Lassen Volcanic

National Park Service
U.S. Department of the Interior

Lassen Volcanic National Park

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

August 2005

Lassen Volcanic National Park
Mineral, California

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Executive Summary

A portion of the roadway in Lassen Volcanic National Park underwent rehabilitation in 2002. That project was described in the Environmental Assessment: Repair and Rehabilitate Main Park Road and Manzanita Lake Campground Entrance Road August 2001 (NPS 2001C). It consisted of the repair of 7.9 miles (12.7 kilometers) of the main park road, beginning at the south entrance, and 0.6 miles (0.96 kilometers) of the road beginning at the north entrance.

In the preferred alternative, described in this Environmental Assessment, the National Park Service would complete the rehabilitation of the Lassen Volcanic National Park Highway (remainder of the main park road), a distance of about 21.7 miles (34.9 kilometers). Project work would also include repair and rehabilitation of the campground loop roads at Manzanita Lake, Crags Campground, Lost Creek Campground and North and South Summit Lake campgrounds. Rehabilitation would begin at the end of the previous rehabilitation project, just north of the Bumpass Hell Parking Area, and would extend northward to where the Phase I project concluded at the Manzanita Lake Campground Entrance Road. Like the former project, the preferred alternative would include repaving and rehabilitation of numerous areas along the route, including spur roads providing access to campgrounds and picnic areas, and pullouts.

Due to funding uncertainties, this project may be split into two phases that would be constructed two to three years apart, each phase requiring approximately 1- 1/2 summer seasons to complete. The first phase would likely begin in summer of 2006 or 2007.

This project would be designed and administered by the Central Federal Lands Highway Division (CFLHD) of the Federal Highway Administration (FHWA) in cooperation with the National Park Service, Lassen Volcanic National Park.

Table of Contents

Introduction

Lassen Volcanic National Park encompasses 106,372 acres on the southern tip of the Cascade Range in northeastern California (Figure 1). Located approximately 50 miles (80 kilometers) from Redding and Red Bluff, California and 20 miles (32 kilometers) from Chester, California, it was established by an Act of Congress on August 9, 1916 (39 Stat. 442)

> . . . for recreation purposes by the public and for the preservation from injury or spoliation of all timber, mineral deposits and natural curiosities or wonders within said park and their retention in their natural condition and to. . . 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. The eruption of Mount St. Helens in 1980 changed that, although it did not change the status 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 geothermal 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).

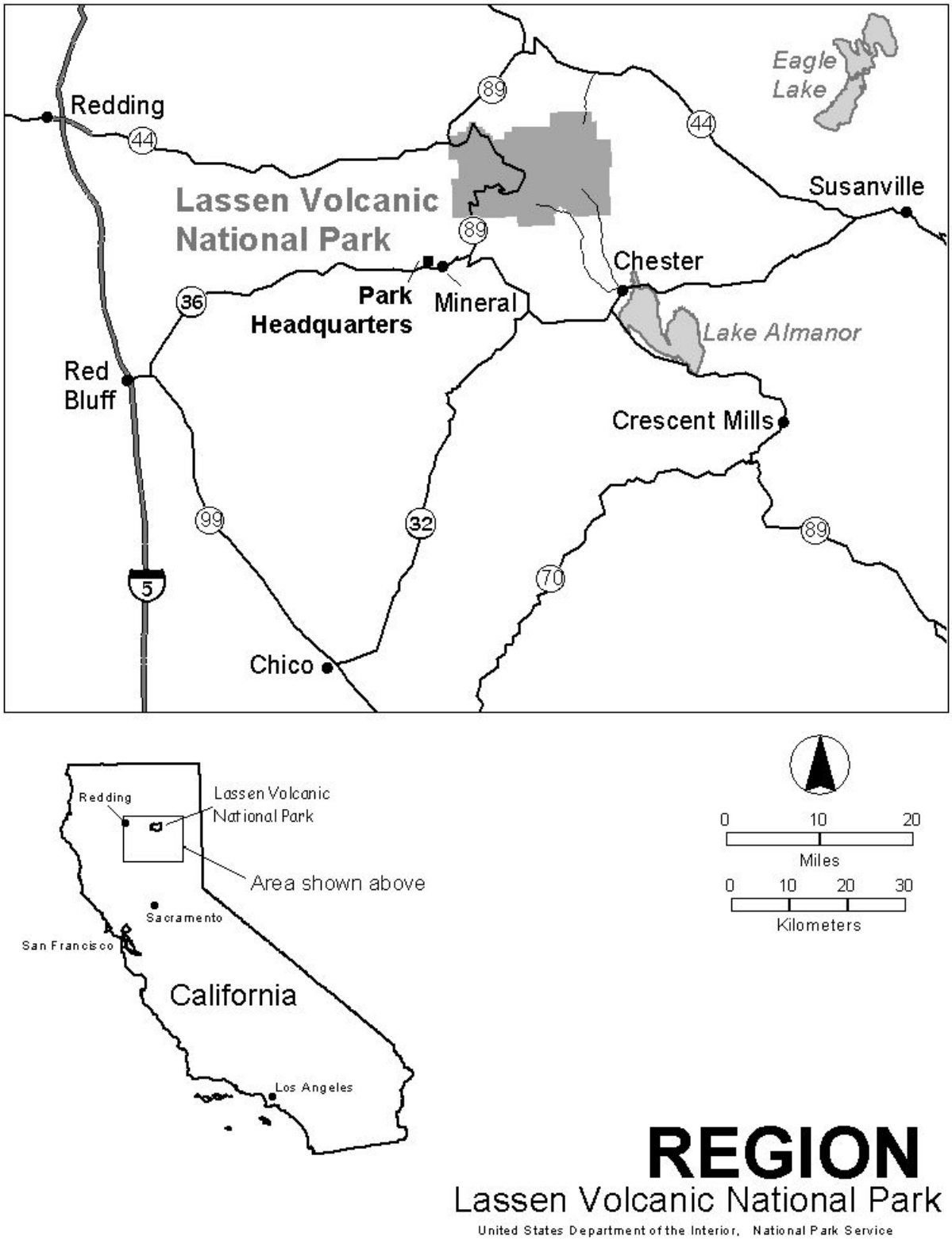
In addition to its geologic features, the park is at the apex of three biogeographic regions – the southern Cascades, the northern Sierra Nevada, and the Basin and Range Province. The overlap of these regions results in exceptionally high biodiversity in the park, with 779species of plants, 56 species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

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 Volcanic National Park Highway as described herein.

Figure 1: Lassen Volcanic National Park Region



I. PURPOSE AND NEED

The approximately 21.7 mile (34.9 kilometer) portion of the Lassen Volcanic National Park Highway not encompassed by rehabilitation work in 2002- 2003 is at the end of its normal service life. Oxidation has caused the asphalt to become brittle and to begin to erode from the outer edge of the pavement inward, creating hazardous driving conditions and narrowing lane widths. Age, weather and heavy use have contributed to deterioration of the roadway surface, leading to warped pavement, pavement cracking, asphalt spalling on the edge of the road, and increased potholing. The road therefore needs comprehensive repair and rehabilitation. This is further evidenced by escalating maintenance costs in recent years to keep the road in fair condition for heavy summer visitor use and to ensure safe passage in winter for snow- plowing operations. The costs to repair the road have averaged over $50,000 a year since 1995 and have included emergency repairs of road failures due to washouts.

The need for repaving and rehabilitation of this road subsequent to the completion of the park General Management Plan has also resulted in an opportunity to implement some aspects of that plan with respect to the roadway improvements it calls for. These improvements include analysis of pull- outs and visitor use parking areas for rehabilitation, restoration and continued use to better preserve adjacent park resources and to improve the visitor experience and to reduce safety hazards associated with visitors pulling on and off the road at poorly located pullouts. The opportunity also exists to remedy some long-term impacts caused by the physical design of the road, including the placement of new culverts and other drainage features where needed, especially in the vicinity of the Lassen Peak Parking Lot and Dersch Meadows, as well as to ensure that the project actions are consistent with the recently completed Wayside Exhibit Plan (NPS 2000c) and the direction in the GMP to minimize ongoing impacts to water quality by paving some formerly unpaved vista points, picnic areas and campground roads and parking areas. In addition, many feet of non- historic road curb lines the main road, presenting a safety hazard during snowplowing. Finally, the opportunity exists to remedy effects of some of the emergency repairs conducted in recent years which have had incremental effects on the aesthetic character of the road, including characteristics which make it eligible for the National Register of Historic Places.

The main park road was recently re- designated the Lassen Volcanic National Park Highway in an analysis of its eligibility for inclusion on the National Register of Historic Places as a cultural landscape. Much of this historic road traverses steep mountainous slopes or valley bottoms along perennial creeks at high elevations on the west side of the park. It is the primary means of access for most park visitors to and through the park because it is the only through road and because it was designed to access many of the park's significant volcanic features and scenic characteristics and many of the park's information areas, campgrounds, picnic areas, trailheads and concession facilities are situated along it.

As a result of its recent determination of eligibility for the National Register, actions that retain the character of the road and which avoid, minimize or mitigate effects on contributing features are important considerations for the proposed project. As with all National Park proposed actions, other important considerations also include ensuring that the project fulfills the mission of the park and the National Park Service in its preservation of park resources and the visitor experience for future generations.

At a minimum, to be considered successful, the purposes of this project must be fulfilled, including to improve public health and safety, enhance the visitor experience, preserve the historic road, improve natural resources protection and to enable more efficient use of park road maintenance funds.

Project Setting

The proposed project area begins just north of the Bumpass Hell Trailhead Parking Area and extends for approximately 21.7 miles (34.9 kilometers) in a general northerly direction to the intersection with the Manzanita Lake Campground Road. The road traverses steep, rocky terrain as it passes Lake Helen on its ascent to the Lassen Peak Parking Area and the Summit Lake campgrounds and then its descent through

Dersch Meadows, Hat Creek and the Devastated Area enroute to Manzanita Lake. Elevations within the project area range from 5,808 - 8,511 feet (1,770 – 2,595 meters). Numerous intermittent and perennial creeks cross this section of the road, including the scenic Kings Creek and Hat Creek areas. Between them, the road follows a small perennial fork of Hat Creek as it traverses Dersch Meadows. Along the way, the road winds through mountain hemlock, red fir and yellow pine forests, subalpine meadows, wetlands and mudflow/rockfall (barren) areas.

Scope of this Document

This Environmental Assessment is intended to analyze impacts from two alternatives, the no action alternative and the National Park Service preferred alternative implementing the rehabilitation of (Mileposts 6.7 to 28.4) of the Lassen National Park Highway.

Included in the cumulative impacts analysis are the following projects:

- Construction of the Southwest Visitor Services Facility (2005- 2006)
- Alteration of parking design and lot size at Lost Creek Campground (2004)
- Seasonal hazard tree removal
- Wayside exhibit installation (2004- 2005)
- Restoration of 40- acre abandoned downhill ski area (2003- 2004)
- Rehabilitation/revegetation of six former dump sites (2003- 2005)
- Rehabilitation of the first segment of the Lassen Volcanic National Park Highway.

The primary issues driving the actions considered in this Environmental Assessment include:

- Minimizing threats to public health and safety,
- Increasing visitor access and enjoyment of the park,
- Preserving park natural and cultural resources, and
- Decreasing the degree of road maintenance and the potential for road failure.

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

Repair and Rehabilitate Main Park Road and Manzanita Lake Campground Entrance Road Environmental Assessment, August 2001

Under this project, the NPS repaired 7.9 miles (12.7 kilometers) of the main park road and 0.6 miles (0.96 kilometers) of the Manzanita Lake Campground Entrance Road in the park. The purposes of that project were to enhance public health and safety, enhance the visitor experience, preserve the main park road (a cultural resource), improve natural resources protection, and to enable more efficient use of park maintenance funds. This project was completed in 2002- 2003.

General Management Plan

The park's recently completed General Management Plan/Environmental Impact Statement (NPS 2003B) provides long- term direction for park resource preservation and visitor use.

The proposed project area occurs within the Scenic Drive Zone as described below (pp. 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. . .

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. . .

Visitor stopping points along the road serve a number of different purposes and they are developed and managed accordingly.

Individual pullouts are located and designed for a visitor or groups of visitors to enjoy the views or other park resources. . . without the disruption of other visitors. Pullouts accommodate one to three vehicles. They are unpaved but designed to prevent informal enlargement. . .

Planning goals for the GMP (NPS 2003B) related to the current proposed rehabilitation of the road include:

- The Lassen Volcanic National Park Highway cultural landscape would be preserved and interpreted for park visitors. (p. 32)
- Physical rehabilitation would be undertaken for resource protection purposes, such as. . . rehabilitation of several historic culverts, repair of road structural deficiencies. . .
- All pullouts where visitor safety is compromised or resource damage is occurring would be evaluated and redesigned for appropriate use. (p. 32)
- The [Kings Creek] area would be redesigned to improve resource protection, safety and visitor experience. . . (p. 33)
- Additional improvements in the [Summit Lake] area would include. . . improved trailhead parking. (p. 33)

The following items related to this Environmental Assessment were considered deficient visitor service facilities (p. 25):

- Poorly located pullouts on the main road that limit scenic view opportunities
- Overflowing parking lots and poorly designed pedestrian crossings at. . . Lake Helen, . . . Kings Creek trailhead. . .

Several of the actions called for in the preferred alternative described later in this document were also identified in the GMP (NPS 2003B), including:

- Improved pullouts on the main road to provide interpretive and scenic view opportunities. (p. 40)
- Parking lots at. . .and Lassen Peak would be redesigned to improve their safety and appearance. Site plans . . . would be accompanied by appropriate environmental compliance. (p. 41)
- Pullouts on the main road would be reevaluated, redesigned and relocated to achieve improved visitor experience including scenic views, interpretation, and availability of convenience facilities (p. 42)
- At Kings Creek, the picnic area would be expanded to provide bus parking and areas suitable for group use. (p. 42)

In addition, the following capital improvement items were included in the selected alternative cost estimate (p. 44) :

- Upgrade Safety at Major Parking Lots
- Relocate/Upgrade Main Road Pullouts

Purpose and Function of Park Roads

One objective of the actions described in this Environmental Assessment is to maintain the purpose of the national park road network as summarized in the "Park Road Design" memorandum dated February 20, 1986 from then NPS Director Mott:

> *The Purpose of park roads remains in sharp contrast to that of the Federal and State highway systems. Park roads are not intended to provide fast and convenient transportation; they are intended to enhance visitor experience while providing safe and efficient accommodation of park visitors and to serve essential management access needs (NPS 2002c).*

As stated in the 1984 NPS Park Road Standards, among all public resources, those of the National Park System are distinguished by their unique natural, cultural, scenic, and recreational qualities; values that are dedicated and set- aside by public law to be preserved for generations. In general, the protection, use, and enjoyment of park resources in a world of modern technology have necessitated the development of a system of public park roads. In most parks today, the basic means of providing for visitor and park administrative access is the park road system. For visitors, park roads provide both access and enjoyment (scenic touring).

The park road system includes roads within or accessing a park. The roads are administered by the NPS or by the NPS in cooperation with other agencies. In defining functional classification, the routes that make up a park road system are grouped into three broad categories, primarily based on use, including: public use park roads, administrative park roads, and urban parkways (NPS 2002).

Park roads intended for the primary use of visitors for access into and within a park are designated as Public Use Park Roads. This classification includes all roads that provide vehicular means of access for visitors, or access to such representative park areas as points of scenic or historic interest, campgrounds, picnic areas, trailheads, and similar features.

Administrative Park Roads are comprised of all public and non- public roads intended primarily to fulfill management objectives for the particular area. This category of roadway includes those routes serving employee residential areas, maintenance areas, and other administrative developments, as well as patrol roads, truck trails, or similar administrative roads (NPS 2002). Urban Parkways are routes and facilities serve high volumes of park and non- park related traffic.

Functionally, the Lassen Volcanic National Park Highway is classified as both a Public Use and Administrative Park Road.

Federal Lands Highway Program

The Federal Lands Highway Program (FLHP) began in 1982 under the Surface Transportation Assistance Act, however, the NPS and the FHWA (and its predecessor, the Bureau of Public Roads) have cooperated since the inception of the NPS in 1916. The NPS and FHWA have had a formal relationship since 1926 to develop and maintain the current system of National Park Roads and Parkways. The main intent of the FLHP is to disburse funding to a coordinated program of public roads that serve the transportation needs of federal lands, not under state or local governmental responsibility.

The Federal Highway Administration (FHWA), operating through Interagency Agreements with federal land managing agencies including the National Park Service, oversees and administers a coordinated federal lands program, which includes forest highways, public lands highways, park roads and parkways, refuge roads, and reservation roads. Overall, the FLHP program is responsible for funding to maintain more than 90,000 miles of federally owned and public authority- owned roads, which provide access to and serve federal lands. The NPS maintains jurisdiction over approximately 8,000 miles of park roads

and parkways. Under this agreement, FHWA is responsible for a majority of the design and construction, while the NPS is responsible for planning, and protection of the environment and park values (NPS 2002).

The rehabilitation of the Lassen Volcanic National Park Highway project is being funded under the FLHP. FHWA, Central Federal Lands Highway Division, is a cooperating agency on the design of the project and preparation of the Environmental Assessment.

II. ALTERNATIVES

Alternative 1: Continue Current Management (No Action)

Under this alternative, no new rehabilitation or comprehensive resurfacing would take place. This alternative would not address improvements to the condition of the road, resource impacts from the existing road, safety issues or improvements to the visitor experience. Although no comprehensive repairs to the road would occur, this alternative would continue to result in routine maintenance actions, including snow removal; spring opening; unpaved road grading, shaping and repair; paved road asphalt patching, crack sealing, and application of slurry- or chip- seal treatments; ditch clearing; culvert cleaning; vegetation maintenance; traffic control striping; and signage replacement as needed (and as summarized below). This alternative would also result in some minor reconstruction of existing road features if failure occurred. The impacts of major rehabilitation or reconstruction treatments, however, have not been included in this analysis. Because the overall condition of the road would not undergo comprehensive improvements, the portion not affected by the 2002- 2003 project (Phase I rehabilitation) would likely continue to deteriorate. Over time, this deterioration could result in increasingly uneven pavement (warping and cracking), narrowing lane width and other road conditions that would adversely affect both visitor safety and experience on the road and within the park, as well as the quality of wetland, forest and other resources along the road, including the quality of the road resource itself and its continued eligibility for the National Register of Historic Places.

Routine Road Maintenance Program

The purpose of the park road maintenance program is to provide safe vehicular access on park destination roads, campground roads, administrative roads, etc. and in public and administrative parking areas. To accomplish this, regular maintenance of the road surface, including bridges, culverts and ditches occurs as summarized below.

Winter

Mechanical removal of snow occurs regularly in the winter. Snow removal also occurs during spring opening and on other roads as needed. Snow removal can include the application of sand or other abrasives as needed to provide traction enhancement for vehicles on icy roads. Snow removal reduces hazardous winter driving conditions and ensures that some park roads are open to visitor use in winter. The main park road from the north boundary to the Manzanita Lake developed area and from the south boundary to the southwest developed area is plowed from mid- October to mid- May each year, depending on snow conditions. Spring opening usually commences on March 5 and at this time the rest of the main park road is begun to be plowed out, with some areas, such as the Lassen Peak Parking Lot left to melt out. To assist with vehicle traction in icy areas, approximately 10 cubic yards (13.08 cubic meters) of cinder sand is applied annually. Snow and ice melt chemicals are not used.

Spring

Spring road opening operations begin by April 1 to ensure availability during the peak visitor use season (June through September). For non- public roads, work is done as needed or at the end of the public road opening. Road opening activities include snow removal, clearing roads of windfall trees and debris, clearing avalanches or rock slides, cleaning culverts, and minor repairs to the road surface or shoulders or embankments.

Summer

Road maintenance activities occurring during normally dry weather include grading unpaved road surfaces, shoulder maintenance, removal of sloughed material from ditches, pavement repairs and leveling, pothole patching, crack sealing, slurry sealing, repaving, pavement marking, signage installation, etc.

Unpaved roads are graded, reshaped and smoothed as needed (without adding material or widening) to restore crown, proper shape, drainage and a smooth traveling surface. Maintenance includes pulling material from and cleaning roadside ditches and culverts and disposing of this material as needed. It also includes reshaping shoulders as necessary.

Unpaved road surface materials are often lost due to traffic, erosion during storms and other predictable and unpredictable events. As needed, repair and stabilization of unpaved roads occurs by adding crushed rock to the road surface. To accomplish this, reshaping and compacting to control ruts, potholes, washouts, and corrugation may also be done.

