue to be the primary means of access in the summit crater and true summit areas. Interpretation would be provided by existing interpretive exhibits and occasional staff presence. Aside from removal of older exhibits, rehabilitation or replacement of exhibits would generally only occur as these were damaged. The connector trail to Manzanita Lake trail is not constructed in this alternative.

In order to fix individual broken trail walls (ongoing maintenance) it is possible some helicopter flights will be necessary and the noise from those flights would impact visitor's wilderness experience. To mitigate the impacts, these flights could be undertaken on weekdays during the shoulder season.

Alternative B: Minor Changes in Lassen Peak Trail Visitor Use Experience

As in Alternative A, the Lassen Peak Trail would retain its current rugged hiking experience. The trail, however, would be reconstructed to a consistent four-foot width and dry laid rock retaining walls would be reconstructed or rehabilitated as appropriate to retain historic fabric. The summit plateau and true summit visitor experiences would be the same as in Alternative A, with no designated / constructed trails or additional interpretive elements. The primary differences between Alternative B and Alternative A would be that in Alternative B the trail would be rehabilitated in a single phased project to a consistent four-foot width (including narrowing of existing wider sections) to replicate its historic condition. Rock walls and steps would be reconstructed or rehabilitated as appropriate to minimize loss of historic fabric and to retain their functionality. Although groups could continue to use the trail, there would be no accommodations made to increase the width of the trail or stopping points as part of the trail rehabilitation project. As in Alternative A, there would be no trailside restrooms so human waste issues would continue. Also as in Alternative A, social trails would continue to be the primary means of access in the crater and true summit areas. As in Alternative A, the summit register would continue to remain hidden and unsigned. Limited interpretive opportunities would continue to occur from existing interpretive exhibits or occasional staff presence and programs.

Helicopter flights over wilderness will be required to move materials to the peak trail (Figure 2). To minimize flights and days of disturbance, large helicopters will be used. To mitigate the noise impacts, these flights could be undertaken on weekdays during the shoulder season when wilderness has fewer visitors. The flight path over wilderness will maximize human safety by avoiding all roads, trails and developed areas. Since there would be no toilets there would be no flights to empty them each fall.

Alternative C: Modest Improvements in Lassen Peak Trail Visitor Experience (Preferred)

The Lassen Peak Trail would accommodate a modest increase in visitor use capacity while maintaining a rugged hiking experience. Similar to Alternative B, Alternative C calls for rehabilitation of the Lassen Peak Trail. In Alternative C, however, the lower section of trail (approximately 1.2 miles to tree line) would be widened to approximately six feet, whereas the upper section would be the same as in Alternative B, approximately four feet. A restroom would be provided at a wide area approximately 0.6 from the summit and approximately 6-8 new turnouts would be constructed alongside the trail to accommodate small groups (10-15 people). Whereas summit crater and true summit trails would remain undesignated in Alternatives A and B, in Alternative C, there would be designated loop and/or spur trails in the summit crater area and a designated route with stabilized tread and a cable with stanchions leading to the true summit, where the summit register would be identified. The connector trail to Manzanita Lake would be constructed and is primarily in wilderness.

Helicopter flights over wilderness will be required to move materials to the peak trail (Figure 2). To minimize flights and days of disturbance, large helicopters will be used to sling load large metal buckets

of rock. To mitigate the noise impacts, these flights would be undertaken on weekdays during the shoulder season when wilderness has few visitors. The flight path over wilderness would maximize human safety by avoiding all roads, trails and developed areas. Flights with a smaller helicopter will be needed in the fall to empty the toilet 0.6 miles below the summit.

The connector trail to Manzanita Lake will be constructed to wilderness standards with a two-foot trail width and primarily using materials found adjacent to it. This will create some disturbance during the summer for the two summers it will take to complete this trail. Trail crews will use primarily hand tools, though on a few days power tools, will be used either to break rocks in talus fields or to compact the trail. The primary mitigation will be to use the power tools during periods of low visitation. Current visitation is very minimal so avoiding most visitors will be not be difficult.

Alternative D: Lassen Peak Trail Visitor Use Accommodation

The Lassen Peak Trail would accommodate more visitors, including novice hikers and groups. Similar to Alternatives B and C, Alternative D calls for rehabilitation of the Lassen Peak Trail. Unlike in Alternative C, where only the lower portion of the trail would be widened, in Alternative D both the upper and lower portions of the trail would be widened up to the summit plateau to approximately six feet, where possible. In addition to the restroom provided 0.6 miles from the summit in Alternative C, there would be a restroom located approximately 0.75-1.0 mile from the parking area. There would also be more and larger turnouts than proposed in Alternative C, with approximately 6 turnouts that would accommodate groups of 15-20 people and 2-4 turnouts that would accommodate groups of 10-15 people. As in Alternative C, there would be designated trails in the summit crater area and to access the true summit, however, in Alternative D, these trails would be wider (24 inches instead of 18 inches) and would be built to NPS trail standards. Interpretive wayside panels would be located along the crater loop trail in the summit crater area. Instead of a cable and stanchions leading to the true summit, there would be a formal trail with even tread, including rock steps. The summit register would be moved down to the summit plateau area to allow more people to access it.