On paved roads, patching of small areas of asphalt paving with cold, premix asphalt concrete to correct abrupt depressions, potholes, edge failures and other potential road/parking surface hazards is undertaken to provide a smooth paved surface. Occasionally, permanent pothole patching is conducted with a premix asphalt concrete and asphalt emulsion (tack) to correct abrupt depressions, potholes, edge failures, and other potential road/parking surface hazards to provide a smooth paved surface.

Other maintenance actions include clearing road shoulder and parking ditches to enable rapid melt water and rain dispersion off the road surface. This includes the cleaning and reshaping of roadside ditches along paved and unpaved roads and parking areas as well as the removal, hauling and disposal of excess material to restore the original grade and to ensure adequate drainage. On occasion, it can include the importation of additional material. It also includes the trimming or removal of woody vegetation from roadside ditches and shoulders and the removal of overgrown herbaceous vegetation. These actions are done to eliminate or improve edge ruts, washouts, ridges, corrugation and encroaching vegetation.

When pavement failures are encountered, these areas may be repaired by removing and replacing areas of failed surfaces with premix asphalt, including a base course, if required, to provide a structurally sound surface and to eliminate safety hazards from roads and parking areas. Work may include the placement of a new asphalt surface leveling course on asphalt- paved surfaces to provide a smooth driving surface and to eliminate safety hazards. Premix asphalt concrete is then applied with either a grader or a spreader box. Slurry seal or chip seal is applied as needed and includes the placement of liquid asphalt with an aggregate or chip seal coat to seal cracks and prevent water entry and related damage to base course materials, correct minor surface depressions to seal asphalt surfaces, to restore skid resistance and to retard further surface deterioration.

Day to day maintenance may also include:

- Sweeping paved road/parking surfaces, including intersections and curb gutters to remove dirt, sand and other debris;
- Cleaning drainage structures by removing rocks, debris and silt from pipe culverts, box culverts, inlets and storm sewers to maintain adequate drainage and to prevent roadway flooding.
- Repairing pipe culverts, drop inlets, catch basins, headwalls, and manholes to provide proper drainage;
- Maintenance and repair of curbs and gutters damaged by snowplows and/or traffic to ensure proper drainage flow, including the replacement of short curb sections;
- Cutting and removing brush, trees and overhanging limbs along roads, in campgrounds and parking areas to maintain vistas and to restore sight distances, to eliminate traffic hazards and to remove encroaching vegetation;
- Picking- up and disposing of litter along roads, at overlooks and along/in parking areas for aesthetics and to remove objects that could be hazardous or could obstruct drainage or damage road maintenance equipment;
- Repairing slope failures and erosion near roads and developed areas and the removal of eroded material, including occasional reseeding, replanting or installing mechanical

erosion control measures as needed to prevent such an occurrence from happening again in the same area;
- Removing rock fall and slide material from the roadway and roadsides;
- Striping the centerline, lane, fog and edge markings on roads and the parking stalls and roadway directions for traffic safety, parking and pedestrian control;
- Cleaning road bridge decks and bearing surfaces to remove sand and other debris, including the cleaning of drain holes, joints and curbs; and
- Repairing minor bridge components such as railing and decks.

Major repairs or rehabilitation falling into these categories would undergo separate environmental analysis and are not included in the analysis of the No Action Alternative.

Alternative 2: Repave and Rehabilitate a Portion of the Lassen National Park Highway (Preferred)

Project Description: The project would begin at the end of the previous main park road rehabilitation project just north of the Bumpass Hell parking lot, and extend approximately 21.7 miles (34.9 kilometers) northward to the Manzanita Lake Campground Road. The project would include the rehabilitation of this section of the main park road and roads providing visitor access to campgrounds, picnic areas, trailheads and day use areas, including 18 specific project improvement areas noted below. Rehabilitation work would also include all pavement, curbs and associated road structures, as well as repairs to concrete box culverts at Hat Creek and Lost Creek. Lastly, the project would include obliteration of numerous gravel pullouts no longer needed for visitor use or administrative access. In addition, the following campground roads would be repaired and rehabilitated (paved): Manzanita Lake, Crags, Lost Creek and North and South Summit Lake.

Under this project, the previous phase would also be chip- sealed (from just southwest of the park entrance to just past the Bumpass Hell Parking Lot and from the junction with the Manzanita Lake Campground Road to the junction with State Route 44 at the park boundary). It would also include the Manzanita Lake Campground Access Road. Chip seal would involve placement of a thin layer of asphalt cement covered by rock chips and would result in a roughened, durable pavement surface. The entire length of the project is 30.6 miles (49.4 kilometers), including the chip seal segments.

Due to funding uncertainties, this project may be split into two phases that would be constructed two to three years apart, each phase requiring approximately 1- 1/2 summer seasons to complete.

The following activities under this project would occur and are described in more detail below: pavement rehabilitation; pullout obliteration, construction and rehabilitation; road shoulder rehabilitation; curve widening; alignment shifts, culvert cleaning, replacement and installation; and gate replacement. In addition, there would be site specific treatments at the following areas: Lake Helen Picnic Area; Lassen Peak Trailhead Parking Lot, Kings Creek Picnic Area, Kings Creek Meadow Pullout, Kings Creek Falls Trailhead, Summit Lake Campground North and South, Summit Lake Ranger Station and Trailhead Parking, Dersch Meadows, Hat Lake Parking Area, Hat Creek Box Culvert, Lost Creek Box Culvert, Lost Creek Campground, Crags Campground, Devastated Area Parking, Hot Rock Pullout, Sunflower Flat Pullout, Chaos Jumbles Pullout, Manzanita Creek Headwall, and Manzanita Lake Campground.

- **Pavement Rehabilitation**

The existing asphalt road surface along the main park road would be pulverized and compacted; a new asphalt surface would be constructed; shoulder grades would be raised with compacted aggregate to the level of the new paved surface; and pavement markings would be applied to the surface of the road. Road

signs would be replaced as appropriate. The new pavement would be similar in width to the existing pavement, with widening only in a few specific areas as identified below. In places where the road base is failing, the base and sub- grade would be excavated and replaced with suitable material. Some culverts would be replaced and other culverts would be extended. Some additional culverts would be installed to correct drainage deficiencies. All new or replaced culverts would retain the native stone headwalls characteristic to the road. Curbing and other minor features would be removed, replaced or repaired as appropriate to facilitate visitor use and to correct drainage problems.

- **Pullout and Wide Shoulder Grading Treatments**

Six different grading treatments would be employed to remove, repair or improve pullouts and shoulders along the road. These treatments are noted by type and purpose below.

Type 1 (Excavation and Berm Construction for Shoulder Benches Greater Than 2.5 m)
Approximately 0.5 miles (0.82 kilometers) would be treated with Grading Treatment Type 1, which consists of the following actions:

- Grade roadside ditch to establish or maintain drainage;
- Construct undulating (varying in width and height) berms approximately 2.3 to 3.3 feet (0.7 to 1.0 meter) high with 1:3 (vertical to horizontal) slopes;
- Scarify area to be revegetated to a minimum depth of 6 inches (150 mm);
- Use excavated material to construct berms;
- Minimize disturbance around existing trees to be retained according to instructions from project engineer; and
- Hydromulch disturbed areas to cover the extent of disturbance.

Type 2A (Placement of Barrier Stones where Drainage is Away from Road)
Approximately 0.9 miles (1.4 kilometers) would be treated with Grading Treatment Type 2A or 2B. Grading Treatment Type 2A consists of the following actions:

- Scarify area to be rehabilitated to a minimum depth of approximately 6 inches (150 mm) and hydromulch;
- Place roadway aggregate shoulder material adjacent to roadway at the edge of pavement; and
- Space barrier stones with an approximately 3 feet (900 mm) diameter 3- 4 feet (900 - 1200 mm) from edge of pavement spaced 5.5 – 7 feet (1700 – 2200 mm) apart and partially bury (approximately 1/3) in ground.

Type 2B (Placement of Barrier Stones with Ditch – Drainage toward the Road)
Grading Treatment Type 2B consists of the actions noted in Type 2A, plus:

- Grade ditch adjacent to roadway aggregate to maintain or establish drainage;
- Space barrier stones as in Grading Treatment Type 2A; and
- Scarify, seed and mulch disturbed area.

Type 3 (Excavation to Oversteepen Shoulder Benches Less Than 2.5 m)
Approximately 12.3 miles (19.83 kilometers) would be treated with Grading Treatment Type 3, which consists of the following actions:

- Scarify area to be rehabilitated to a minimum depth of approximately 6 inches (150 mm) and hydromulch;
- Place roadway aggregate shoulder material adjacent to roadway at the edge of pavement;
- Oversteepen edge of road beyond crushed aggregate to 1:3 maximum for 3 feet (1 meter) width and flatten slope to two percent to intercept existing slope. Slopes would be rounded at intercept point;
- Excavated material would be used to construct berms for Grading Treatment Types 1, 4A and 4B.

Type 4A (Construct Berm on Bench)

Approximately 1.6 miles (2.6 kilometers) would be treated with Grading Treatment Type 4A or 4B. Grading Treatment Type 4B consists of the following actions:

- Scarify existing ground prior to berm construct and hydromulch finished berm grades
- Use excavated material from Type 3 treatments to construct approximately 2- 3 feet (0.7- 1.0 meter) high berms with an undulating appearance (varying in width and height). Berms would be constructed from excavated material and be topped with topsoil;
- Place roadway aggregate shoulder material adjacent to roadway at the edge of pavement; and
- Excavate ditch at a minimum 4 feet (1.2 meters) away from the edge of pavement to maintain or establish drainage and scarify to 6 inches (150 mm).

Type 4B (Construct Undulating Backslope with Ditch and Fill against Slope)
Grading Treatment Type 4B involves back filling against an existing slope and uses the same actions noted for Grading Treatment Type 4A.

❖ **Pullout Modifications (See Appendix 2: Pullout Modifications for a list of pullouts with proposed changes)**

Consistent with the GMP, a pull- out analysis was conducted and appropriate pull- outs to be retained, added or removed along this portion of the roadway were identified. Pullouts selected to remain are needed to preserve the road's cultural history, for visitor enjoyment (as viewpoints), for visitor safety, or for road maintenance.

Of the following estimated 96 pullouts along this section of the roadway, 4 would be new, 29 would be regraded and/or repaved, and 63 would be obliterated. Most (22 of 25) paved pullouts would be retained, while, most (53 of 60) gravel pullouts would be obliterated.

The following actions would be undertaken for the pullout modifications:

- Pull- outs to be removed would be regraded and restored using native vegetation, hydromulched and seeded, or planted amongst partially buried, staggered random boulders or berms placed to deter future parking.
- Some pull- outs to be retained would be modified by reducing the pull- out width, length or shape, or their ability to accommodate interpretive waysides and most would be paved.
- Existing asphalt curbing along pullouts and the roadway would generally be removed to facilitate snow- plowing operations and to minimize the effect of these later additions to the historic roadway.
- New pullouts to accommodate visitor use and to reduce impacts to roadside resources would be added in the following areas: Lake Helen Picnic Area (southbound side); before Lassen Peak Parking Lot (southbound side); and two just past Kings Creek Meadow (one on southbound side and one on northbound side).

❖ **Road Curve Widening**

The paved surface of the road would be widened along several tight radius curves, while keeping the same alignment of the road. The disturbed areas adjacent to the inside curve widening would also be rehabilitated using the grading treatments noted above. Curves anticipated to be widened include:

- Lake Helen curve,
- Two Hairpins south of Shadow Cliffs (near stations 24000 and 24200), and
- Minor curves along the road north of Shadow Cliffs (near stations 25000, 30618, 41500, 43458).

❖ **Alignment Shifts**

A number of slight alignment shifts (approximately 21) would also occur along the road using the existing road bench, between the following stations: from 23520 – 23820, 24400 – 24720, 29000 – 29300, 31150 –

31630, 31980 – 32340, 32970 – 35210, 35500 – 36320, 37440 – 38290, 38470 – 39190, 40140 – 40760, 41900 – 42500, 43130 – 44140, 45840 – 46830, 47390 – 47680, 47900 – 48600, 49700 – 49820, 50000 – 50360, 50500 – 50770, 50940 – 51590, 53720 – 53910, and 55100 – 55450. Alignment shifts would be utilized to center the new pavement and abutting shoulders onto the existing bench areas to avoid introducing new uphill cuts or downhill fill slopes.

- **Culvert Modifications (See Appendix 3: Culvert Modifications for a list of culverts and proposed improvements)**

- Approximately 102 of 165 culverts (including 7 new ones and 14 that may not be present) would have some work done to them in the proposed project.
- Approximately 52 culvert inlets and outlets would be cleaned. Some interiors may also need cleaning.
- Another 2 culvert headwalls and 4 culverts would be removed. One culvert would be realigned with its drainage channel, while 8 would be replaced and 13 extended.
- Approximately 43 new headwalls and 29 riprap aprons would be constructed. Seven new culverts would be installed (five of these where the road passes through Dersch Meadow).
- Headwalls would be constructed to look like historic headwalls, but would be distinguished from these by their use of different (non- weathered) mortar and rocks.

- **Road Gate Replacement**

Road gates throughout the park are comprised of many different styles and several (on the following roads) would be replaced with a consistent design.

- Summit Lake North Campground,
- Summit Lake South Campground,
- Lost Creek Water Treatment Plant,
- Lost Creek Group Campground,
- Crags Campground, and
- South of Manzanita Lake on the main road.

- **Staging**

Staging areas for equipment and materials would be in previously disturbed, park- approved locations. Major staging would occur at the Lost Creek Helispot/Maintenance Area (staging area). Staging areas would be protected from spillover impacts by the placement of silt fencing or other barriers as appropriate and would be returned to pre- construction conditions upon completion of the proposed project. Only the southern portion of this area may be used, the northern portion of area (existing helipad) must be kept clear for emergency use.

Lost Creek Helispot/Maintenance Area (Primary Staging Area)
This old pumice quarry area, near Devastated Area, about 0.5 miles (0.87 kilometers) south of Hot Rock Pullout, now functions as a helispot and park Maintenance staging area. To avoid the helispot/take- off area on the north, materials would be stored lengthwise and/or toward the southern end of the site. Staging would not expand beyond the upper paved area down into the lower pumice quarry site.

- **Borrow Pits/Use of Native Materials**

Rock removed from ditch cleaning by the park is stockpiled at the Lost Creek Pit. Approximately 10,500 cubic yards of fill is required for the proposed rehabilitation. This fill would be obtained from other portions of the project area and would primarily be used in the following locations:

- Lake Helen curves and Lake Helen Picnic Area,
- Kings Creek Trailhead,

- Dersch Meadows widening, and
- Where use of Grading Treatment Type 4 is employed.

Boulders for placement in restored or minimized pullouts and road shoulders will come from outside the park, and from road rehabilitation excavation or other areas along the road corridor. Rocks, whether obtained from the park or from outside sources, will be similar in texture and color to the surroundings they are placed into.

❖ Construction Delays

Visitors to the park could encounter construction delays of up to 30 minutes Monday through Friday. To minimize impacts on the busiest days, no construction delays would occur on weekends or federal holidays. Holiday, weekend and night work could be approved through specific authorization of the park superintendent, with adequate public notification. Work that would affect major visitor use areas, such as the Kings Creek Picnic Area or the Manzanita Lake Campground Road would be scheduled late in the season to avoid the greatest potential for visitor use impacts due to area closures that would need to occur. A public information campaign would be initiated to inform visitors and local residents of construction delays and closure scheduling. Public notices would include fliers posted at local businesses, press releases and information in the park newspaper. The California Department of Transportation statewide toll- free telephone road conditions message would also be notified of the project construction delays and scheduling.

❖ Disturbed Area Rehabilitation and Restoration

As earthwork concludes, disturbed areas would be hydromulched by the contractor. Some areas would also be hand- seeded and/or planted by the park or its revegetation contractor. Topsoil and duff would be salvaged to the degree possible from the road corridor and pullouts and applied to priority areas by the contractor as available and directed by the park. Disturbed areas not receiving topsoil may be treated with soil amendments or growth stimulants as they are planted. Based on past experience with road rehabilitation and other restoration projects in the park, the most effective hydroseeding technique is to employ a two step process in the fall: 1) hydroseed, 2) hydromulch (with tackifier and paper mulch).

Approximately 6 hectares (14.8 acres) of previously disturbed area within the road prism (primarily attributed to pullout obliteration and wide bench obliteration and installation of culverts at Dersch Meadow) would be disturbed by the proposed improvements. This area also includes minor road widening at the Kings Creek culvert and some fillslope modifications.

To facilitate rehabilitation of these areas, the following actions would occur:

- The proposed road contractor would complete earthwork (such as placement of berms, boulders and scarification) according to contract documents to ensure adequate surface preparation for restoration/revegetation.
- Prior to construction, site specific and species specific seed collection would occur along the length of the project area.
- Revegetation treatments would include hydromulching (mechanical seeding), hand seeding with native perennial grasses, and spot tree and shrub planting. Revegetation would occur following road rehabilitation work proposed under this alternative.
- The revegetation strategy would rely heavily on natural regeneration from conserved topsoil. Blue wild rye, a fast establishing native grass, would provide initial erosion control. Revegetation plantings would use native species that are slower to establish naturally (e.g. red/white fir, western white pine, pinemat manzanita) and would be from genetic stocks originating in the park. The

principal goal is to assist natural regeneration in re- establishing a sustainable native plant community similar to surrounding undisturbed vegetation.
- Revegetation success would be monitored by park staff to ensure its successful implementation and in compliance with applicable permitting requirements.
- The primary revegetation areas include obliterated pullouts and wide road shoulders where various grading treatments would result in either undulating berms or the placement of staggered random boulders to deter future parking use.
- Although some revegetation would be done by park staff, the park would also contract with appropriate sources for seed propagation and restoration treatments such as duff salvage, plant propagation and planting.

❖ **Monitoring**

FHWA would work in cooperation with the NPS to provide oversight and compliance monitoring of contractor activities throughout the duration of the project. NPS staff would periodically conduct onsite monitoring construction activities or inspection of materials to ensure protection of park resources. Arrangements would be made to inspect all equipment and materials entering the project.

❖ **Site Specific Treatments**

In addition to pulverizing and repaving (hot mix asphalt concrete) the main park road generally following its current width and alignment, site specific improvements would be made to the following areas. These improvements would be made for various reasons, including: to improve accessibility, to reduce the existing resource impacts from the current road, and to improve visitor safety and the visitor experience.

Lake Helen Picnic Area

- Main Park Road: Create a left turn lane out of the current width of the road adjacent to Lake Helen. Due to the high degree of super- elevation on the main road at this intersection, visibility into the parking area from the road is extremely limited, making left turns from the northbound lane difficult. Adjusting the super- elevation of the main road and adding the turn lane into Lake Helen would reduce the blind turn and sight distance problems, and allow left- turning vehicles to wait for oncoming vehicles to clear without blocking through traffic. Visibility for vehicles making turns out of the parking lot back onto the main road would also be improved. This alignment change can be accomplished within the existing road bench.
- Redesign the entrance to the Lake Helen Picnic Area. Existing asphalt pavement would be pulverized and a new asphalt surface placed on top.
- Pave the parking area to eliminate the existing gravel parking, which generates dust during dry conditions and contributes sediment to Lake Helen. Restore areas nearest the lake to natural conditions [the large denuded area and social trails would be scarified (loosened) and hydromulched by the contractor and restored by the park].
- Two clumps of trees, one with approximately 12 small mountain hemlocks (2- 5 inches or 51- 127 mm in diameter) and the other with approximately 8 small mountain hemlocks (2- 6 inches or 51- 152 mm in diameter) as well as a number of seedling trees and shrubs would be removed to accommodate turning radius needed for one- way parking loop.
- The large pullout on the same side of the road as the Lake Helen parking lot would be repaved and used for oversize vehicle parking. A new wayside exhibit would also be installed along the edge of this oversize vehicle parking to provide better information about this alpine lake.
- Construct concrete walk from accessible parking to existing vault toilet.
- Delineate parking by constructing 12 to 16 parking spaces, including accessible spaces, close to picnic tables, the existing vault toilet and lake access.

Lassen Peak Trailhead

At the Lassen Peak Trailhead, there would be three improvements made: 1) installing increased capacity

drainage structures to correct flooding and ditch scouring along the main park road during spring snowmelt; 2) installing a drystack rock wall at the foot of the slope bordering the northern edge of the parking lot to prevent slope raveling and to assist in discouraging pedestrian use of the slope area which results in this denuded area of loose rock; and 3) resurfacing the parking lot with a chip seal to seal cracks and prevent water entry and related damage to base course materials, and to retard further surface deterioration. The parking lot would be then be restriped to match the existing striping pattern.

- Lassen Peak Parking Area Culvert

Beginning around Memorial Day, park crews plow out the parking lot to approximately four feet deep. At that time, the partially plowed parking area is surrounded by approximately 18- foot walls of snow and then is allowed to melt out. During melt- out the snow becomes super- saturated with water. Upon further melt, it breaches on the lower end and water rushes out across the main park road (bypassing the undersized and poorly located culvert) and coursing down the road into Lake Helen, causing road bank erosion and contributing a high degree of sediment to the lake. As a result, under the proposed project the following actions would occur:

- Install a drainage structure (a large aluminum arch pipe culvert) under the main park road, near the lower (downslope) end of the Lassen Peak Parking Area. Water would then be redirected via a swale to this new aluminum arch pipe culvert and under the road.
- Recontour, grade and pave drainage swale from lower end of parking area to further redirect water into the proposed culvert and under the road.
- Construct a Trench drain near the south entrance of the parking area that outlets into the drainage swale and riprap the downslope area to redirect water flow to the settling basin. Flow of water into the settling basin across the road will allow the flow of water to slow down and to drop its sediment load. The proposed settling basin is a rock- surrounded depression left over from the construction of the Lassen Peak parking area and the re- routing of the main road adjacent to the parking lot (c. 1960).
- Place riprap at the culvert outlet to protect the slope from erosion as water settles into the catch basin.

These actions will help to capture the rush of water that currently occurs. With the slower transport, silt and heavier sediments will settle out as the water ponds, before being slowly released through groundwater transport toward Lake Helen. Installation of the arch pipe will provide an increase in capacity compared to the existing metal pipe culvert (24 inches or 610 mm). In addition to cost and ease of construction, the arch pipe (with stone veneer headwalls and wing walls) would provide an opening shape similar to other locations such as the Kings Creek crossing and the Manzanita Creek culvert.

- Lassen Peak Parking Area Rockery Wall

The purpose of the rockery wall is to decrease the slope raveling into the Lassen Peak Parking Area and to stem the proliferation of social trails onto this sparsely vegetated rocky slope above the parking lot:

- Construct drystack rockery wall (2.5 to 2.8 feet tall and 345 feet or 105 meters long) at toe of upper end slope to retain slope. The wall would be set back approximately 6 feet (1.8 meters) from a new curb along the northeast edge of the parking lot. (Pedestrians would continue to walk alongside in the paved parking lot. The six foot buffer located between the curb and rockery wall will prevent snowplows from striking the wall and allow for snow storage.)
- Replace existing curb, gutter and sidewalk with colored concrete curb, gutter and sidewalk. New curb and gutter would also be installed along portions of the parking lot entrances for storm water and vehicle control.

The drystack (without grout) rockery wall would be primarily composed of 2 to 3 courses of rock. The bottom layer of rocks is proposed to have a diameter of between 1.5 feet (450 mm) and 2.0 feet (610 mm). The top course(s) would be comprised of rocks ranging in size from 12- 18 inches (300- 450 mm). The height of the wall will vary from 1.6 – 2.0 feet (500- 610 mm). Due to the size and quantity of rocks needed

to construct the wall, rocks would be obtained from field and/or quarried stone outside the park and would be of materials similar in texture and color to those found at this location.

The 1:3 slope behind the wall would initially provide a bench that later would fill- in with slough rock from the slope above and the wall would fulfill its dual purpose of retaining the slope and preventing visitor use of this sensitive area adjacent to the Lassen Peak Trailhead.

Item	Approximate Quantity
Excavation	103 cubic yards (79 cubic meters)
Backfill Material	74 cubic yards (57 cubic meters)
Rockery Wall	115 square yards (96 square meters)

- Lassen Peak Parking Area Rehabilitation
  - Chip seal parking area, and
  - Restripe the parking lot.

The proposed layout for striping the parking lot would provide 132 regular parking stalls, 4 accessible parking stalls and 11 oversize spaces. Circulation through the lot would primarily be two- way (23- 29 feet or 7.2- 9 meters wide). Regular parking stalls would be 9.8 feet (3.0 meters) x 19.6 feet (6.0 meters), with oversize spaces large enough for buses at 16.5 feet (5.0 meters) x 54 feet (16.5 meters). The striping would result in improved vehicle circulation and accessible parking areas.

Kings Creek Picnic Area

- Culvert Replacement and Roadway Widening Along the Alignment
- Remove and replace the 24 and 36 inch (610 and 900 mm) culverts with bottomless structural plate box culvert that is 8.75 feet x 2.5 feet (2.67 meters x 0.76 meter).
- Construct stone veneer headwalls and wing walls similar to historic culverts.
- Rehabilitate and widen the road (approximately 3- 4 feet or 1.1- 1.45 meters) at the culvert to provide a minimum 16 foot or 5.0 meter width).

Because road closure is required to replace the culverts, the culverts would be replaced in fall during low flows to both minimize impacts to water quality and park visitors. Depending on water flow, water would likely first be redirected (through sandbagging) into one of the existing culverts and then into the other after replacement of the first culvert. To complete the work a small coffer dam would likely be constructed and silt fencing installed to minimize transport of sediment during construction and to comply with water quality certification and other applicable permit conditions. Willows near the inlet would be salvaged and stored on an upstream sandbar to allow their availability for transplanting following construction.

- Picnic Area Parking and Circulation Improvements
- Formalize the parking lot by paving primarily within the existing disturbed footprint. Remove the lodgepole pine at chokepoint.
- Pave gravel road and turnaround, leaving island. Two small trees near the corner of the turnaround would be removed to improve the turning radius for oversized vehicles.
- Shift accessible parking in front of vault toilet and construct a sidewalk to the existing vault toilet.
- Construct 3 accessible and 31 regular parking spaces as part of the picnic area access and turnaround improvements.

Later improvements would occur, as called for in the GMP, to improve picnicking facilities. Actions could include modifying picnic table locations, adding group sites, and constructing access trails as appropriate.

Kings Creek Meadow Pullout

Impacts are occurring at the Kings Creek Meadow Pullout due to dispersed vehicle parking and the pullout encroaching on the meadow. Modifications would be made to the Kings Creek Meadow area to reduce these impacts and to improve visitor access from the opposite side of the road.

- Reduce the size of the main pullout and repave it. Install barrier rocks to prevent vehicles from driving onto the meadow.
- Add a new pullout across the road from the meadow to improve access for vehicles traveling the opposite direction by utilizing disturbed gravel area there.
- Rehabilitate portion of reduced pullout above and nearby pullout adjacent to the creek and meadow to restore wetland functions.

Kings Creek Falls Trailhead

This heavily visited area is in need of rehabilitation to provide for visitor safety and to prevent resource impacts caused by visitor confusion over the location of the trailhead that continues to occur. The following actions are proposed:

- Realign the road from the Kings Creek Box Culvert to the Kings Creek Trailhead area slightly by moving the center line about one foot north (thereby slightly reducing the size of the paved pullout parking across the road).
- Rehabilitate paved parallel parking pullouts across from the Trailhead (reducing current parking widths to accommodate the alignment change).
- Redesign and extend the pullout on the south side eastward to expand parking capacity.
- Redesign the Kings Creek Trailhead and its approaches to make it more obvious and to reduce trail- cutting along the slope by constructing a curb and raised sidewalk up to the large red fir (37 inches or 950 mm) (to be retained). Connect the parking to an asphalt walkway that continues to the end of the new parking area (the asphalt walkway will be delineated by a white stripe between the edge of the new parking and the at- grade walkway).
- Construct an interpretive area above the trail to formally designate the trailhead. Stone veneer masonry walls would be used to support the walkway and trailhead improvements.
- Construct a stone stairway from the trailhead down to meet the existing trail. This will stabilize the sidehill trail and discourage social trailing.
- Capture and disperse road surface water flow underneath the stone veneer retaining wall and trail by installing a catch basin and culvert outlet.

Summit Lake North and South Campgrounds

- Repave/rehabilitate existing campground loop roads and campsite parking pads.

Summit Lake North Campground contains two one- way loops with 0.36 miles (0.58 kilometers) of roads varying in width from 10 to 15 feet (3- 4.6 meters). Summit Lake South has three one- way loop roads with 0.49 miles (0.79 kilometers) of roads that vary in width from 12 to 15 feet (3.6- 4.6 meters). Both campgrounds contain a short segment of two- way road connecting the day use areas and the loop roads (approximately 0.2 miles or 0.32 kilometers total).

Under the proposed project which would occur either before or after the rehabilitation of the main park road, existing asphalt would be pulverized, bladed smooth, and then compacted. Afterwards, a 2.5 inch (63.5 mm) mat of hot mix asphalt concrete would be applied. This asphalt would cover the current footprint of paved roads and parking spaces in the campground (although some parking spaces are now deteriorated, at one time all were paved). Road and parking shoulders would then be dressed with

aggregate base course material from a park- approved source. There would be no substantive changes in sites or parking.

Summit Lake South Campground
Rehabilitation of this area would include the following minor actions.

- Rehabilitate the access road (19.7 feet or 6 meters) and day use parking area at existing widths up to the campground registration station. Saw cut tree roots at edge of pavement prior to pulverizing it to reduce the damage to existing trees and remove existing 40 inch (1 meter) stump.
- Remove and replace the asphalt walkway near the registration kiosk.
- Construct an administrative parking space next to the kiosk. Barrier stones would be placed at the edge of the pavement to show the parking limits. An existing 14 inch (350 mm) culvert would be removed and replaced, including installing stone masonry headwalls and a riprap apron at its outlet.
- Repave/rehabilitate existing campground loop roads and campsite parking pads.

Summit Lake North Campground
Like the Summit Lake South Campground, minor actions to improve the roadway (prior to entering the campground) would occur.

- Rehabilitate the entrance road to provide a minimum 19.7 foot (6 meters) width.
- Obliterate and restore the gravel area on the north side of the intersection with the main park road (Type 3 grading treatment).
- Pave around the narrow tree island, retaining trees. Extend the paving from the tree island to the existing parking blocks to improve vehicle circulation.
- Remove and replace the existing 12 inch (300 mm) culvert at the entrance. The new culvert would have stone masonry headwalls and a riprap apron at the outlet.
- Repave/rehabilitate existing campground loop roads and campsite parking pads.

Summit Lake Ranger Station and Trailhead Parking
Modifications to the Summit Lake Ranger Station and Trailhead Parking Area would be made to reduce sedimentation and to improve wetland resources and visitor access by providing designated parking and a vehicle turnaround.

- Rehabilitate the road generally at existing width, widening slightly where less than 15.7 feet (4.8 meters) and remove the small lodgepole pines along the road berm where it traverses the wetland.
- Pave and stripe the unpaved trailhead parking lot within the existing disturbed footprint. Paving would extend only up to the drip line of trees surrounding parking area. Paving will include removal of two trees in the center of the lot [28 inch (0.7 meter) and 32 inch (0.8 meter)] and one on the north edge of pavement [22 inch (0.55 meter)] as well as an approximately 50 inch (1,270 mm) red fir stump on the edge of the parking lot.
- Replace 18 inch (450 mm) culvert (shorten culvert to end at apron) in wetland area and apply stone facing to metal apron headwalls.

Dersch Meadows
The main park road along Dersch Meadow acts like a raised dike through the meadow preventing the natural flow of surface and subsurface water from one side to the other. Only one culvert crossing consisting of two 30 inch (750 mm) pipes allows for continuous flow of the creek running adjacent to the road. In addition, the roadway width (20.3 feet or 6.2 meters) is less than the typical width of the main park road (22 feet or 6.7 meters), causing cars to pass very closely to one another. To address these problems the following actions would be taken:

- Install five 18 inch (450 mm) culverts to allow continuous conveyance of water under the main park road. These culverts would generally be placed in natural depressions where water is ponding on the south side of the road. The south side of the road has flowing water along much of its length through the meadow.

- Extend the existing northwest 30 inch (750 mm) culvert 6.5 feet (2 meters) downstream and add a stone masonry headwall (parallel to the main park road) connecting the two large culverts.
- Reconstruct road for approximately 540 feet (165 meters) from 10- foot (3 meters) travel lanes with no shoulder to 10- foot (3 meter) travel lanes with one- foot (300 mm) shoulders (to maintain a width consistent with the rest of the road). A number of small lodgepole pines (est. 0.5 – 5 inches or 13- 127 mm) that have become established in the unnatural higher ground of the road shoulder would be removed.
- Construct a steepened rock fill along the fillslopes on the north side of the road to retain the roadway and to minimize further encroachment into the north side wetlands.
- Disturbance along the south side of the road would primarily be confined to the inlet grading at proposed culvert locations. Approximately 0.044 acres of wetlands would be affected by the placement of the culverts and the construction of the fill slope to retain the road and the culvert headwalls.

Hat Lake Parking Area

The Hat Lake Trailhead and interpretive wayside parking area would undergo the following minor improvements.

- Pulverize the asphalt parking area and place new asphalt with concrete curbs, and an accessible path to the trail across the road (leading to Hat Lake).
- Replace asphalt curb with a colored concrete curb around the parking lot and island.
- Formalize path through island by providing a walkway of asphalt to accommodate pedestrians crossing the island and main park road to reach the trail across the road.
- Add curb cuts on either side of the walkway to match pavement grades.

Hat Creek and Lost Creek Box Culverts

Concrete deterioration (spalling and cracking) within and on (headwalls) of the Hat Creek Box Culvert and within the Lost Creek Box Culvert would be repaired.

The following measures would be used to repair both culverts:

- To minimize dust, sediment or other materials from the concrete removal from entering the waters below the culverts, contractors would employ a mechanism to catch falling debris (Hat Creek and Lost Creek).
- Work would occur in the dry season to minimize sedimentation of the creek. There would be no access roads or pathways constructed (Hat Creek and Lost Creek).
- Work would be implemented from the surface of the box culvert (Hat Creek) to repair concrete deterioration on headwalls. Needed hand equipment would be lowered from the road for this work.
- Interior work on both culverts would employ hand tools and small hand- carried power tools to prevent the need for reopening long- abandoned access routes down the slope.
- Deteriorated (spalling and soft) concrete would be mechanically removed using small power-driven hand tools (small jackhammers – less than 30 lbs., chipping hammers – 15 lbs. or less).
- Hand tools (hammers and chisels) would be used for removal of the final particles of concrete or to achieve the required finish removal.
- All reinforcing steel to remain in place would be cleaned of rust and corrosive products, including oil, dirt, concrete fragments, and other coatings that would destroy or inhibit the bond with new concrete.
- Any damaged reinforcing steel would be repaired or replaced.

Erosion adjacent to the north wing wall of the Hat Creek Culvert also would be repaired as described below:

- Excavate material adjacent to box culvert north wing wall and replace with riprap to retain the slope.

- Grade the area to redirect water flow away from, instead of into culvert wing wall. Small trees encroaching on the wing wall would also be removed.
- Employ resource protection measures to prevent contamination of the creek and to ensure larger trees not affecting the culvert wing walls are retained.

At Lost Creek, the degree of concrete deterioration within the culvert may require diversion of water from one side of the double box to the other. Work is anticipated to extend to the bottom of the interior walls, which would need to be worked on in dry conditions.

The following resource protection measures would pertain to the culvert rehabilitation projects:

- Finish work would retain the character of the historic rock facing (Hat Creek) to the degree possible (including numbering and photographing rock used in facing as necessary and reusing it in the same locations in reconstruction).
- Erosion control and tree protection measures would be used to prevent damage to trees to be retained and raveling of material downslope during wing wall riprap installation (Hat Creek).

Lost Creek/Crags Campgrounds

- Repave/rehabilitate existing campground loop roads and campsite parking pads.

The Crags and Lost Creek Campgrounds project is similar to the Manzanita Lake Campground paving described below. Repaving would be limited to the current footprint or original as built drawings. Approximately 0.32 miles (0.51 kilometers) would be paved in Crags campground and 0.30 miles (0.48 kilometers) of road in Lost Creek Campground. Lane width varies from 10 to 15 feet (3- 4.6 meters). Both campgrounds have a short section of two way road with a width of 19 feet (5.8 meters). The remainder of the campground roads are a circular one- way road with parallel, pull through and perpendicular parking.

Under the proposed project which would occur either before or after the rehabilitation of the main park road, existing asphalt would be pulverized, bladed smooth, and then compacted. Afterwards, a 2.5 inch (63.5 mm) mat of hot mix asphalt concrete would be applied. This asphalt would cover the current footprint of paved roads and parking spaces in the campground (although some parking spaces are now deteriorated, at one time all were paved). Road and parking shoulders would then be dressed with aggregate base course material from a park- approved source. There would be no substantive changes in sites or parking.

Devastated Area

The Devastated Area parking lot would be rehabilitated and improvements would be made to improve restroom accessibility.

- Rehabilitate the parking lot pavement by pulverizing and overlaying.
- Realign the existing walkway to the restrooms to meet Americans with Disabilities Act (ADA) standards by constructing a new, slightly wider (6 feet or 1.8 meters) asphalt sidewalk to create an accessible path to the existing restroom (replace asphalt with asphalt). Maintain an accessible grade of 1:20 or less on the proposed sidewalk.
- Retain existing stone curbing and reset stone curbing where needed (hand remove asphalt back from stone curb to preserve curb).
- Construct a 6 foot (1.83 meter) wide opening between the existing curb stones to access the vault toilet sidewalk. (Some stone will need to be removed to facilitate this opening.)
- Saw cut tree roots at proposed edge of pavement to avoid tree removal.

Two different options were considered for both the sidewalk length (minimum or entire) and its construction material (asphalt or colored concrete), the one selected was to construct an asphalt sidewalk the entire length to the vault toilet. This option provided the lowest cost and would best meet accessibility standards. (See *Alternatives Considered But Rejected* for more information.)

Hot Rock Pullout
The Hot Rock Pullout would be rehabilitated to allow for new interpretive signing and to make it accessible. Rehabilitating the pullout includes cutting and removing tree roots which are damaging the existing pavement, installing root barriers, and replacing asphalt curbs with concrete curbs as follows:

- Create space for an accessible wayside.
- Remove and replace asphalt curb with a colored concrete curb. Place boulders at the beginning and end of the pullout to deter vehicles from pulling off the pavement.
- Regrade pullout and remove tree roots to decrease buckling of pavement.
- Decrease the size of the existing pullout by delineating it through new curbing.

Sunflower Flat Pullout
The gravel Sunflower Flat Pullout has expanded over the years and would be reduced and paved as follows:

- Decrease the existing pullout area. Pulverize existing pullout surface and pave the proposed footprint (to accommodate five vehicles).
- Scarify area to be revegetated and place partially buried boulders at the pavement limits to prevent parking beyond newly paved pullout.

Chaos Jumbles Pullout
Similar to Sunflower Flat and Hot Rock, this gravel pullout would paved and would have an accessible interpretive exhibit created as follows:

- Create an accessible interpretive exhibit by regrading area (retaining shrubs near current exhibit).
- Parking area would accommodate five vehicles.
- Pave the existing footprint.

Manzanita Creek Culvert
This creek flooded in 1997 and the road to Manzanita Lake Campground washed out. Emergency funding was sought to repair the road and replace the culvert. Funding allowed for a steel plate culvert to be inserted, but did not allow for rock facing of the culvert headwalls or wingwalls. As a result, under the proposed project, the headwalls and wingwalls would be faced with stone. Installation of the stone faced headwalls would occur at the close of the primary visitor use season in late fall.

Manzanita Lake Campground

- Repave/rehabilitate existing campground loop roads and campsite parking pads.

This project would involve paving all four campground loops and the main service road from the terminus of the Manzanita Lake Camper Service Store Parking Lot to the entrance of loop D. According to the FHWA inventory, this paving would encompass approximately two lane miles of existing asphalt road with a varying lane width of between 11 and 16 feet. The camp ground loop roads are one way and have irregular width.

Under the proposed project which would occur either before or after the rehabilitation of the main park road, existing asphalt would be pulverized, bladed smooth, and then compacted. Afterwards, a 2.5 inch (63.5 mm) mat of hot mix asphalt concrete would be applied. This asphalt would cover the current footprint of paved roads and parking spaces in the campground (although some parking spaces are now deteriorated, at one time all were paved). Road and parking shoulders would then be dressed with aggregate base course material from a park- approved source. There would be no substantive changes in sites or parking.

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 2, the 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 road 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:

- Minimizing loss of natural and cultural resources
- Protecting public health, safety, and welfare
- Improving operations efficiency and sustainability, and
- Protecting employee safety and welfare.

Because Alternative 1, the No Action Alternative, could result in adverse effects on the eligibility of the Lassen Volcanic National Park Highway for the National Register of Historic Places; because this alternative would also continue to result in adverse impacts to wetlands in the vicinity of Dersch Meadows; because this alternative could continue to result in adverse impacts to visitor safety; and because this alternative would likely result in a greater potential for road failure, it would not best meet the criteria noted above.