Helicopter flights over wilderness will be required to move materials to the peak trail (Figure 2). To minimize flights and days of disturbance, large helicopters will be used to sling load large metal buckets of rock. To mitigate the noise impacts, these flights would be undertaken on weekdays during the shoulder season when wilderness has few visitors. The flight path over wilderness would maximize human safety by avoiding all roads, trails and developed areas. Flights with a smaller helicopter will be needed in the fall to empty the toilets.

The connector trail to Manzanita Lake will be constructed to wilderness standards with a two-foot trail width and primarily using materials found adjacent to it. This will create some disturbance during the summer for the two summers it will take to complete this trail. Trail crews will use primarily hand tools, though on a few days power tools will be used either to break rocks in talus fields or to compact the trail. The primary mitigation will be to use the power tools during periods of low visitation. Current visitation is very minimal so avoiding most visitors will be not be difficult.

Step 6: Choose an alternative. What is the Minimum Activity?

The preferred alternative presented in the Lassen Peak Trail Rehabilitation Project Environmental Assessment is *Alternative C: Modest Improvements in Lassen Peak Trail Visitor Experience*.

Review of resource and visitor impacts and mitigation strategies has found that the preferred alternative achieves the greatest balance between the need for repairing the trail and the need for preserving natural, cultural, and wilderness resources and improving the visitor experience in the park.

The Minimum Activity is Alternative A: *No Action*, however it fails to meet any of the goals and objectives of the project.

Describe the rationale for selecting this alternative:

NPS management policies and the United States Code's (U.S.C.) interpretation of the Wilderness Act both state that foot trails are an appropriate means to provide the public the opportunity to recreate in wilderness. "Trails will be permitted within wilderness when they are determined to be necessary for resource protection and/or for providing for visitor use for the purposes of wilderness" (NPS Reference Manual #41 6.3.10.2). "Except as otherwise provided in this act, wilderness areas shall be devoted to purposes of recreational, scenic, scientific, educational, conservation, and historical use. Section 4 (b) (16 U.S.C 1133)

The rehabilitation of the Lassen Peak Trail will require at least 750 cubic yards (alt b) of additional rock. This quantity of rock is not available adjacent to the Lassen Peak Trail and having trail crews extract 200 pound boulders from a loose talus field and transport them to the trail would be next to impossible and create a severe safety hazard. Helicopters are considered the minimum tool for importing rock because moving 750 cubic yards of rock with trail carts or stock would create a significant safety hazard. Helicopters will move large volumes of material in just a few days and the trail will be closed on these days. All other methods would mean moving material on almost every week day for the next several summers. The type and width of trail, and the choice of tools proposed on Lassen Peak are outside of the purview of the Wilderness Act because they are not in wilderness (designated or proposed).

The connector trail to Manzanita Lake fits the profile of uses permitted and encouraged in wilderness. In a few sections, which total less than ½ mile, the decision was made that it was preferable to route the trail through the toe of a talus field rather than through the adjacent alpine vegetation. A single trail in an alpine meadow often evolves into multiple trial ruts as early season visitors walk adjacent to the trail to keep their feet dry. Most alpine species will not reestablish in these ruts as has been observed in Tuolumne Meadows, Yosemite National Park. The toe of a talus field often contains rocks averaging three feet in diameter. A punjar is the minimum tool to break these rocks and create a two-foot wide wilderness trail. Using a mechanical tamper to compact the trail tread will create a much more durable tread and require significantly less maintenance long term.

The National Park Service would like most able bodied visitors to have safe access both the Lassen Peak Summit and to the Vulcan's Castle area. Alternative B,C and D all meet the goal of safe access to Lassen Peak, but following detailed analysis Alternative C best protects the natural and cultural resources.

Alternatives A and B are identical in that new trail construction will not occur in wilderness. Vulcan's Castle area will remain open to visitors but few have the wilderness skills to get there. Those who do go there, create a bevy of social trails each of which damages natural resources, primarily slow growing alpine vegetation. Under Alternatives C and D the same trail will be constructed using the same tools. This trail will allow a much large portion of Lassen's visitors to experience the Vulcan's Castle area and will reduce damage to the alpine vegetation which is trampled each summer. This is why alternative C has been chosen as the preferred alternative.