Alternatives Considered But Rejected

Pavement Only Repair and Rehabilitation

Under this alternative, none of the visitor use areas addressed in the site specific improvements section would be modified. This alternative was rejected because modification of many of these sites will improve not only the visitor experience, but also resource protection, including enhanced preservation of historic structures, rehabilitation of wetland impacts, reduction in dust and sediment entering waterways, etc. This alternative was also rejected because comprehensive improvement to the roadway would result in repairs that will ensure that the Lassen Volcanic National Park Highway and other park resources are

preserved. This alternative would not provide widening of substandard roadway widths, control of snow melt at the Lassen Peak Parking Lot or replacement of damaged culverts.

Other Surfacing Treatments for Devastated Area Walkways
Four different options were considered (including developing cost estimates) for the Devastated Area Walkway to the vault toilet. These included constructing A) an asphalt sidewalk the minimum length to the toilet; B) constructing an asphalt sidewalk the entire length to the vault toilet, and constructing a colored concrete sidewalk the minimum (C) or entire (D) length. Option B was selected because it would have the lowest cost and would best meet accessibility standards.

Option	Description	Estimated Cost
A	Construct asphalt sidewalk the minimum length (56 feet or 7 meters)	**$700**
B	Construct asphalt sidewalk the entire length (157 feet or 48 meters) to vault toilet	**$2,000**
C	Construct colored concrete sidewalk the minimum length (56 feet or17meters)	**$3,000**
D	Construct colored concrete sidewalk the entire length (157 feet or 48 meters) to vault toilet	**$8,000**

Lassen Peak Parking Area Culvert Type and Length
Also considered for the culvert replacement at the lower end of the Lassen Peak Parking Area was a concrete box culvert, but an aluminum arch culvert was found to have lower cost, easier constructability and similar headwall aesthetics given the proposed location. In addition, extending the box inlet further up the channel was considered but rejected due to increased maintenance difficulty and the cost of a longer structure.

Other options for restoring cross-road wetland flow in Dersch Meadows
FHWA was asked to come up with solutions to restore wetland water flow that would minimize the amount of disturbance through this area. The following options were considered but rejected during the design process due to their greater (unacceptable) impacts on the wetland as noted in brackets:

- Construct small walls to increase top bench width [Road clear zone would not be maintained];
- Reconstruct roadway embankment with a permeable wrapped rock fill to allow cross drainage [New culverts would still be needed in case rock fill blanket clogs];
- Construct reinforced fill with geotextile using steepened side slopes to maintain existing toe of slope [Area would have wetlands impacts that would be difficult to revegetate];
- Replace the existing crossing with a larger concrete box crossing [Would result in visually intrusive and larger wetlands impacts]; and
- Installing 2.0 foot (600 mm) diameter round pipe culverts [Would have required raising the road grade 12- 18 inches (300- 450 mm) and caused more wetlands impacts.]

Kings Creek Meadow Pullout
Similar to Sunflower Flats and Chaos Jumbles (below), the park and FHWA looked at options for "head-in" parking but found that it could cause increased wetlands impacts and would have made it difficult for visitors to back out onto the main highway due to limited sight distance. Specifically considered alternatives included head in parking with a 12 foot (3.6 meter) backing aisle and raised pedestrian boardwalk (rejected due to wetlands impacts and safety concerns with backing into main park road traffic), and head in parking with a 20 foot (6.0 meter) backing aisle and raised pedestrian boardwalk (rejected due to much greater wetlands impacts).

Kings Creek Trailhead
Other alternatives considered at this location included a mortared stone masonry wall on a concrete

footer (rejected due to incompatibility with stone masonry veneer elsewhere in the park); a wall location further downslope (with far greater impacts on vegetation); a plaza area at grade with two stairways (rejected due to safety problems with pedestrians in the plaza area); and not including a walkway to convey pedestrians from distant parking to the plaza area (added to enhance recognition of trailhead and to increase visitor safety).

Sunflower Flats and Chaos Jumbles

The park and FHWA looked at options for "head- in" parking similar to the current configuration for the Brokeoff Mountain Trailhead parking lot but found that these would be too large and expensive for current and future anticipated visitor needs.

III. IMPACT TOPICS

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 (no comments received on March 2004 public scoping press release), NPS, and other agencies, and to address federal laws, regulations and orders, and NPS policy. A brief rationale for the selection or non- selection of each impact topic is given below.

IMPACT TOPICS ANALYZED IN THIS DOCUMENT. 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; and park operations.

Soils: *Management Policies* (NPS 2001A) require the NPS to understand and preserve and to prevent, to the extent possible the unnatural erosion, physical removal, or contamination of the soil. The Preferred Alternative involves ground- disturbing activities with the potential for erosion or sedimentation impacts to occur. Therefore, soils are addressed as an impact topic.

Water Resources, including Wetlands and 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. NPS *Management Policies* provide direction for the preservation, use, and quality of water in national parks.

The preferred alternative would take place in and/or near surface waters, namely Manzanita, Hat, Kings, and Lost Creeks. 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.

> **Water Quality**: Section 401 of the *Clean Water Act* as well as NPS policy requires analysis of impacts on water quality.
>
> **Wetlands**: Executive Order 11990 requires that impacts to wetlands be addressed.
>
> **Water Quantity:** The increased/decreased use of water to provide for public use may also have an impact on park resources, such as amphibians. Withdrawal of water from Kings Creek and Manzanita Lake, as well as from the park's domestic water supply is proposed.

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.

Most of the road corridor traverses a volcanic landscape nearly devoid of vegetation. Even so, areas unaffected or affected long ago by volcanic activity have recovered to the point that the project area encompasses some old growth forest and a variety of other vegetation communities. The Preferred Alternative will remove vegetation including trees.

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 may 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 occur 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 necessary.

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*, p. 181).

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 1995 *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* (2001). 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). Requirements for proper management of museum objects are defined in 36 CFR 79.

Visitor Experience: Dependent on the selected alternative, a variety of impacts to visitor use may occur. Based on *Management Policies* (2001), impacts to visitors are considered with respect to park undertakings.

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

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 effects that are localized effects that would not be 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.

Although the preferred alternative would require use of heavy equipment during certain activities, emissions and dust associated with these activities would be rapidly dissipated by air movement. Effects would be short- term and negligible in a local and regional context.

Water Resources:

> **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 proposed project is primarily located along steep, mountainous roads. The requirements of this executive order do not apply to the proposed action. No new facilities are proposed within floodplains.

Geologic/Geothermal 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 geothermal areas. These present an ongoing hazard to visitors and staff. *Management Policies* (2001) calls for analysis of geological hazards should they be relevant. Although there are a large number of thermal volcanic features traversed by the main park road, these are outside of the proposed project area. In addition, while geologic hazards could occur at any time, the proposed project would not influence their occurrence or affect them in any way.

Prime and Unique Farmlands: Even though soil surveys have not been conducted in Lassen Volcanic National Park, 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.

Scenic Values: Management Policies and the NPS Organic Act identify the need to protect the scenic values of parks. The main park road and other elements of this project are now in place and have been for decades. Although the roads themselves do interrupt the scenic values of the park, they also provide access to them. The proposed action does not relocate or expand the roads while it does maintain a leisurely, park- like setting for the road. During construction there would be effects due to the presence of construction equipment but these effects would be short- term and would occur within an existing developed road corridor, and therefore negligible.

Collections: Management Policies 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 the *Environmental Consequences* section).

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. 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.

Although some construction work on the road would occur near the wilderness boundary and near some trailheads, proposed and designated wilderness would be avoided during construction activities. There would be no long- term adverse consequences to proposed federally designated wilderness lands or potential wilderness values or solitude should the proposal be selected. Therefore, this impact topic has been dismissed from further analysis.

Socioeconomics: Socioeconomic impact analysis is required, as appropriate, under NEPA and NPS Management Policies 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. Measures to minimize traffic disruptions during construction would be implemented (e.g., no construction on weekends or federal holidays, no more than 30 minute traffic delays, dissemination of information to the public concerning construction delays and closure scheduling). Therefore, construction is not expected to discourage or reduce visitation and adverse impacts on tourist- related businesses is expected to be negligible.

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.

IV. AFFECTED ENVIRONMENT

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

B. 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 to 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 also altered by early ranchers to more evenly distribute water in the meadow for livestock grazing. Dream Lake Dam was also built in Warner Valley in the 1930's as part of the Drakesbad Guest Ranch prior to park ownership in the late 1950's.

Of the drainages noted above, only the Hat Creek, Lost Creek, Kings Creek, and Manzanita Creek drainages are within the proposed project area. Lake Helen, Summit Lake, Hat Lake, Manzanita Lake and Reflection Lake are also adjacent to proposed project areas (see also more detailed discussion below in *Wetlands*).

1. 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 Devil's Kitchen.

Surface water from a total of six sources (Butte Lake, Manzanita Creek, Lost Creek, East Fork Hat Creek, Forest Creek, and Martin Creek) and two springs (Drakesbad Springs and Warner Valley Springs) is treated to provide drinking water for park visitors and staff. Drinking water is monitored daily to 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. A level I water quality inventory will be completed for the park by the US Geological Survey in 2005.

2. Wetlands

Wetlands are a critical resource in the park supporting a high diversity of species. National Wetlands Inventory (NWI) maps were produced in ~~the~~ 1989 for the park and surrounding National Forest 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/alder zones total over 2,000 acres in the park. Of this acreage, several wet meadow wetland complexes are significant in size, including Drakesbad Meadow, Kings Creek Meadow and Dersch Meadows. Drakesbad Meadow in Warner Valley was identified as a fen in 2000 because it has organic soils more than 40 cm thick. At approximately 35 acres, this spring- fed complex is the largest wetland in the Park. Fens occur throughout the Rocky Mountains but there are very few reports of peat lands occurring in the Cascades (California, Oregon and Washington) or the Sierra Nevada (California). There are hundreds of smaller wetlands throughout the park; many are associated with lakes and ponds and can be found throughout the park's wilderness.

The following wetlands are located in or near the proposed project area:

- Dersch Meadow,
- Kings Creek Meadow,
- Summit Lake Meadow,
- Kings Creek,
- Lost Creek, and
- Hat Creek.

Of these areas, the three 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 the three creeks are considered upper perennial riverine wetlands (Johnson personal communication 2005).

Palustrine wetlands include all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and some saltwater wetlands. Palustrine wetlands include those areas called marshes, bogs, fens and prairies as well as shallow permanent or intermittent ponds. Palustrine wetlands are further classified as forested, emergent wetland persistent, and scrub- shrub wetlands (Cowardin *et al.* 1979).

Dersch Meadow (a scrub- shrub palustrine emergent wetland) contains an overstory of alder and willow, and an understory of grasses, sedges and rushes. Scrub- shrub wetlands generally contain an overstory of trees (approximately 20%) and an understory of shrubs (60%) with the trees usually less than 20 feet tall (Cowardin *et al.* 1979).

Summit Lake and Kings Creek meadows are classic sedge- dominated wet meadows, with Kings Creek shown as an example of this type of wetland in the USFWS guide to *Wetlands and Deepwater Habitats of the United States* (Cowardin *et al.* 1979) (Plate 66).

Riverine wetlands include all wetlands and deepwater habitats contained within a channel, except for wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens and those near salt water. Water is usually, but not always flowing in the channel and these wetlands may also be surrounded on their floodplain by other kinds of palustrine wetlands (Cowardin *et al.* 1979).

Lost, Hat and Kings Creek are upper perennial streams with seasonally flooded margins including small pockets of wetlands and scrub- shrub wetlands on the boundary of their riverine and upland habitats.

Wetland boundaries for Dersch and Kings Creek meadows were ground- truthed in summer 2002, using Global Positioning System (GPS) devices. These boundaries have, in turn, been analyzed with respect to the proposed road rehabilitation occurring in their vicinity. Wetland boundaries have also been delineated for the Summit Lake Ranger Station, Hat Creek, Lost Creek and other areas affected by the proposed project.

3. Water Quantity

Two water treatment plants at the developed areas at the southwest entrance station (Forest Creek) and at Manzanita Lake (Manzanita Creek) provide domestic water supply of approximately 30,000 gallons per day and 62,000 gallons per day, respectively. Other creeks which provide water for park uses include: Lost Creek, East Fork of Hat Creek and Martin Creek. Of these, the park's domestic water supply at both Manzanita Lake and the southwest water treatment facilities, and water from Kings Creek and Manzanita Lake are proposed for use under the current project in Alternative 2.

C. Vegetation

Lassen Volcanic National Park covers approximately 166.2 square miles (106,372 acres) of the southernmost peaks of the Cascade Mountain range just north of the Sierra Nevada. Elevations in the park vary from 5300 feet (1,616 meters) at Warner Valley to 10,247 feet (3187 meters) atop Lassen Peak. Because the park is located near the junction of two mountain ranges and comes close to the Great Basin Province as well, plant diversity is great and the park contains overlapping ranges of species common to each of these unique areas. According to the GMP, the diversity of geologic formations and chemical and textural compositions of lava have also resulted in a wide diversity of plants in these communities and many anomalies to the altitudinal life zones.

Most of the park below 7,900 feet (2,400 meters) is forested, with the distribution of conifers affected by elevation (Parker 1991). Red fir *(Abies magnifica)* and lodgepole pine *(Pinus contorta var. murrayana)* dominate upper elevations (6,900- 7,900 feet or 2,100- 2,400 meters), whereas white fir (*Abies concolor)* and Jeffrey pine (*Pinus jeffreyi)* are most abundant at lower elevations (<6,900 feet or 2,100 meters). Limited stands of mountain hemlock *(Tsuga mertensiana)* occur at treeline generally above 7,900 feet or 2,400 meters.

Although most of the park is forested, a great percentage is also rocky, exposed and relatively devoid of vegetation. The volcanic eruptions of Lassen Peak destroyed over three square miles of forests. With reforestation now occurring through succession, herbs, shrubs and now trees are growing. The first trees to survive are lodgepole pines, which then give way to other pines and firs.

Four major plant communities are found within the park, including yellow pine forest, red fir forest (including the intermediate lodgepole pine forest), subalpine forest and alpine fellfields. Minor plant communities include montane chaparral or brush lands and herbaceous wet meadows as well as localized riparian areas (dominated by willows and alders along water courses and aspens in moist areas at low elevations.

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 is found between 6,500 and 8,000 feet or 2,400 and 2,900 meters and covers some 35,000 acres, about one third of the Park. In red fir forests, red fir (*Abies magnifica*) is the sole dominant tree in the canopy, but lodgepole pine (*Pinus contorta* ssp. *murrayana*), Jeffrey pine (*Pinus jeffreyi*), mountain hemlock (*Tsuga mertensiana*), sugar pine (*Pinus lambertiana*), western white pine (*Pinus monticola*) or white fir (*Abies concolor*) may be present in small numbers. Mature red fir is commonly 60 to 120 feet or 22- 44 meters tall and lives over 300 years. Red fir seedling distribution is closely related to shade; seedlings are largely absent from areas receiving more than half strength full sun. Shrubs and flowers include arrowleaf balsamroot (*Balamorhiza saggittata*), mule's ear (*Wyethia mollis*) and greenleaf manzanita (*Arctostaphylos patula*).

Depending on soil type and elevation, mountain hemlock may be a component of either the Red Fir Forest or the Subalpine Forest. Mountain hemlock is usually found on nutrient- poor sites with coarser textured soils than red- fir dominated sites (Parker 1991). The pre- successional lodgepole pine stands often occur between 6,200 and 7,500 feet or 1,900 and 2,300 meters and are most common on flat, valley bottom sites or lower slopes, often near the margins of meadows and lakes.

Yellow Pine Forest: This forest type is found below 6,000 feet (1,900 meters) usually with a mix of species including sugar pine (*Pinus lambertiana*), Jeffrey pine, white fir, ponderosa pine (*Pinus ponderosa*), western white pine, incense cedar (*Calocedrus decurrens*) and even red fir. The soils associated with these forest types have significantly higher potassium, calcium, and magnesium than most other Lassen Park forest types (Parker 1991).

Subalpine Forest: The subalpine forest, at the upper end of the park's coniferous forests in elevation (above 8,500 feet or 3,100 meters) is dominated by mountain hemlock and whitebark pine (*Pinus albicaulis*), a highly weather resistant pine that may grow as high as 10,000 feet or 3,600 meters. Shrubs and flowers include currants (*Ribes* sp.), willow (*Salix* sp.), lupine (*Lupinus* sp.), senecio (*Senecio* sp.), pearly everlasting (*Anaphalis margaritacea*), rubber rabbitbrush (*Chrysothamnus nauseosus*), and pine mat manzanita (*Arctostaphylos nevadensis*).

Alpine Meadows and Fellfields: These areas, located above timberline, are carpeted with colorful wildflowers, including spreading phlox (*Phlox diffusa*), phacelia (*Phacelia* sp.), stonecrops (*Sedum* sp,), alpine saxifrage (*Saxifraga tolmei*), cinquefoils (*Potentilla* sp.), penstemons (*Penstemon* sp.), alpine daisy (*Erigeron compositus*), and buckwheats (*Eriogonum* sp.).

Montane Chaparral or Brushland: Pinder *et al.* (1997) found that most chaparral species in the park occur below 7,500 feet (2,300 meters) 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)*, snowbrush ceanothus *(Ceanothus velutinus*), and bush or California chinquapin *(Castanopsis sempervirens)* as well as currant (*Ribes* sp.), gooseberry (*Ribes* sp.), serviceberry (*Amelanchier* sp.), bitter cherry (*Prunus* sp.).

Wet Meadows: Herbaceous communities are scattered throughout the park and range from 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*

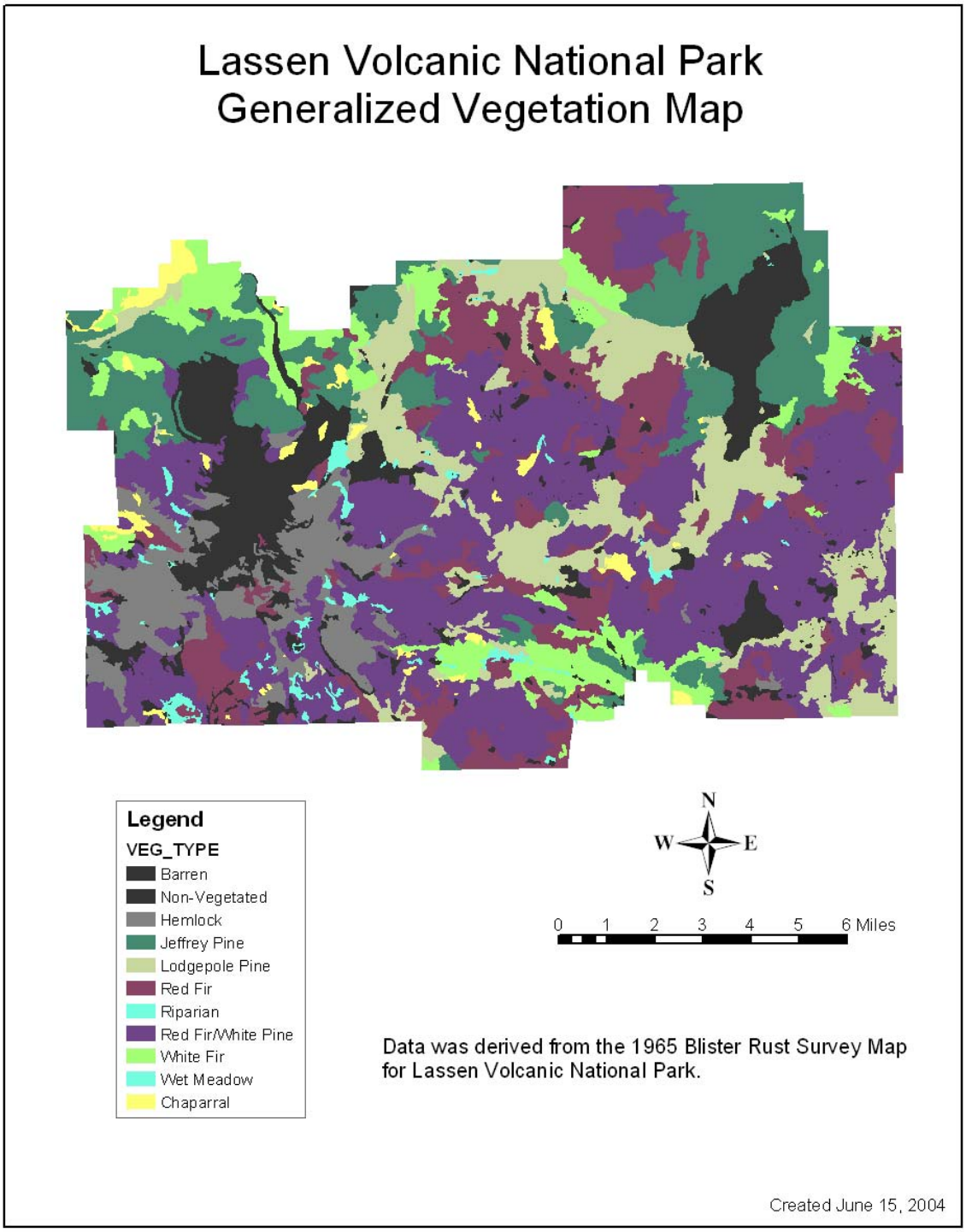
thuberiana),tufted hairgrass *(Deschampsia caespitosa*) , and Pullup muhly (*Muhlenbergia filiformis*) (Taylor 1990b); to less densely vegetated areas composed of mostly broad- leaved plants such as satin lupine *(Lupinus obtusilobus),* mule's ears, sagebrush (*Artemisia douglasiana*), and mountain alder (*Alnus tenuifolia*) that occur on steep slopes or in larger gaps within forested areas (Pinder *et al*. 1997). Forbs include monkeyflower (*Mimulus* sp.), bog laurel (*Kalmia* sp.), California corn lily (*Veratrum californicum*), alpine shooting star (*Dodecatheon alpinum*) and lupine.

See additional descriptions above under *Water Resources – Wetlands* for the two wet meadows that would be traversed by the proposed project area.

Vegetation Distribution in the Project Area

Most portions of the project area are dominated by development, including the road and associated parking areas, and support little vegetation. The project area, however, traverses a variety of plant communities, including red fir forest, riparian corridors, wet meadows, and subalpine meadows. During late summer and early winter visits, the following plants were observed in areas that would be affected by the proposed project: trees (mountain hemlock, lodgepole pine, red fir, alder, and willow); shrubs (pine mat manzanita, and rabbitbrush); forbs (lupine, yarrow, everlasting, aster, and mints); as well as a variety of unknown grasses, sedges, and rushes. Most of the vegetation excluding trees that would be affected by the proposed project consists of sparse vegetation in highly disturbed road shoulders and pullout edges.

Figure 2. Generalized Vegetation Map for Lassen Volcanic National Park.



D. 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. 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 redside. 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.

E. Special Status Species

1. Plants

There are no federal or state listed threatened and endangered plants occurring in Lassen Volcanic National Park. The park is home, however, to 24 special status species monitored by park staff and the California Native Plant Society (Koenig 2004A). These species are associated with aquatic or alpine habitats and would not be affected by the actions proposed in this Environmental Assessment.

2. Wildlife

Federally Threatened and Endangered Species.

Species	Federal Status
Bald Eagle (*Haliaeetus leucocephalus*)	Threatened
California Red Legged Frog (*Rana aurora draytonii*)	Threatened
Delta Smelt (*Hypomsus transpacificus*)	Threatened
Central Valley Steelhead (*Oncorhynchus mykiss*)	Threatened
Winter Run Chinook Salmon (*Oncorhynchus tshawytscha*)	Endangered
Shasta crayfish (*Pacifastacus fortis*)	Endangered
Central Valley spring-run chinook salmon (*Oncorhynchus tshawytscha*)	Threatened
Vernal pool invertebrates	Critical habitat

Bald Eagle. The bald eagle is the only listed species known to occur in the park. 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 nest in the park at Snag Lake, which was first discovered in 1980 and monitored until 2001. The nest tree fell down during the winter of 2000/2001 and no new nest has since been located. In 2002, there were sightings of bald eagles around Snag Lake and Butte Lake although no nests were found. There were no sightings of bald eagles in the Snag Lake area in 2003. There were reports of bald eagles at Butte Lake in 2004, although nesting was not confirmed. Surveys are currently being conducted to locate a new nest in the Snag/Butte Lake area. 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 eagles believed to nest at McCumber Reservoir 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.

The other seven federally listed species described below have not been found in the park and suitable habitat does not exist 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. There are no vernal pools within the project area. Vernal pools and the invertebrates associated with them would not be affected by this project.

Candidate Species

Green sturgeon (*Acipenser medirostris*). The green sturgeon is known only from the Klamath River. No evidence of this species has been found within the park and no suitable habitat exists within the project area. There would be no effect on this species from this project.

Central Valley fall/late fall-run chinook salmon (*Oncorhynchus tshawytscha*). The Central Valley fall/late fall- run chinook salmon is found only in the central valley of California. No evidence of this species has been found within the park and no suitable habitat exists within the project area. There would be no effect on this species from this project.

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.

Species of Concern

Seven bats have been identified by the USFWS and California 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 three, 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. None of the above features would be affected by the actions proposed in this Environmental Assessment. There would be no effect on bat species from this project.

California wolverines (Gulo gulo luteus) 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 no confirmed detections statewide. Due to its absence from the park, there would be no effect on California wolverine 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 road, would not be affected by the proposed project. There would be no effect on snowshoe hare from this project.

Pygmy rabbit *(Brachylagus idahoensis)* is associated with tall, dense, large- shrub stages of big sagebrush, greasewood, and rabbitbrush. This species does not occur in the park and will not be affected by this project.

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 traffic levels. There will be no effect on American marten from this project.

Sierra Nevada red fox (*Vulpes vulpes necator*) (California endangered). 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. This species is known to beg at parking areas and campgrounds throughout the park. 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 but would not be affected by the proposed project described in this Environmental Assessment since no suitable roosting or foraging habitat would be modified and no nesting areas affected.

California spotted owl (*Strix occidentalis occidentalis*). There are three known spotted owl pairs within Lassen Volcanic National Park. Two pairs are on Prospect Peak and one pair inhabits the Terminal Geyser area. Nest trees have been located for all three of these pairs. No systematic survey of Lassen Volcanic National Park has been completed. Surveys were initiated in 2002 to survey for spotted owls within Prescribed Fire Management project areas. These surveys will cover roughly half of the suitable spotted owl habitat within the park. Surveys will be conducted in 2005 and 2006 in areas outside of projected Prescribed Fire Management areas to conduct a complete survey of suitable habitat within 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 California spotted owls from this project.

Western burrowing owl (*Athene cunicularia hypugaea*). This species is a small ground nesting bird of prairie and grassland habitats. They depend upon burrows made from other animals to nest. There have been no sightings of this species with Lassen Volcanic National Park. This species will not be affected by this project.

Flammulated owl (*Otus flammeolus*). This species is found in coniferous forests in the Sierra Nevada and Cascade ranges. It nests in cavities or woodpecker holes below the elevation of the park. This species has not been documented within the park and will not be affected by this project.

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, Snag Lake, and Warner Valley. No reproduction of this species has been confirmed in the park. Kings Creek meadow is the only suitable habitat found in the project area. There has only been one sighting in this meadow. Due to the absence of greater sandhill cranes and the negligible effect on this meadow under the proposed project, there will be no affect on greater sandhill cranes.

Little willow flycatchers (*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. This species is currently found in the Warner Valley area of the park. A breeding pair was discovered in Warner Valley in the park in 2004. Due to lack of habitat in the project area, there will be no affect to little willow flycatchers with this project.

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 it migratory nature and lack of habitat in the project area, this species will not be affected by this project.

Lawrence's goldfinch (*Carduelis lawrencei*). This species requires open woodland or shrubland, a nearby source of water, with forbs and shrub seeds. This species has only been documented in Warner Valley (one dispersing juvenile in 2004) and habitat does not exist in the park. This species will not be affected with this project.

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 will be no effect on this species due to the lack of habitat in the project area.

Black swift *(Cypseloides niger).* This species requires moist locations on cliffs behind or adjacent to water falls in deep canyons. This species has been documented in the park. There will be no effect on this species due to lack of habitat in the project area.

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 and will not be affected by this project due to lack of habitat in the project area.

Lewis' woodpecker (*Melanerpes lewis*). Lewis' woodpeckers are found in dry open woodlands, orchards, farmlands, and foothills. This species requires open habitats with scattered trees and snags with cavities. This species has been documented in the park and will not be affected by this project due to lack of habitat in the project area.

Tricolored blackbird (*Agelaius tricolor*). This species is found in the central valley of California and seeks cover in emergent wetland vegetation. It nests in dense cattails or tules. There is only one record for this species in the park at Manzanita Lake. Due to lack of presence in the project area, this species will not be affected by this project.

Oak titmouse (*Baeolophus inornatus*). This bird prefers woodland habitat in which oaks predominate. This species has not been recorded in the park boundary and will not be affected by this project.

Loggerhead shrike (*Lanius ludovicianus.*). This species prefers open habitats in lowlands and foothills with scattered shrubs, trees, posts, fences which are used as perches. This species has not been recorded in the park and will not be affected by this project.

Long-billed curlew (*Numenius americanus*). This species is found in estuaries along coastal areas and wet meadow habitat in northeastern California. This species has not been documented in the park and will not be affected by this project.

Prairie falcons (*Falco mexicanus*) require sheltered cliff ledges for cover. There are historic breeding records of this species at Eagle Peak. This species will not be affected by this project due to lack of habitat in the project area.

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, Reflection Lake area. 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.

Foothill yellow-legged frogs (*Rana boylii*). This species is found in or near rocky streams in a variety of habitats from sea level to 6,000 feet. There is one specimen in the Lassen National Park museum, however, it is unclear whether this species came from the park. There have been no recent sightings of this frog in the park. It is believed this species does not occur in the park due to its elevation limits and therefore it would not be affected by this project.

Cascades frog (*Rana cascadae*). This species 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 affect on this species due to its absence in the project area.

Eagle Lake rainbow trout (*Oncorhynchus mykiss auilarum*). This species is endemic to Eagle Lake in Lassen County. It is used in planting programs by the State of California and may be one of the species planted for recreational fishing in Manzanita Lake. There would be no effect on this species from the proposed project.

Rough sculpin (*Cottus asperrimus*) This species is found in the Pit River, Fall River and Hat Creek. There have been no observations of this species in the park. There will be no effect on this species due to its absence from the park.

Pit roach (*Lavinia symmetricus mitrulus*). This species is found in the Pit River and does not occur in the park. There will be no effect on this species due to its absence from the park.

Longfin smelt (*Spirinchus thaleichthys*). This species is found along the Sacramento and San Joaquin estuaries and does not occur in Lassen Volcanic National Park. There will be no effect on this species due to its absence from the park.

Sacramento splittail (*Pogonichthys macrolepidotus*). This species occurs in the Sacramento River and its tributaries and is not found within Lassen Volcanic National Park. There will be no effect on this species due to its absence from the park.

F. 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 main park road corridor from the beginning of the project near the Bumpass Hell Parking Area up to its junction with and including the Manzanita Lake Campground Entrance Road. It encompasses all of the areas affected by the original road construction and areas within 40 feet of the centerline of the road, expanding to include the outside edge of pullouts and parking areas and developed areas, not included within this zone [including those at Lake Helen, Lassen Peak, Kings Creek Meadow, Trailhead and Picnic Area, Summit Lake Campgrounds (North and South) Entrance Roads (North and South) and Day Use Area, Summit Lake Ranger Station roadway, Lost Creek, Hat Creek, Devastated Area, Sunflower Flat, and Chaos Crags].

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 96 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.

One archeological district listed on the National Register of Historic Places (NRHP) is located within the park but outside of the project area. The Sulphur Creek Archeological District contains ten sites and reflects late prehistoric occupation as early as 700 A.D. to approximately 150 years ago (Moffitt and Anderson 1979). The District contains six late prehistoric or protohistoric campsites and four sites that were determined to be ephemeral, or limited use lithic scatters. Determination of function or duration of use appears to be based on the extent of cultural material deposits either on the surface or, when exposed, in subsurface contexts. Limited activity areas or lithic scatters have small assemblages of obsidian or other volcanic lithic debitage and few or no tools. Campsites generally have greater numbers of tools and debitage, and often contain one or more components indicating a slightly longer- term occupation. Indicators of long- term occupation include ground stone artifacts, midden deposits, and house pit depressions. Two of the sites in the district have historic Euro- American components in addition to the Late Horizon prehistoric components. Each has evidence of historic camping or habitation activities.

Approximately 5- 6 miles of the road were completely surveyed before snowfall. An additional 3.5 miles were surveyed on one side of the road. Recording of isolated sites and the remains of a CCC camp at Old Boundary Spring is still needed. As a result, archeological survey of the upper main park road corridor is incomplete and will be reinitiated when snow cover recedes. Specific measures have been identified below in the *Environmental Consequences* section to ensure that the project has no effect on potentially unidentified archeological resources. In addition, the entire road has been surveyed for historic resources related to its construction (see below).

Historic Archeological Resources: Historic- period archeological sites in the park include features that related to early emigration to California, homesteading, ranching, early use of the park area for recreation, and park administration and development. 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.

As a result of the ski area rehabilitation and Southwest Visitor Services Facility projects, an archeological survey was conducted in 2003, within the project area 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). The newly documented site, SWCA 1, consists of a few remains of a historic downhill ski area. The integrity of the remaining ski area features has been

compromised by the removal of most of the equipment after the closing of the ski operations after 1993. Therefore it is determined that the ski area site is not eligible for the National Register of Historic Places and no further treatment of the site is required.

Special Areas to be Protected

Water Flume: South of Crags Campground is a constructed earthen ditch and timber- framed water flume historically used to convey (divert) water from Lost Creek to Manzanita Lake to generate electricity. The flume is designated a special resource area and has been documented as an archeological resource. Although the flume is eligible for the National Register of Historic Places, it has not yet been listed.

Nobles Emigrant Trail Crossing: The Nobles Emigrant Trail (which crosses the main park road near Crags Campground and Manzanita Lake) was one of the many routes that comprised the California Trail and is significant as a 19th century transportation route that served as an avenue of commerce and communication during westward migration across the United States. The trail is listed on the National Register of Historic Places (regional level of significance). In the park, the trail continued to be used over the years as a wagon road, then as a service road.

G. Ethnography

The Lassen area has been described as a meeting point for at least four native groups. Use of the area by the Atsugewi, Yana, Yahi, and northern Maidu groups brought a mix of cultural elements characteristic of central and northeastern California with Great Basin- Plateau elements (Treganza 1963:5).

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.

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 Yahi. Although there is a fair amount of written ethnographic data for these American Indian groups, little information about the groups' contemporary use of the Park resources has been obtained. The park is in the early stages of acquiring and documenting traditional and current use information from the local American Indian communities.

Detailed ethnographic accounts for these groups (Garth 1978; Johnson 1978; Riddell 1978) and for the park (Schultz 1954) portray seasonal use of the park area by all three groups to exploit seasonally available food resources and to follow mobile game. For an in- depth review of settlement patterns and subsistence strategies, refer to these publications. Ethnographic resources may include places traditionally used to hunt or gather resources, trails or paths and associated camping sites, and ceremonial locations or places of religious significance. Affiliated American Indian groups still retain strong emotional ties to the Lassen Volcanic area and information pertaining to culturally significant places is confidential. The park recently completed a Traditional Use Study that identified areas of sacred significance. Some Traditional Cultural Places have been identified in the Traditional Use Study and some have been identified through consultation with Native American Tribes. One site which has not been designated, but that may be eligible, is located in the vicinity of the road in the proposed project area. The site is significant to the Pit River Tribe and has a strong sacred and cultural history and continues to be used today. Nonetheless, the park has been informed of it and is continuing to obtain information that will be valuable in its management. That management and the site (as noted in the *Environmental Consequences* section below) would not be affected by the actions proposed in this Environmental Assessment.

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 Rancheria. These five tribes were sent letters on April 14, 2004 and October 4, 2004 noting the likely undertaking in the proposed project area.

H. 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, Horseshoe Lake and Warner Valley ranger stations, the Loomis Visitor Center, as well as numerous bridges, signs, trails, and other features. Also considered eligible, although currently removed from its original location, is the Prospect Peak Fire Lookout. The following properties associated with the road are either listed or have had a Determination of Eligibility (DOE) completed and been determined eligible for listing (Park Entrance Station and Residence – DOE 1975, Nobles Emigrant Trail – listed 1975, Park Headquarters – listed 1975, Headquarters District – DOE 1994, Loomis Visitor Center – listed 1975, Park Naturalist's Residence – DOE 1976, and Loomis Comfort Station – DOE 1975) (NPS CLI 2000:4/2).

I. 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 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.

According to the Historic American Engineering Record (NPS HAER 2000) and the Cultural Landscape Inventory (CLI) (NPS 2000), the 30- mile long Lassen Volcanic National Park Highway is eligible for designation on the National Register of Historic Places as a cultural landscape. 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."

In addition, 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). According to the CLI the road retains integrity to both its original construction through the CCC work on it (1925- 1941) and later road paving and widening projects (1948- 1951) that brought the road to its current width (from 16 feet to 20 feet with 2- 3 foot shoulders) (NPS CLI 2000:1/14). As a result, retaining the character of the road and avoiding, minimizing, or mitigating effects on contributing features are important considerations of the road rehabilitation design.

The Lassen Volcanic National Park Highway is a linear landscape that extends 29.86 miles (48 kilometers) between the southwest and northwest entrance stations of Lassen Volcanic National Park. The road traverses active geothermal 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.

As with other park roads constructed during the early twentieth century, some of the most prominent names in NPS park development and road construction were involved in the Lassen Volcanic National Park Highway design (NPS HAER 2000). The collaborative undertaking between the former Bureau of Public Roads and the National Park Service "ensured that park roads were built to the highest engineering standards, while also protecting the natural landscape and scenic values" (NPS HAER 2000). These standards included locating borrow pits out of sight of the road, preserving natural vegetation to the degree possible in the construction right- of- way, often including preservation of specimen trees adjacent to the road, and sloping shoulders to prevent erosion and to maintain a naturalistic appearance.

The road was originally constructed as a narrow (16 feet or 4.8 meters wide) gravel road but was later paved and widened to approximately 22- 26 feet (6.7- 7.9 meters). At switchbacks and tight curves in the road, small boulders and large rocks edge the road, discouraging drivers from pulling off at undesignated locations (NPS HAER 2000). The road has a maximum grade of six percent. . . Perennial streams at Hat Creek and Kings Creek are crossed with historic box culverts that are finished with lava rock masonry. Architectural details on the culvert at Kings Creek include a headwall with a lintel and ringstones. Rustic stone masonry headwalls at Hat Creek extend above the surface of the road at Hat Creek to form a low rising stone curb alongside the road. While constructed of concrete, the Lost Creek culvert also contains rustic cut lava rock stone masonry veneered headwalls. Where the Nobles Immigrant Trail crosses the road between Hat Creek and Sunflower Flat, vegetation is regularly cut back to create discrete vistas and to preserve the trail (NPS HAER 2000).

A culvert survey was undertaken in Fall 2004 and black and white and color photographs were taken of several presumed historic culverts with print (black and white and color) and digital (color) cameras. According to the CLI (NPS CLI 2000:1/22), during the CCC era drainage systems were introduced to channel groundwater, rain and snowmelt away from the surface of the road. Culverts then were either 10 or 18 inch (254 mm or 457 mm) corrugated metal drain pipes dressed with rubble masonry headwalls.

The significance of cultural landscapes is related to the degree to which the following features are represented:

- 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.).

According to the CLI (NPS CLI 2000:3a/1) those identified above by underlining retain integrity. Only some small scale features and some buildings and structures have lost integrity.

Of the main road, only the segments east of the Lassen Peak Parking Lot and the Kings Creek Picnic Area are not contributing because the road originally curved around the upper end of the lot and because the picnic area was originally a campground.

Parallel pullouts can be found along the entire length of the park road. These features are oriented as bump- out or parallel, rather than perpendicular extensions, and can generally be found where views to the eastern portion of the park can be seen. Approximately ninety exist; half of these are paved. Although no construction document has been found that designates any of the pullouts as formal or designed constructions, the 1939 "Lassen Volcanic National Park" guidebook lists "points of interest" along the road. The following minor developed areas (NPS CLI 2000:3a/13) are listed: Diamond Peak, Lake Emerald, Lake Helen, Highway Summit, Kings Creek Meadows, Summit Lake, Devastated Area, Hot Rock, and Chaos Crags. Pullouts in these locations can be considered integral components of the road's formal design. Further research is needed to determine the intent of all other pullouts along the park road (NPS CLI 2000:3a/13). Later, however (NPS 2000:3b/26- 27), the CLI names the Lake Helen/Emerald Lake views and vistas, Bumpass Hell parking lot, Panorama Pullout (about one mile east of Lassen Peak parking lot), Meadow Views (consisting of the formal and informal series of pullouts lining the road between Kings Creek Meadow, Dersch Meadow and Hat Lake), with the Devastated Area, Nobles Emigrant Trail as having significant views and vistas.