Although trail construction activities would disrupt general wilderness character and experience in alternative C, once the trail is in place, the effect of this new trail on the whole of the wilderness value and character at Lassen Volcanic National Park would be minor (5.15 miles compared to over 140 miles of maintained trails in wilderness). Maintained trails, have a negligible effect on the visitor experience of primeval character and influences or "naturalness." The experience of trails serves to facilitate the experience of a primitive unconfined wilderness experience by facilitating access into wilderness where few human signs are present. Off the trail in surrounding wilderness, these experiences would continue to be easily available. There would continue to be abundant opportunities for experiencing both the primitive nature of wilderness, its natural state and solitude.

Please check any uses proposed in this alternative that would generally be prohibited under the Wilderness Act Section 4(c), refer to page 1 of the Guidelines:

mechanical transport

landing of aircraft

motorized equipment

temporary road

motor vehicles

structure or installation
(Bathrooms and waysides exhibits on the Peak Trail,
and Construction of the new Manzanita Lake
Connector Trail)

motorboats

*Note: The motor vehicle (trail cart) and the structure (bathroom(s)) are part of the project but they will not be used in wilderness.

Check one:

The proposed action is a temporary one-time activity. (construction is a one-time activity, however the trail will remain)

The proposed action will be an on-going, long term activity.

Approvals:

Recommended by: _____

Louise Johnson
Chief of Natural Resources Management
Wilderness Manager

Date _____

Approved: _____

Darlene Koontz
Superintendent

Date _____

Any Comments and Conditions:

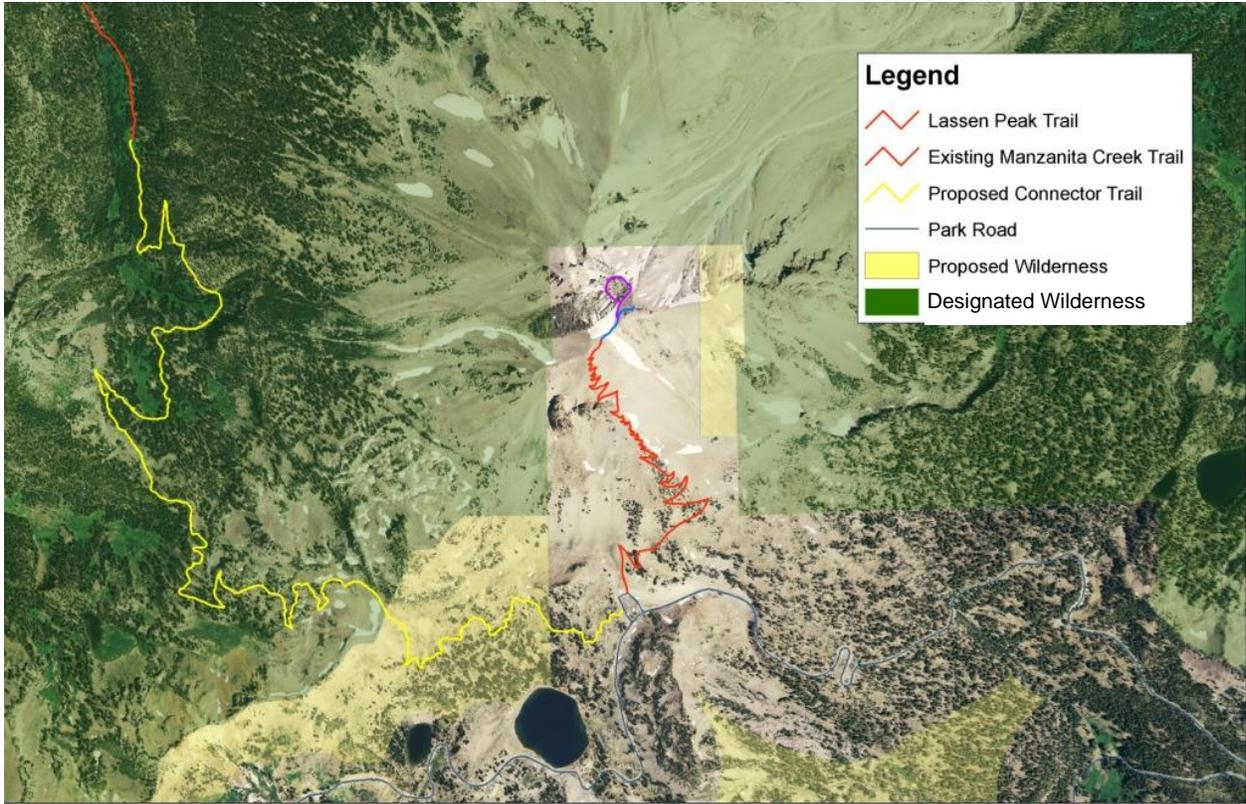


Figure 1. The connector trail to Manzanita Lake, the Lassen Peak Trail, and the crater loop trail and their spatial relationship to Lassen designated and proposed Wilderness. The entire area shown is in the winter backcountry zone and is managed as wilderness when the park road is closed.