Culvert headwalls and drainage culverts are the predominant NPS rustic design feature on the road. Headwalls were designed to serve a practical function as well as to produce an aesthetic effect; they provided passage for perennial and intermittent streams while masking the corrugated iron pipes within. The use of locally obtained lava rock used in the headwall masonry was both an economic expedient and a design contrivance as it was readily available and served to blend the structures into the landscape. Of the constructed water features, headwalls constructed between 1925 and 1951 (during the period of significance) appear to be distinguishable from later construction by masonry patterns, masonry materials, and culvert diameters (18 or 24 inches in diameter corrugated iron pipes), according to the CLI (NPS CLI 2000:3a/18). While headwall dimensions vary in relation to culvert diameter, most are four feet by four feet by eighteen inches and feature flush pointing and squared edges. Masonry construction techniques range from ashlar to rubble. The headwalls and drainage culverts are documented in the Bureau of Public Roads Final Construction Reports for the 1920s and 1930s and were installed as part of early road grading and later road widening processes. Headwalls constructed between 1925 and 1951 appear to be distinguishable from later construction by masonry patterns, masonry materials, and culvert diameters. Road- widening projects between 1947 and 1951 would have necessitated the reconstruction of many of these headwalls. Additional headwalls and drainage features were installed following the periods of significance. In 1983/84, two major culvert replacement projects were undertaken. Cement mortared rubble headwalls were constructed with a less regular pattern, an uneven face, and used stone other than lava rock. The second major culvert replacement project, in 1993/94, replaced or installed twenty- four plastic pipe culverts. Each was built with new rubble and poured concrete headwalls in two general

locations: between the Chalet and the Emerald Sidehill south of the summit and between Lower Kings Creek Meadows and the east fork of Hat Creek.

The CLI concludes that of the original culverts on the road 117 appear to remain from the periods of significance and of these 104 retain the original corrugated iron culvert and a single headwall, with 10 having the iron culvert and two headwalls and two with no headwalls and 3 iron pipes with rebuilt headwalls. All should be considered contributing.

The Lost Creek (1931: dual- span box culvert), Kings Creek (1928- 29: masonry arch culvert) and Hat Creek (1931: single span box culvert) bridge culverts all retain integrity. The Hat Creek culvert was veneered with local stone in three textures to a depth of 12 inches. According to the CLI, the Lost Creek culvert wing wall masonry rock was carefully selected for its weathered appearance.

The Hat Lake and Manzanita Lake signs are 2 of 5 contributing small scale features (NPS CLI 2000:3b/2).

In 1998, the CLI documented the condition of the eligible Lassen Volcanic National Park Highway as "fair," stating that "the landscape shows clear evidence of minor disturbances and deterioration by natural and/or human forces, and some degree of corrective action is needed within 3- 5 years to prevent further harm to its cultural and/or natural features. If left to continue without the appropriate corrective actions, the cumulative effect of the deterioration of many of the character- defining elements in the landscape will cause the landscape to degrade to a poor condition" (NPS CLI 2000:4/5).

Among the recommendations included in the CLI were:

1) A number of historic culvert headwalls along the entire length of the road are in need of repointing and, in some cases, rebuilding. Condition assessment of headwalls should be performed with subsequent preservation/stabilization actions performed.

2) Significant spring and groundwater activity is found along the road. . ." This recommendation noted that the repair would likely be completed during the first phase road project, which was proposed at the time of its writing and likely referred to the two big landslide areas repaired in Phase I.

3) Buildings and structures that contribute to the integrity of the road are few. . .Future projects on those remaining structures should follow the Secretary of the Interior's Standards. . .

4) Major culvert replacement projects in 1971, 1984 and 1995 have removed historic fabric at the expense of historic integrity. Further, a number of headwalls have been inappropriately built, or rebuilt with unsympathetic stones and patterning. Future drainage projects should strongly consider retaining historic culverts, headwalls and original materials (NPS CLI 2000:4/6).

J. Visitor Experience

1. 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 (80 percent) visitors to Lassen Volcanic National Park are from California. The balance of park visitors come from the rest of the United States (15 percent) and from foreign countries.

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.

2. 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 park boundaries.

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.

Ranger talks, guided walks/talks, and Junior Ranger and Firefighter programs are scheduled from early July 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, and the Discovery Center. Other interpretation includes handouts, wayside exhibits and roving interpreters.

3. Visitor Safety

Volcanic Activity: Because Lassen Volcanic National Park vicinity has an extensive history of volcanic activity, seismic activity is monitored by a network of nine seismometers located both within and outside of 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.

Ongoing studies by scientists have also resulted in changes in park operations. For instance, after a study in the 1970s showed potential dangers from avalanche rock fall at Manzanita Lake, these facilities were closed until subsequent geologic analyses in 1987 reevaluated the hazard and concluded that it was somewhat less threatening and extensive than had previously been indicated. This reappraisal resulted in the reopening of most of the facilities in this area.

Relationship to Accidents: Approximately 150,000 vehicles use the road annually. The current broken and uneven road surface can cause traffic markings to rapidly deteriorate, which could lead to accidents. Of the two fatality accidents that have occurred along the road (near Diamond Point and Sulphur Works), however, neither was determined to be related to road conditions or to roadway geometrics. In addition, the only recent accident to have occurred in the proposed project area (near Kings Creek) was related to driver inattention.

Construction Activity: Road construction projects are by nature inherently hazardous to workers involved in the project and to park visitors. Workers must have adequate training and knowledge, particularly in traffic safety operations as well as those associated with their individual areas of expertise, to effectively carry out their job. In a national park this knowledge must include familiarity with the terrain and park resources affected by the project and how these resources might respond to disturbance (including tree felling, rock fall, slumping, etc.). Although park visitors must be aware of road hazards on a continuous basis, road construction areas are particularly hazardous, especially when implemented in scenic terrain. Visitors may be unaware of the road construction project and may come upon it suddenly, while focused on viewing scenery or wildlife. They may be unprepared for or become bothered by long delays during one- lane closures. Some are unfamiliar with the nature of historic, winding park roads, which often contain few of the traffic devices normally encountered in steep mountainous terrain, such as guard walls, reflectors and sudden or sharp curve signage.

K. Park Operations

Lassen Volcanic National Park contains and is responsible for the management of 42 miles of paved park roads, 15 miles of unpaved roads, 13 parking lots (containing approximately 665 spaces), 314 road signs and 5 road bridges.

The park runs a complex road maintenance operation, which includes vegetation maintenance, snow management, road repair and a variety of other activities in season on the above system of developed roads and roadway structures. The road maintenance operation comprises approximately 10- 15 percent of the park budget, not including rehabilitation projects like that discussed in this Environmental Assessment. It includes the array of activities described in the No Action Alternative.

V. Environmental Impact Analysis

The National Environmental Policy Act (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 two 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, NPS *Management Policie*s (NPS 2001A) 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 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. NPS managers must always seek ways to avoid or minimize to the greatest degree practicable adverse impacts on park resources and values. However, the laws do give the NPS management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the NPS management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. Impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including opportunities that would otherwise be present for the enjoyment of those resources or values. An impact to any park resource or value may be impairment, however, an impact would more likely 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;
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park;
- or identified as a goal in the Park's General Management Plan or other relevant NPS planning documents.

METHODOLOGY

The environmental consequences for each impact topic were defined based on the following information regarding context, type of impact, duration of impact, area of impact and the cumulative context.

- **CONTEXT**: Setting within which impacts are analyzed – such as the project area or region, or for cultural resources – the 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 impact being discussed.
  - **Adverse**: Increases or results in impact being discussed.
  - **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. The duration of impacts evaluated in this EA may be one of the following:

- **Short-term**: Often quickly reversible and associated with a specific event, 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.

❖ **AREA OF IMPACT**
- **Localized**: Detectable only in the vicinity of the activity
- **Widespread**: Detectable on a landscape scale (beyond the affected site)

❖ **CUMULATIVE**: 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.

❖ **IMPACT MITIGATION**
- **Avoid** conducting management activities in an area of the affected resource
- **Minimize** the type, duration or intensity of the impact to an affected resource
- **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
  - **Compensating** a major long- term adverse direct impact through additional strategies designed to improve an affected resource to the degree practicable.

All Impacts Except Special Status Species and Cultural Resources

- **Negligible**: Measurable or anticipated degree of change would not be detectable or would be only slightly detectable. Localized or at the lowest level of detection.
- **Minor**: Measurable or anticipated degree of change would be have a slight effect, causing a slightly noticeable change of approximately less than 20 percent compared to existing conditions, often localized.
- **Moderate**: 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. Can be localized or widespread.
- **Major**: Measurable or anticipated degree of change would be substantial, causing a highly noticeable change of approximately greater than 50 percent compared to existing conditions. Often widespread.

Special Status Species

- **No Effect:** The project (or action) is located outside suitable habitat and there would be no disturbance or other direct or indirect impacts on the species. The action will not affect the listed species or its designated critical habitat (USFWS 1998).
- **May Effect, Not Likely to Adversely Effect**: The project (or action) occurs in suitable habitat or results in indirect impacts on the species, but the effect on the species is likely to be entirely beneficial, discountable, or insignificant. The action may pose effects on listed species or designated critical habitat but given circumstances or mitigation conditions, the effects may be discounted, insignificant, or completely beneficial. Insignificant effects would not result in take. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not 1) be able to meaningfully measure, detect, or evaluate insignificant effects or 2) expect discountable effects to occur (USFWS1998).
- **May Effect, Likely to Adversely Effect:** The project (or action) would have an adverse effect on a listed species as a result of direct, indirect, interrelated, or interdependent actions. An adverse effect on a listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions and the effect is not: discountable, insignificant, or beneficial (USFWS 1998).

Cultural Resources Impacts

- **No Effect**: The action will not affect a historic property or the characteristics of a property that may qualify it for inclusion in the National Register of Historic Places. The action would also not, based on conditions of approval, likely result in impacts to presently unidentified cultural resources.
- **No Adverse Effect**: An undertaking has an effect on a historic property when the undertaking may alter characteristics of the property that may qualify the property for inclusion in the National Register. For example, the action may result in diminishing the character- defining features or aspects of a historic structure that make it eligible for the National Register, but the actions are consistent with the Secretary's Standards for the Treatment of Historic Properties.
- **Adverse Effect**: An undertaking is considered to have an adverse effect when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling or association. In other words, the effects on character- defining features or aspects of a historic structure would result in diminishing or removing the characteristics that make it eligible for the National Register of Historic Places and as a result would not be consistent with the Secretary's Standards for the Treatment of Historic Properties.

Mitigation Measures Incorporated into the Preferred Alternative

These measures have been developed to lessen the potential adverse effects of the Preferred Alternative. The rehabilitation of the Lassen Volcanic National Park Highway would be phased to avoid the rainy season and snow conditions, thus construction would occur from May through November or December. Other general measures include: (1) limiting rehabilitation to work within the existing road prism (area affected by road construction activities), (2) using construction materials (design, types, and colors) that blend with the surroundings, and (3) revegetating disturbed areas to blend with the surrounding environment. Construction Best Management Practices (BMPs) would be used to control impacts from construction. These include the following measures:

- The contractor would conduct a project orientation program for all workers to increase their understanding and sensitivity to the challenges of working within a national park environment.
- Construction limits would be clearly marked with stakes at the beginning of ground disturbing activities. No disturbance would occur beyond these limits. Temporary construction fencing would be installed where determined necessary by FHWA and NPS project coordinators.
- Vegetation and soil disturbance would be minimized to the maximum extent possible.
- Erosion control measures will include the use of some or all of the following: sediment traps, silt fencing, and check dams. Disturbed and/or stockpiled soils may be temporarily covered with straw, jute matting, and erosion control netting, or plastic sheeting.
- Temporary barriers, such as those noted above, would be used to protect natural surroundings (including waterways, trees, plants, and root zones) from damage.
- Waste and excess excavated materials would be located outside of drainages to avoid sedimentation.
- Regular site inspections during construction would be conducted to ensure that erosion control measures remain in place and are functional.
- Controls would be implemented to eliminate the discharge of pollutants into storm water and into streams, lakes, reservoirs or other waters from project construction materials.
- Chemicals, fuels, and other toxic materials would be properly stored, used and disposed of (according to manufacturer's instructions).
- Construction equipment would be refueled in upland areas to minimize the potential for fuel spills near drainages and would be inspected for hydraulic and oil leaks regularly as well as prior to use in the park.
- Water would be used as necessary to control dust.
- All construction equipment would employ functional exhaust/muffler systems to minimize sound- related environmental impacts.

- The asphalt batch plant would be located outside the park.
- Revegetation would occur as soon as possible following road rehabilitation actions.
- Excavated soil from the proposed grading treatments would be used within other grading treatments.
- Revegetation work would use topsoil conserved along the corridor and seeds or propagules from native species (genetic stock originating in Lassen Volcanic National Park).
- Sources of rock, sand, gravel, earth, topsoil or other natural material would be inspected for noxious weeds prior to use in 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 would be monitored and control strategies implemented if such species occur.
- Construction equipment would be washed to thoroughly remove all dirt, plant and other foreign material before it is brought into the park and prior to working with or transporting weed free materials. Particular attention must be shown to the under carriage and any surface where soil containing exotic seeds may exist.
- Construction vehicle parking would be limited to existing roads and parking areas.

Should unknown archeological resources be uncovered during construction, work would be halted in the discovery area, 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. In compliance with this act, the National Park Service would also notify and consult concerned tribal representatives for the proper treatment of human remains, funerary, and sacred objects should these be discovered during the course of the project.

During construction, signs would inform visitors of the construction activities on the park road and of potential travel delays. Barriers and barricades, signs and flagging, as necessary or appropriate, would be used to clearly delineate work areas and provide for safe vehicle travel through the construction area.

Contractor- selected non- commercial material source, staging or spoils areas not identified within this Environmental Assessment for project work would, at a minimum, prior to any use have written documentation submitted by the contractor (under the laws noted) to ensure that potential effects on rare, threatened or endangered species (Endangered Species Act), waters of the United States (Clean Water Act), or prehistoric or historic resources (National Historic Preservation Act) have been evaluated as to presence and effects of the proposed activity(ies).

VI. ENVIRONMENTAL CONSEQUENCES

Table 1: Alternatives Comparison

Impact Topic	*No Action Alternative*	*Preferred Alternative*
Soils	Soil disturbance as a result of annual and cyclic routine maintenance would result in a long-term negligible adverse effect. Catastrophic failure of slopes or culverts could result in short and long-term minor to moderate adverse effects depending on the degree of failure.	Excavation and grading during construction would result in a minor to moderate, localized long-term adverse effect. Soil compaction during construction would result in a short-term negligible to minor, adverse effect. Soil mixing and pullout and walkway paving would result in a long-term negligible localized adverse effect. The application of grading treatments would have both a localized minor to moderate adverse effect and a long-term minor to moderate beneficial effect. Culvert repair, replacement and inlet/outlet cleaning would result in a negligible to minor localized adverse effect on soil. Rehabilitation of denuded areas would result in negligible to minor localized long-term beneficial effect on soils.
Soils Impact Summary	Cumulative: Impacts from past, present and future actions on soils would continue to result in minor adverse cumulative impacts to soils. The No Action alternative would contribute a negligible long-term adverse impact, while the Preferred Alternative would contribute localized negligible to moderate, short and long-term, beneficial and adverse impacts on park soils, which would be both disturbed and restored. Conclusion: The No Action Alternative would have long-term negligible and short-term minor to moderate impacts on soils. The Preferred Alternative would result in localized negligible to moderate adverse and negligible to moderate beneficial effects. There would be no impairment of park soil resources or values.	
Water Resources Water Quality	Continued inputs of pollutants, localized flooding and continued wetlands impacts would result in a long-term minor to moderate adverse impacts.	Earthwork would result in negligible to minor, short-term adverse impacts on water quality. Culvert repair, replacement or installation would result in localized, short-term minor to moderate adverse effects combined with long-term minor to moderate beneficial effects by increasing water flow and decreasing the potential for clogged culverts and localized flooding. Rehabilitation of affected areas would result in short- and long-term negligible to moderate beneficial effects on sediment retention, thereby improving water quality. The importation of fill and surfacing materials would result in some beneficial and some adverse effects, both slowing and speeding the passage of water through affected areas. New paving, as well as improvements such as those above Lake Helen, would also result in localized, long-term negligible to moderate beneficial effects by decreasing sedimentation, therefore improving water quality.
Water Resources Water Quality Impact Summary	Cumulative: 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. The No Action Alternative would contribute negligible to minor localized inputs to cumulative impacts. With the Preferred Alternative, there would be short-term, localized negligible to moderate, adverse effects on water resources during construction and long-term, negligible to moderate beneficial effects during operations. Overall, water resources would likely benefit from the Preferred Alternative. Conclusion: The No Action Alternative would continue to contribute negligible to minor localized adverse effects on water resources. The Preferred Alternative would employ construction storm water management mitigation measures to control erosion and sedimentation during construction, and coupled with improvements in water collection and conveyance would result in short-term negligible to moderate localized effects and long-term	

Impact Topic	*No Action Alternative*	*Preferred Alternative*
	minor to moderate beneficial effects. There would be no impairment of water resources under either alternative discussed in this Environmental Assessment.	
Water Resources Wetlands	Although no new wetlands impacts would occur, there would continue to be negligible to minor, long-term adverse effects. At Kings Creek and Dersch Meadow, there would continue to be long-term, minor to moderate adverse impacts.	Under the proposed project, 0.028 acres of wetlands would experience permanent effects and 0.123 acres would experience temporary effects, for a total wetlands impact of 0.151 acres. Of the wetlands impacted, only those at Kings Creek Meadow (0.001 acre), Kings Creek Culvert (0.012 acres) and Dersch Meadow (0.040) would be considered jurisdictional (subject to wetlands permitting under the U.S. Army Corps of Engineers administration of the Clean Water Act). In addition, the following non-jurisdictional areas would be impacted to the degree shown (includes temporary and permanent impacts): Manzanita Creek Culvert 0.012 acres Hat Creek Box Culvert 0.025 acres Lost Creek Box Culvert 0.018 acres Unnamed Culverts 0.420 acres These wetlands impacts would occur in areas previously impacted by road construction activities and fall under an excepted action in NPS compliance with the executive order on the protection of wetlands.
Water Resources Wetlands Impact Summary	Cumulative: Overall, in comparison to the total park area originally containing wetlands, the extent of cumulative impacts has been localized and negligible to minor (ranging to moderate or major effect where dams have been constructed). The contribution of the No Action or Preferred alternatives to these effects would be both negligible in terms of both beneficial and adverse effects. Conclusion: While the No Action Alternative would not affect new wetlands, it would continue to contribute to negligible to minor (ranging to moderate at Dersch Meadow) long-term localized adverse effects throughout the park where water flow is impeded by poorly constructed or maintained culverts, drainage ditches and other water conveyance devices. Under the Preferred Alternative, approximately 0.028 acres of wetlands would be affected permanently (placement of riprap or other fill material) and 0.123 acres of wetlands would experience temporary effects (primarily removal of vegetation) from construction activities, for a total of 0.151 acres of wetlands affected. There would be no impairment of wetlands or wetland values as a result of either alternative.	
Water Resources Water Quantity	There would be no additional use of water under this alternative.	There would be a minor to moderate localized effect on water quantity from the use of water to aid in dust control and execution of the proposed road rehabilitation project.
Water Resources Water Quantity Impact Summary	Cumulative Impacts: Water is withdrawn throughout the park in small quantities to supply visitor and administrative needs, including for campgrounds, picnic areas, restrooms and other activities. The use of this water has occurred from the establishment of the park. The small additional use of water to keep dust down on the roadway, and to facilitate the implementation of the road project would add incrementally to the use of water for visitor and administrative uses. Conclusion: The limited use of water from Kings Creek, Manzanita Lake or the park's domestic water supply to control dust and to aid in road project implementation would have a minor to moderate adverse effect on water quantity, but would not impair the park's ability to provide water or the natural systems where that water would otherwise be present.	
Vegetation	Routine maintenance and minor repairs would	The application of grading treatments and curve widening would result in negligible to minor localized

Impact Topic	No Action Alternative	Preferred Alternative
	continue to result in long-term negligible adverse effects on vegetation. Depending on the severity of catastrophic road failure, impacts would range from minor to moderate and would likely be long-term but localized.	adverse impacts, coupled with long-term minor to moderate beneficial effects from restoration. Indirect effects from discouragement of visitor use following restoration would also add long-term negligible to minor beneficial effects. The removal of trees and other incidental vegetation during rehabilitation of minor developed areas, roadside ditches and culverts would result in localized long-term negligible to moderate adverse impacts. Reestablishment of plants following these activities would constitute a negligible long-term beneficial effect.
Vegetation Impact Summary	Cumulative: Impacts from past and future actions, in combination with the impacts of the No Action Alternative, would result in negligible adverse cumulative effects on vegetation over the long-term. Both the Preferred and the No Action alternatives would have a negligible to minor, localized and long-term adverse contribution to the total cumulative effect on vegetation in the park, while the Preferred Alternative would also have long-term negligible to minor localized beneficial effects. Conclusion: The No Action Alternative would have long-term, but localized, negligible to minor adverse effects on vegetation from ongoing repairs in the road corridor that affect vegetation. The Preferred Alternative would also have a series of adverse effects on vegetation, primarily from the removal of that vegetation to construct needed repairs. These effects would range from negligible to minor and would be localized and long-term. This Alternative, however, would also have complementary long-term localized beneficial effects on vegetation from the restoration of approximately 6 hectares (2.42 acres) of disturbed road shoulders and pullouts, resulting in negligible to minor effects, depending on the location. There would be no impairment of vegetation or values related to it from the implementation of either alternative.	
Wildlife	Ongoing repair and routine maintenance of the road would result in periodic noise and human presence that would have short-term, localized negligible to minor impacts on wildlife. Continued use of the road would continue to result in noise and mortality of wildlife. Catastrophic road failure could result in additional short-term minor to moderate noise and disturbance, as well as localized habitat removal.	Noise and activity associated with construction would be concentrated in various locations throughout the project area, constituting a short-term, negligible to minor impact on wildlife presence in the project area. Excavation and other earth disturbing activities could result in mortality of some some animals and invertebrates, and continued use of the road would continue to result in disturbance and mortality of wildlife, resulting in negligible, but long-term adverse effects. The negligible loss of vegetation would result in an incremental, long-term negligible effect on wildlife. Importation of fill materials could result in negligible, long-term adverse effects. Restoration of gravel pullouts would result in long-term negligible to minor, localized beneficial effects, increasing plant cover and adding incrementally to wildlife habitat.
Wildlife Impact Summary	Cumulative: 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. Actions proposed under the No Action Alternative or the Preferred Alternative would contribute a negligible long-term adverse effect, as well as negligible to minor beneficial effects from habitat restoration along road shoulders and pullouts from the latter alternative. Conclusion: The No Action Alternative would have short-and long-term negligible to minor adverse impacts from retention of the roadway and from minor repairs to it. The Preferred Alternative would result in short-term negligible to moderate adverse impacts from noise and disturbance associated with the rehabilitation project and long-term negligible to minor beneficial impacts from increasing plant cover associated with changing the condition of road shoulders and pullouts. There would be no impairment of wildlife under either alternative.	
Special Status Species	There would be no additional impacts (no effect) to special status species under the implementation of the No Action Alternative.	There would be no effect on special status species under the implementation of the Preferred Alternative.

Impact Topic	*No Action Alternative*	*Preferred Alternative*
Special Status Species Impact Summary	Cumulative: 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 neither alternative would affect special status species, there would be no contribution to cumulative effects on these species. 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 either alternative discussed in this Environmental Assessment.	
Prehistoric and Historic Archeological Resources	There would be no additional impacts (no effect) on known archeological resources as a result of the implementation of the No Action Alternative. Although routine maintenance and minor repairs have the potential for uncovering archeological resources, mitigation measures would ensure that there would be no adverse effect on these resources should they be found.	Potential for finding previously unidentified archeological resources would be increased, however work is taking place in previously disturbed areas and surface surveys for archeological resources will be completed prior to the project's initiation. Therefore, because mitigation measures would be employed, there would be no adverse effect on archeological resources.
Archeological Resources Impact Summary	Cumulative: Archeological resources along the Lassen Volcanic National Park Highway and elsewhere in the park have been adversely impacted 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. There would be no construction-related contributions to cumulative impacts from the no-action alternative. There is a slight possibility; however, that future proposed work or landslides could affect unidentified cultural resources. Because of mitigation measures, the Preferred Alternative would also not be expected to contribute to cumulative effects on archeological resources. Conclusion: The proposed actions under the No Action or Preferred Alternative would have no adverse effect on and would not impair park archeological resources or the values for which they have been protected.	
Ethnography (Including Impact Summary)	There would be no additional impacts to, no cumulative effects from, and no impairment of known ethnographic resources as a result of the implementation of either alternative.	
Historic Structures/ Cultural Landscapes	This alternative would result in not rehabilitating the Lassen Volcanic National Park Highway, a road eligible for the National Register of Historic Places. As a result, there would be ongoing deterioration of the road and its associated structures, unless another comprehensive rehabilitation effort or specific measures to preserve historic culverts and headwalls or other contributing structures was undertaken. Initially there would be no effect on the road, however, over time benign neglect could result in a short-term adverse effect on the road's eligibility for the National Register as its historic features deteriorated.	Taken together, modifications to the historic roadway, pullouts, culverts and culvert headwalls and other features of the cultural landscape, which would adhere to the Secretary's Standards (including with respect to the design of new features and reconstruction of existing historic features using historic materials to the degree possible) would have no adverse effect on historic structures or the eligibility of the Lassen Volcanic National Park Highway as a cultural landscape. Proposed actions would result in the retention of historic designed features of the road that planners envisioned and that have contributed to visitor enjoyment dating from the historic period.
Historic Structures/ Cultural Landscapes Impact Summary.	Cumulative: The impacts from past actions in combination with the impacts of the no-action alternative would continue to result in impacts on historic structures and cultural landscapes but would, if conducted in the manner described herein, with recognition and consultation regarding the significance of the cultural landscape would have no adverse effect on the eligibility of these resources for the National Register of Historic Places. If however, under the No Action Alternative, the road was allowed to continue to deteriorate, there could be an adverse cumulative effect on the road as an historic resource and cultural landscape.	

Impact Topic	*No Action Alternative*	*Preferred Alternative*
	Conclusion: The No Action and Preferred alternatives would ultimately result in no adverse effect to or impairment of the Lassen Volcanic National Park Highway or the values for which it has been preserved.	
Visitor Experience ***Visitor Access/ Opportunities***	Continuing deterioration of the road could result in road closures for emergency repairs and unsafe driving conditions for visitors and park staff, a long-term minor to moderate adverse impact. Catastrophic road failure could result in short-term, minor to major impacts of park visitors.	Road rehabilitation would result in short-term, negligible to moderate adverse effects on visitor access as visitors are directed around or unable to visit certain areas. At the conclusion of the project, there would be increased opportunities for visitors, especially those with mobility problems or large vehicles to access the park. New interpretive opportunities would complement the aesthetics of the improved road, resulting in both minor beneficial and adverse effects on visitor access and opportunities. Negligible effects could occur as a result of the obliteration of some pullouts.
Visitor Experience Safety	Not rehabilitating the road could fail to meet one objective of the road's use – that is to provide a safe road condition for all travelers and to reduce the possibility of catastrophic road failure. Current roadway problems, such as, settling, pavement cracking, and slumping are being caused by weather conditions and the age of the road. These conditions will continue to cause similar distress if stabilization repairs are not implemented. This could result in a long-term negligible to moderate adverse impact on visitor and employee safety.	Long-term minor to moderate beneficial effects would be realized from rehabilitating the road, improving minor developed areas, directional signage and improved pullouts/recovery zones and road shoulders. These changes would result in minor to moderate improvements to visitor safety, lessening confusion and improving the ability of visitors to enjoy accessing these areas. Negligible to minor beneficial impacts would result from improvements associated with further separating pedestrians and vehicles in the access of day use areas.
Visitor Experience Impact Summary	Cumulative: Because the roadway would continue to deteriorate, the No Action Alternative would continue to contribute to a potential long-term minor to moderate adverse impact on visitor access and opportunities and a negligible to moderate adverse impacts on visitor safety, while the Preferred Alternative would have some short-term negligible to minor adverse effects on visitor access and an array of negligible to moderate beneficial effects on visitor access and opportunities and visitor and employee safety. Conclusion: The proposed rehabilitation under the Preferred Alternative would result in negligible to moderate adverse, primarily short-term, effects on visitor access, opportunities and safety and negligible to moderate beneficial effects on access, opportunities and safety. Improvements to the roadway would compensate for the short-term inconvenience to visitors and would result in a better road for many years. There would be no impairment of the visitor experience as a result of the proposed project under Alternative 2.	
Park Operations	This alternative would not result in comprehensive improvements to the Lassen Volcanic National Park Highway and would result in minor to moderate, long-term adverse effects on park operations. Without a comprehensive project that would improve the road, opportunities to improve visitor access to minor and major developed areas also would not occur and would result in ongoing difficulties for park managers in maintaining these areas. Impacts to park resources, including wetlands, opportunities for social trails to persist, and vegetation damage would continue, increasing the need for restoration efforts. Incremental effects on the character of the road as the Lassen Volcanic National Park Highway would continue, potentially altering the ability of the park to retain some character defining features of the	Systematic improvements (visitor, resource, safety, and others) to the main park road and associated minor and major developed areas would result in long-term improvements that would constitute a minor to moderate beneficial effect on park operations. Until the deterioration of such resources began anew, the park would realize benefits from systematic improvements related to water conveyance and improved visitor access and opportunities, resulting in long-term negligible to minor to moderate beneficial effects.

Impact Topic	*No Action Alternative*	*Preferred Alternative*
	road and therefore possibly jeopardizing the road's eligibility for inclusion on the National Register of Historic Places as a cultural landscape.	
Park Operations Impact Summary	Cumulative: The No Action Alternative would contribute a minor, long-term, adverse increment to total cumulative effects on park operations (drawing time and money away from the management of other park resources to maintain an ever deteriorating roadway), while the Preferred Alternative would initially result in an easy to maintain roadway before once again contributing to increased expenditures for maintenance as the road deteriorated, ending its service life before repairs were needed once again. Conclusion: The No Action Alternative would have a minor, long-term, adverse effect on park operations. Under the Preferred Alternative, visitors would be inconvenienced during road repairs, but the road would remain open and access to the park would continue over the long-term. The Preferred Alternative would have primarily long-term beneficial negligible to minor impacts, benefiting park cultural and natural resources by enhancing their preservation and enhancing visitor safety and visitor enjoyment while reducing the need for day-to-day maintenance. Neither would impair park operations.	

A. Soils

Alternative 1

Under the No Action Alternative, there would be few impacts to soils except in the event of road failure. Routine, ongoing maintenance of the road surface could involve shoulder work and ditch maintenance and would affect soils. As a result, soils could be mixed, removed, moved and replaced. These actions would likely occur as a result of annual and or cyclic maintenance or repair needs and except in the case of annual maintenance actions would occur widely spaced over time, constituting a long- term, negligible adverse impact. In the event of catastrophic road failure, soils would be disturbed and erosion and sedimentation could occur and affect areas down slope from the road, resulting in short and long- term minor to moderate adverse effects, depending on the severity and extent of the road failure.

Alternative 2

The following specific actions called for by this alternative would affect soils:

- Pavement rehabilitation and new paving application in former gravel parking areas and pullouts and widened curves or road alignment changes
- Replacement/construction of restroom walkways at Lake Helen Picnic Area, Kings Creek Picnic Area and the Devastated Area; construction of trail steps at the Kings Creek Falls; and construction of the pathway through the island at Hat Lake Parking Area.
- Creation of accessible interpretive exhibits or trailhead features at Kings Creek Falls, Summit Lake North Campground, Hot Rock, Sunflower Flat and Chaos Jumbles (excavation, grading and surfacing)
- Application of grading treatments for road shoulder rehabilitation and pullout construction, rehabilitation and obliteration, and placement of riprap (excavation, fill placement and compaction, berm construction, grading – general and ditch creation, procurement and placement of barrier rocks, scarification for restoration)
- Culvert cleaning, removal, replacement and installation, and installation of a trench drain in the Lassen Peak Parking area (excavation and fill placement and compaction)
- Construction of a drystack rock wall in the Lassen Peak Parking area and a concrete core wall with stone veneer at Kings Creek Falls Trailhead (excavation, fill placement and compaction and wall construction)

- Formal utilization of catch basin across from Lassen Peak Parking Area (water storage)
- Removing vegetation, including trees and stumps (excavation)
- Hydromulching, hand seeding or planting as well as the salvage or importation of topsoil and the salvage of duff during rehabilitation or restoration
- Materials staging and spoils deposition
- Use of borrow material from within and outside the park

Under this Alternative, soils would be affected over the length of the road rehabilitation project, wherever excavation and/or fill is called for, as well as in the following specific areas, where excavation or grading would occur: Lake Helen Parking Area, Lassen Peak Parking Lot, Kings Creek Culvert and Picnic Area, Kings Creek Falls Trailhead, Summit Lake Trailhead, Dersch Meadow, Hat Creek, Devastated Area, Sunflower Flat and Chaos Jumbles, however much of this soil disturbance would be limited within the existing road prism (area affected by original road construction activities).

Soil excavated during construction would be retained for use on the roadway or in the grading treatment areas. During excavation and grading, soils would be mixed, moved, and replaced, causing a minor to moderate, localized but long- term, adverse effect to the area's soil profiles, with the greater degree of impact occurring in the limited areas not previously disturbed by the construction of existing cut and fill slopes.

Moving, covering, trampling, and compaction of soils by equipment and workers within the construction work zone would also occur, however, a majority of soils in the project corridor have been previously disturbed by road- related development activities (e.g., maintenance and construction). Localized soil compaction would temporarily decrease soil permeability, change soil moisture content, and lessen its water storage capacity. Because of planned scarifying during restoration, these actions would constitute a negligible to minor, short- term adverse effect on soils.

During pavement rehabilitation and new paving application along the 21.7 mile (34.9 kilometer) length of the roadway project, in former gravel parking areas and pullouts and in widened curves or areas where the road alignment is changed, soils would be excavated, mixed and replaced, with fill materials, including aggregate base added where needed to ensure a smooth finished road surface. Paving would include asphalt milling and compaction, base and sub- base excavation (as needed), fill placement and compaction, and surfacing as appropriate to ensure a smooth finished road surface. This would constitute a long- term negligible localized adverse effect on soils, much of which have been previously disturbed by original road construction and repaving efforts since park establishment.

Replacement and/or construction of restroom walkways at Lake Helen Picnic Area, Kings Creek Picnic Area and the Devastated Area; construction of trail steps and a pedestrian walkway/interpretive trailhead at the Kings Creek Falls; and construction of the pathway through the island at Hat Creek Parking Area would result in excavation and removal of soil to create the walkways, resulting in a negligible long- term localized adverse effect on soils.

Application of grading treatments for road shoulder rehabilitation and pullout construction, rehabilitation and obliteration, and placement of riprap (excavation, fill placement and compaction, berm construction, grading – general and ditch creation, procurement and placement of barrier rocks, scarification for restoration would cover approximately 6 hectares (2.42 acres). In some cases, topsoil would be removed, stored and replaced; in others soils would be graded, then excavated for placement of boulders or excavated, then bermed. Scarification (ripping) of soils to decrease compaction would occur wherever restoration treatments are prescribed (primarily in obliterated or reduced pullouts). Ditching would consist of creating or recreating ditches that run alongside the road to ensure clear passage for water flow during rain and snow melt. Together these activities would constitute a localized minor to moderate long- term adverse effect on soils. Upon successful seeding and replanting, there would also be

a long- term minor to moderate beneficial effect as the growth of plants and their return of nutrients and water holding capacity to soils in restored areas resulted in less erosion and more stable roadsides.

With approximately 60 culverts slated for cleaning, and 42 for headwalls installation or repair, and 29 for riprap installation, there would also be excavation of soils at culvert ends to ensure clear passage for water flow during rain or snowmelt. An estimated 50- 235 square feet (4.64- 21.84 square meters) would be affected at each location, depending on the size of the culvert and other needed rehabilitation work. The installation of new culverts (primarily at Dersch Meadow) and replaced culverts would also result in an additional 15,000 cubic yards (11,500 cubic meters) of soil excavation. Installation of a trench drain in the Lassen Peak parking area would result in some additional excavation (13 cubic yards or 10 cubic meters) and fill. Construction of rock walls at Lassen Peak and Kings Creek Falls Trailhead would also result in 350 cubic yards or 270 cubic meters of soil excavation, respectively to create a foundation for wall placement. Together these actions would constitute a negligible to minor localized adverse effect on soils.

Aggregate, asphalt and some soil would likely come from commercial sources, resulting in a need to ensure clean fill materials to prevent contamination of the park soils through weed seed or other unwelcome additives. Where disturbed, slopes would be sculpted to provide a natural appearance to emulate the surrounding terrain and blend with landscape. Mulch and seed would also be applied to the reclaimed areas. This would constitute a negligible to minor localized long- term and beneficial effect on soils.

The following avoidance, minimization and mitigation measures would limit effects on area soils:

- reuse of excavated material to construct berms or to use in leveling areas of impact;
- revegetation through seeding or planting of road shoulders and obliterated pullouts (using soil additives where appropriate or needed);
- construction of natural appearing undulating berms and scattered random rock placement in obliterated pullouts and/or wide road shoulders; and
- importation of weed- free specified clean fill.

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 to both beneficial and adverse impacts to soils. Because most of the park continues to be undisturbed by human impacts and 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 above actions, together with the impacts of the No Action or Preferred alternative, would continue to result in minor adverse cumulative impacts to soils in the park. The No Action Alternative would contribute a negligible, long- term, adverse increment to total cumulative effects on soils, while the Preferred Alternative would contribute a localized negligible to moderate adverse and negligible to moderate beneficial impacts on park soils, which would both be disturbed and restored under this alternative.

Conclusion: The No Action Alternative could have long- term negligible and short- term minor to moderate impacts on soils. The implementation of the Preferred Alternative would result in localized negligible to moderate adverse and negligible to moderate beneficial effects on area soils, which would be compacted, altered, removed, moved, mixed, replaced and rehabilitated. Approximately 16,570 cubic yards (12,670 cubic meters) of soil and earth would be removed from the project site for subexcavation, select borrow, and earthwork. Approximately 850 cubic yards or 650 cubic meters of fill material would be needed. Approximately 6 hectares (14.8 acres) of disturbed ground would be restored and revegetated

following construction and mitigation would include adding soil amendments as needed in areas that would be replanted. Surfacing, scarifying, rehabilitation, and revegetation efforts 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 resources as a result of the proposed actions described in this Environmental Assessment.

B. Water Resources

1. Water Quality

Alternative 1

Existing impacts on water resources would continue under the No Action Alternative. In addition to petroleum products deposited onto the road surface from passing vehicles and picked up during rain and snowmelt, there could be localized flooding due to undersized, damaged, or clogged culverts, and from poor drainage conditions under affected roads. Poor drainage under the roadway and localized flooding could also contribute to a catastrophic road failure. In that case, it is likely that disturbed soil and sediment would be carried into the nearby streams and adversely impact water quality. This condition would constitute a long- term, minor to moderate, adverse impact.

Alternative 2

The following specific actions called for by this alternative could affect water quality:

- Construction or rehabilitation of landscape features, such as paving gravel parking areas and roads, constructing rock walls, curbing, compacted roadside ditches, walkways; placement of barrier stones; etc.
- Excavation, grading, vegetation removal, scarification and other soil moving activities for road repair, shoulder rehabilitation and for pullout modifications, construction and obliteration/restoration
- Culvert cleaning, replacement, removal and installation
- Redirecting water flow as needed for general culvert replacement and specifically for the Kings Creek Culvert, Dersch Meadow culvert installation, Lost Creek Box Culvert and Manzanita Creek headwall replacement.
- Regrading and redirecting water flow near the north wing wall of the Hat Creek Box Culvert
- Work near water, including that near unnamed snowmelt drainages, intermittent or perennial creeks along the main park road and other access roads.
- Not following construction best management practices during periods of wet or snowy weather.
- Plant salvage and planting within Kings Creek (Kings Creek Culvert)
- Construction of a-riprap protected slope in Dersch Meadows.
- Hydromulching and importation of fill materials (aggregate, topsoil, barrier and headwall stone, etc.
- Reconstruction of the Lassen Peak Parking Area exit culvert and direction of that water into a catch basin
- Removal of asphalt walkway near the Summit Lake North Campground registration kiosk
- Removal of asphalt curbing throughout the proposed project

The greatest impacts to water resources would be from the potential erosion of graded or bermed areas, especially those located near streams or lakes, during the first rains following construction (sediment transported offsite during uncontrolled storm water runoff), although these impacts would be naturally limited by the high porosity of the park's volcanic soils, resulting in little erosion or transport (Johnson personal comm. 2004). Other areas sensitive to erosion would include earth stockpiled during construction. Still other potential impacts could occur from spills of fluids or petroleum products during refueling or maintenance operations within construction areas.