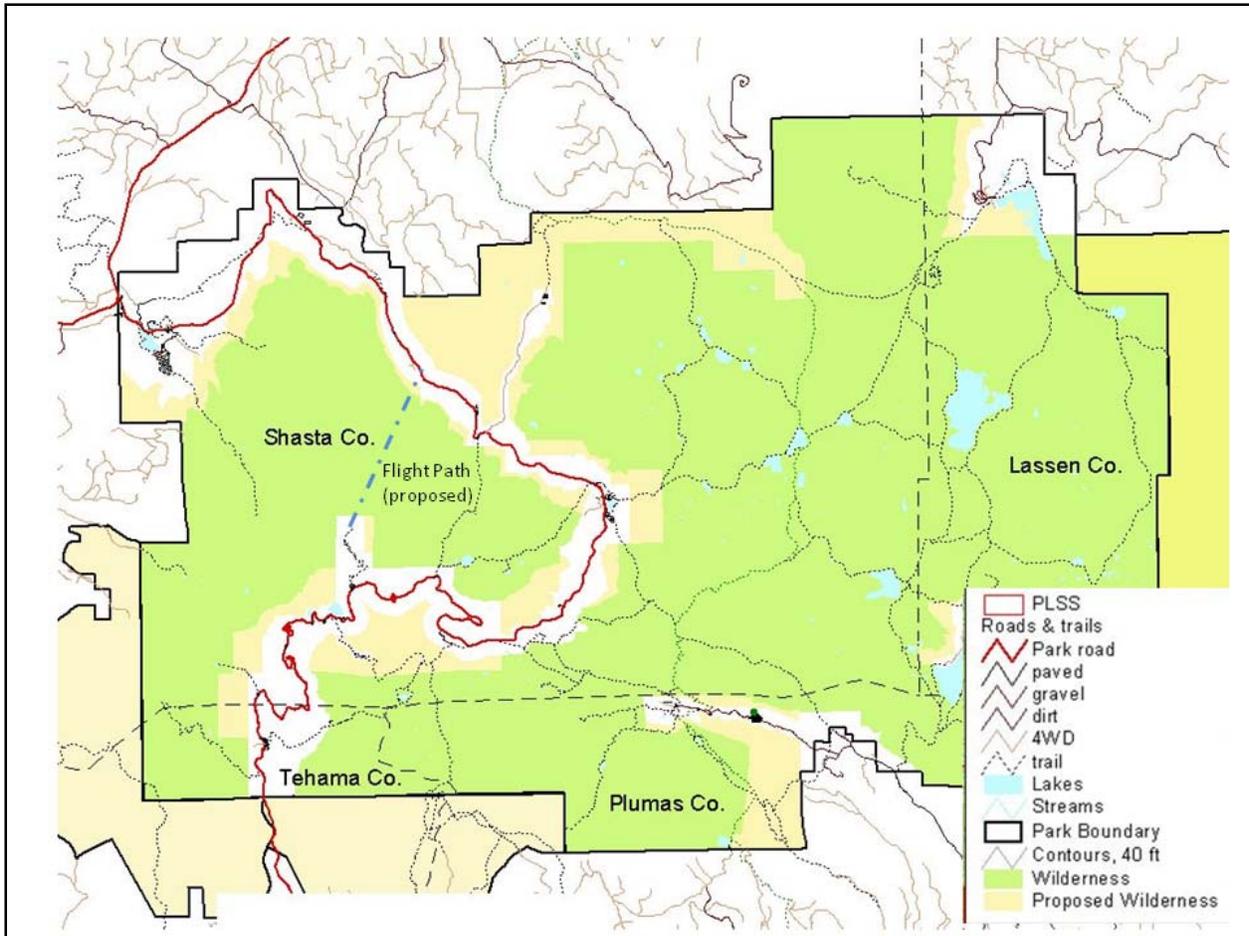


Figure 2. The shaded areas are designated (green) and proposed (yellow) wilderness in Lassen Volcanic National Park. The helicopter flight path (blue) will fly above three miles of designated wilderness. This flight path is the best option for human safety because it does not cross roads, trails or developed areas.