Earth work would include: construction or rehabilitation of landscape features; excavation, grading, vegetation removal and scarification for pullout and shoulder work; and culvert cleaning, replacement, removal and installation. This work could constitute a negligible to minor short- term adverse impact on water quality.

Work in or near water would include culvert work at several unnamed intermittent or perennial creeks (see Table 2 below in *Wetlands* section); and re- directing water flow as needed for Kings Creek Culvert, Dersch Meadow culvert installation and construction of over steepened riprap edge, Lost Creek Box Culvert and Manzanita Creek headwall replacement; regrading and redirecting water flow near the north wing wall of the Hat Creek Box Culvert; and other work near water, including that near unnamed snowmelt drainages, intermittent or perennial creeks along the main park road, Summit Lake, and Manzanita Lake. These actions could result in localized inputs of sediment to their associated water bodies, constituting localized short- term minor to moderate adverse effects. Cleaning out, replacing and installing new culverts and hardening some drainage system components by the placement of riprap or headwalls, however would have long- term minor to moderate beneficial effects on water resources by improving water flow throughout the proposed project area, thereby limiting the potential for catastrophic road failure to result in major sedimentation impacts. These projects could therefore have short- term minor to moderate adverse impacts during construction, and minor to moderate beneficial impacts once construction is complete.

Short- term negligible to minor beneficial effects would result from hydromulching, which would add nutrients to typically nutrient poor volcanic soils and aid in retaining water and soil for plant establishment. Restoration efforts throughout the project area resulting in plant establishment would have a long- term negligible to moderate beneficial effect on sediment retention by increasing plant cover and, over time, soil fertility as plants grow and decompose, eventually also increasing the water holding capacity of the soil.

The importation of fill materials (aggregate, topsoil, barrier and headwall stone, etc.) would result in some beneficial and some adverse effects – with the use of aggregate adjacent to the roadway acting as a sediment trap to retain pollutants before they are transported into groundwater and the use of barrier stones, asphalt and other impervious surfacing treatments increasing the speed of runoff and accelerating the pace at which pollutants, including sediments enter nearby water bodies.

The proposed project will not only repave existing paved areas, but will also add paving in nearly 9,900 square meters or 2.5 acres for new paved pullouts and parking areas, resulting in both short- and long- term beneficial and adverse effects on water quality. As noted above, impervious surface treatments would increase the speed of runoff. This effect would, however, be countered by grading new parking areas and pullouts so that water flow is directed into areas that may filter pollutants, including directing culvert and sheet flow into vegetated areas, before entering nearby creeks or lakes. New paving would also, however, have a long- term minor to moderate beneficial effect on decreasing sedimentation in these same areas because formerly gravel parking areas and pullouts would be paved. This would result in a long- term negligible to moderate beneficial effect on water quality, particularly in the vicinity of Lake Helen and Summit Lake as well as near Kings Creek.

Reconstruction of the Lassen Peak Parking Area exit culvert and direction of that water into a catch basin would result in a long- term minor beneficial effect on water quality at Lake Helen. Whereas runoff from parking area snowmelt currently courses down the main road and then via groundwater flow into Lake Helen, holding that water in a catch basin would slow its transport and allow filtration of pollutants prior to reaching groundwater and Lake Helen.

To minimize the potential for water quality impacts to occur, the following Best Management Practices (BMPs) would be used during (and submitted and approved prior to) construction:

- Using temporary sediment control devices such as filter fabric fences, sediment traps, or check dams as needed during culvert replacement.
- Covering stockpiled soil and rock throughout the duration of the project with semi-permeable matting or plastic or another type of erosion control material.
- Minimizing soil disturbance and re- seeding or revegetating disturbed areas as soon as practical.
- Retaining silt fencing in disturbed areas until stabilization by reseeding or revegetation.
- Using swales, trenches, or drains to divert storm water runoff away from disturbed areas.
- Locating staging areas away from areas where water would runoff to adjacent rivers and streams.
- Tackifier/paper mulch may be used for erosion control in revegetated areas. Elsewhere, silt fences and seed- free curlex logs may be used for erosion control.
- Contractor must submit an erosion control plan and storm water pollution prevention plan (required by California Water Quality Control Board).
- Turbidity (a measure of water quality) would be monitored upstream and downstream from project activities and actions taken upon unacceptable readings.

Cumulative Impacts: Other visitor use and facilities in the park and project area contribute to sediments 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. The No Action Alternative would contribute negligible to minor localized inputs to cumulative impacts. With the Preferred Alternative, there would be short- term, localized negligible to moderate, adverse effects on water resources during construction and long- term, negligible to moderate beneficial effects during operations. Cumulative impacts could result if erosion and sedimentation measures are not controlled following construction (i.e., during earth disturbance construction activities or by improving drainage systems) but would not otherwise be present. Overall, water resources would likely benefit from the planned road project.

Conclusion: The No Action Alternative would continue to contribute negligible to minor localized adverse effects on water resources. The Preferred Alternative would employ construction storm water management mitigation measures to control erosion and sedimentation during construction, and coupled with improvements in water collection and conveyance would result in short- term negligible to moderate localized adverse effects and long- term minor to moderate beneficial effects. There would be no impairment of water resources under either alternative discussed in this Environmental Assessment.

2. Wetlands

Alternative 1

No new wetlands impacts would occur under the implementation of this Alternative. There would, however, continue to be negligible to minor long- term adverse effects throughout the park where water flow would continue to be impeded by unimproved or plugged culverts, poorly maintained or constructed roadside ditches, and other inadequate water conveyance devices. In addition, at Kings Creek Meadow and Dersch Meadow there would continue to be long- term minor to moderate adverse impacts to these palustrine emergent wetlands as a result of the existence of the park road and (in the case of Kings Creek Meadow) visitor parking on the meadow itself. Some culverts would also be subject to catastrophic washout as a result of the inadequacy of the size or location or footings of culverts and culvert headwalls.

Alternative 2

The following specific actions called for by this alternative would affect delineated wetlands in the project area:

- Kings Creek Culvert (Picnic Area) replacement and road widening;
- Kings Creek Meadow Culvert Replacement;
- Dersch Meadow culvert installation and replacement and riprap construction;
- Summit Lake Ranger Station Access Road culvert replacement and road widening;
- Lost Creek Box Culvert repair;
- Hat Creek Box Culvert repair; and
- Manzanita Creek headwall replacement.

In addition there would likely also be some disturbance of wetlands associated with some unnamed culverts due to end cleaning, replacement and headwall or riprap installation or repair. For the impacts noted below, wetlands delineation maps from Lassen Volcanic National Park were derived from aerial photos and ground- truthed using GPS in the field (Koenig 2004B). Installation of silt fencing would occur approximately two feet outside wetland boundaries. The installation area is included in the figures given below (for temporary impacts).

The following table identifies wetland areas that would be impacted by the proposed road rehabilitation project. Permanent adverse effects include the loss of wetland soils and vegetation when they are replaced by compact aggregate fill or riprap. Temporary adverse effects would include the loss of existing vegetation and would be temporary because vegetation, particularly low herbaceous grasses and grass-like plants, would readily reestablish in these areas following disturbance and because it would not change the degree of effectiveness of the culvert, and would remain unless future project work requires its removal (such as in cyclic culvert maintenance work). Temporary adverse effects could also include some sedimentation around culvert ends from placement of silt fencing to protect areas outside the limits of construction. The potential range of these effects is as identified for each area below.

Table 2: Potential Wetland Impacts

Carter Burgess
Proj. No. 070589.145

Lassen Volcanic N.P.
Wetlands Impacts

CA PRA LAVO 10(2)
NPS PMIS No.: 54565

Station Location	Side	Area of Impacts (sq. meters)			Other Description
		Permanent	Temporary	Combined	
Main Park Road					
28+777	Lt.		10.19	10.19	culvert outlet
28+867	Lt.		12.09	12.09	culvert outlet
29+050	Lt.		7.97	7.97	culvert outlet
30+045	Lt.		7.45	7.45	culvert outlet
30+288	Lt.	0.43	5.57	6.00	Kings Creek Meadows
30+362	Lt.		16.92	16.92	culvert outlet
30+415	Lt.		14.37	14.37	culvert outlet
30+656	Lt.		21.84	21.84	culvert outlet
37+132	Rt.		4.64	4.64	culvert outlet
38+028	Rt.		14.51	14.51	culvert outlet
38+086	Lt.	2.08	10.16	12.24	Dersch Meadows - culvert
38+086	Rt.	0.69	4.12	4.81	Dersch Meadows - culvert
38+126	Lt.	5.87	8.91	14.78	Dersch Meadows - culvert
38+150	Lt.	6.51	8.53	15.04	Dersch Meadows - culvert
38+125 to 38+156	Rt.	31.12	23.61	54.73	Dersch Meadows - culvert/rock slope
38+183	Lt.	4.87	9.18	14.05	Dersch Meadows - culvert
38+188	Rt.	13.50	3.86	17.36	Dersch Meadows - culvert
38+220	Lt.	6.63	8.55	15.18	Dersch Meadows - culvert
38+220	Rt.	8.73	6.80	15.53	Dersch Meadows - culvert
39+074	Rt.		11.57	11.57	
39+230	Rt.		16.87	16.87	
40+967	Lt.		27.37	27.37	Hat Creek box culvert inlet
40+967	Rt.		73.13	73.13	Hat Creek box culvert outlet
45+450	Lt.		50.27	50.27	Lost Creek box culvert inlet
45+450	Rt.		24.04	24.04	Lost Creek box culvert outlet
Kings Creek Picnic Area					
5+305 to 5+309	Rt.	2.46	5.16	7.62	Kings Creek Culvert
5+303 to 5+309	Lt.	10.25	6.46	16.71	Kings Creek Culvert
5+311 to 5+316	Rt.	5.12	8.57	13.69	Kings Creek Culvert
5+311 to 5+315	Lt.	5.67	2.96	8.63	Kings Creek Culvert
Summit Lake Ranger Station - Access Rd.					
5+084	Rt.	4.16	11.82	15.98	Culvert outlet
5+084	Rt.	5.12	12.44	17.56	Culvert inlet
Manzanita Lake Culvert					
0+275	Lt.		23.60	23.60	Manzanita Creek culvert inlet
0+275	Rt.		23.60	23.60	Manzanita Creek culvert outlet
Subtotals (sq. meters)		113.21	497.13	610.34	
Subtotals (hectares)		0.011	0.050	0.061	
Subtotals (acres)		0.028	0.123	0.151	

Kings Creek Picnic Area: To extend and to construct new headwalls for the culvert located just below the junction of the main park road and the picnic area road, wetland areas on either side of the road would be affected. The perennial Kings Creek flows through these culverts. There would be 394 feet (120 meters) of under drain constructed approximately 1,640 feet (500 meters) down the road. A second set of culverts (24 inches or 600 mm and 36 inches or 900 mm), located where Kings Creek crosses the road would be replaced with a structural plate bottomless box culvert and the road widened slightly. This would result in 502 square feet (23.5 square meters of permanent impacts and 23.15 square meters) of disturbance for the culvert replacement and road widening. The two existing corrugated metal pipe culverts would be replaced. Stone masonry headwalls and wing walls would complete the construction. Together these actions would result in .012 acre of disturbance and would constitute a negligible to minor localized long-term adverse effect. Disturbed areas would be replanted using plants salvaged from the construction area and stored in the Kings Creek on sandbars and by planting willow cuttings taken from the area, resulting in a long- term negligible beneficial effect.

Unnamed culvert inlets/outlets: Wetland impacts would occur at a total of 13 additional culverts where inlet and outlet cleaning and/or repairs would result in a total of 0.42 acres (171.96 square meters) of impact. Impacts at each culvert would, however vary from 0.001 acres (4.64 square meters) to 0.005 acres (21.84 square meters). This would constitute a negligible long- term localized adverse effect.

Kings Creek Meadow: Culvert replacement would result in 0.001 acres (6 square meters), most (60 square feet) of which would be temporary impacts, resulting in a temporary negligible to minor adverse effect. Long- term negligible to moderate beneficial effects would be realized from the removal of dispersed parking from the meadow.

Dersch Meadow: The installation of five 18 inch (450 mm) culverts (including two- end headwall construction) and extension/replacement of one (30 inch or 750 mm) culvert, as well as road widening (from 9- 11 foot travel lanes or 3.3- 4.0 meters) and the construction of a road- retaining steepened rock fill slope would result in 0.040 acres or 163.72 square meters of disturbance in delineated wetlands. Road widening would occur within the disturbed footprint of the road (including paving of gravel shoulders), while the installation of the culverts and retention wall would require new excavation. The five culverts would be from 32- 33.5 feet or 9.7- 10.2 meters in length. While the installation of these features would have a minor localized long- term adverse effect, they would immediately begin to correct cross- flow impacts in Dersch Meadow that have been present since the road was constructed, resulting in a minor to moderate long- term beneficial effect as water begins to pass under the road at these locations. This would likely eventually result in changed vegetation patterns on the south side of the road that had been altered by the drier conditions present as a result of the road and now contain lodgepole pines.

Summit Lake Ranger Station: Replacement of an 18 inch (450 mm) culvert in the wetland and removal of lodgepole pines along the road berm where it traverses the Summit Lake wetland would result in 0.008 acres (33.54 square meters) of disturbance. Although delineated wetlands exist in the vicinity of the paving of the parking area, none would be disturbed by this or other construction activity work at the site. Work at the site would result in both short- and long- term, localized negligible adverse effects to Summit Lake wetlands.

Lost Creek: Removal of a 12 inch (300 mm), 16 foot (5.0 meter) long corrugated metal pipe culvert from the top of the slope and repair of the concrete headwalls at Lost Creek as shown in the above table would result in 0.018 acres (74.31 meters) of temporary wetland impacts, a short- term, negligible adverse effect.

Hat Creek: Excavation to stabilize the box culvert wing wall slope and work to repair structural damage, cracking and spalling on the concrete culvert headwalls would affect Hat Creek. Approximately 13 cubic yards (9.93 cubic meters) of material would be excavated and replaced by riprap adjacent to the wing wall. This would result in 0.025 acres (100.5 square meters) of temporary wetland impacts. Headwall repair would not require excavation, but would require diversion of the creek to work in dry conditions. This

would constitute a minor, localized short and long- term adverse effect to wetlands previously disturbed by the construction of this concrete box culvert.

Manzanita Creek: Approximately 0.012 acres of wetlands (47.2 square meters) would be disturbed by the installation of stone headwalls for this culvert which, like other culvert activities where perennial water flow occurs, would require temporary diversion of the creek to allow replacement work to be completed in dry conditions. This would constitute both a negligible short and long- term localized adverse effect.

Cumulative Impacts: Wetlands and riparian areas 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 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 ~~level~~ 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 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 effect where dams have been constructed). The contribution of the No Action or Preferred alternatives to these effects would be both negligible in terms of both beneficial and adverse effects.

Conclusion: While the No Action Alternative would not affect new wetlands, it would continue to contribute negligible to minor (ranging to moderate at Dersch Meadow) long- term localized adverse effects throughout the park where water flow is impeded by poorly constructed or maintained culverts, drainage ditches and other water conveyance devices. Under the Preferred Alternative, approximately 0.028 acres of wetlands would be affected permanently (placement of riprap or other fill material) and 0.123 acres of wetlands would experience temporary effects (primarily removal of vegetation) from construction activities, for a total of 0.151 acres of wetlands affected. Mitigation for wetland disturbance would include: salvage and replanting of vegetation, where appropriate, including at Kings Creek culvert, and construction of drainage improvements (such as culvert end cleaning) so that vegetation recolonization could occur. These wetlands impacts would occur in areas previously impacted by road construction activities and fall under an excepted action in NPS compliance with the executive order on the protection of wetlands, which allows for maintenance of existing structures (such as culverts) along with new impacts that enhance wetlands if they cause little permanent impact (0.1 acre). Under the NPS Wetlands Procedural Manual, "actions designed specifically for the purpose of **restoring** degraded (or completely lost) natural wetland, stream, riparian, or other aquatic habitats or ecological processes. For purposes of this exception, "restoration" refers to reestablishing environments in which natural ecological processes can, to the extent practicable, function at the site as they did prior to disturbance. Temporary wetland disturbances that are directly associated with and necessary for implementing the restoration are (also) allowed under this exception." There would be no impairment of wetlands or wetland values as a result of either alternative.

3. Water Quantity

Alternative 1

There would be no additional use of water under this Alternative.

Alternative 2

To aid in dust control and execution of the proposed road rehabilitation project, water from Kings Creek, could be used. Near the north entrance, water may be pumped from the Manzanita Lake Boat Ramp (with a 7 mm or smaller screen located on the intake to prevent fish from entering the pump). Up to

10,000 gallons (37,850 liters) of water could be used per day from the park's domestic water system between June and August from any of the fire hydrants in the Manzanita Lake Developed Area. In addition, a raw water supply through a two inch diameter pipe could be provided from the Southwest Water Treatment Plan (approximately 2,500 gallons over 20 minutes).

The use of this water would have little effect on the water supply in either Kings Creek or that in the park's domestic water supply. The culverts at Kings Creek will be modified under the current project. Water used from Manzanita Lake would have no discernible effect on the level of water in that lake. Use of water from the domestic water supply is permissible because the supply of water for this system has repeatedly proven to be far greater than demand. In addition, there is sufficient supply for domestic needs as well as for fire fighting.

Cumulative Impacts: Water is withdrawn throughout the park in small quantities to supply visitor and administrative needs, including for campgrounds, picnic areas, restrooms and other activities. The use of this water has occurred from the establishment of the park. The small additional use of water to keep dust down on the roadway, and to facilitate the implementation of the road project would add incrementally to the use of water for visitor and administrative uses.

Conclusion: The limited use of water from Kings Creek, Manzanita Lake or the park's domestic water supply to control dust and to aid in road project implementation would have a minor to moderate localized adverse effect on water quantity, but (like Alternative 1) would not impair the park's ability to provide water or the natural systems where that water would otherwise be present.

C. Vegetation

Alternative 1

Under the No Action Alternative, continual minor repairs and maintenance to the Lassen Volcanic National Park Highway would be necessary. These activities may include repairs in the shoulder areas and drainage ditches, which could result in the removal or disturbance of vegetation. This would be a long- term negligible impact. In the event of a catastrophic road failure, depending on the location and severity of the failure, adverse impacts to vegetation could range from minor to moderate in intensity, and be long- term in duration, depending on the nature of the repair (for example, from new fill placed in fill slope to riprap that replaces fill slope) and the degree of revegetation implemented, but would likely be localized.

Alternative 2

The following specific actions called for by this alternative would affect vegetation:

- Application of grading treatments (grading, berms and barrier stone placement) for road shoulder rehabilitation and pullout construction, rehabilitation and obliteration; and curve widening
- Revegetation treatments, including scarification, hydromulch application, hand seeding and planting, topsoil, duff salvage and reuse
- Incidental vegetation loss associated with roadside ditch line construction and rehabilitation; culvert cleaning, replacement, extension and installation; construction of the rock walls at Lassen Peak Trailhead and Kings Creek Falls Trailhead; and removal of vegetation along road shoulders and vegetation in the way of pullout reshaping or construction.
- Removal of trees at:
    - Lake Helen Picnic Area [two clumps of trees with approximately 12 small mountain hemlocks (2- 4 inches or 50- 100 mm) in one and eight mountain hemlocks (2- 6 inches or 50- 150 mm) in the other];
    - Kings Creek Meadow pullout [several small lodgepole pines (2- 4 inches or 50- 100 mm)]);
    - Kings Creek Picnic Area [one lodgepole pine (est. 12 inches or 300 mm)];

    - Kings Creek Falls Trailhead [two mountain hemlocks (est. 12 and 18 inches or 300 and 450 mm respectively and one red fir (est. 36 inches or 900 mm)];
    - Summit Lake Trailhead Road and Parking Area [15- 20 small lodgepole pines (1- 3 inches or 25- 75 mm)];
    - Dersch Meadow [numerous small lodgepole pines (2- 4 inches or 50- 100 mm)]; and
    - Hat Creek Box Culvert [one small lodgepole pine (est. 6 inches or 150 mm)].
- Staging and spoils deposition; and the
- Importation of fill, including asphalt, aggregate, mulch, erosion control devices, barrier stone and other materials.

Although there is very little vegetation along most road shoulders and in most pullouts in the project area, the application of grading treatments in these areas and curve widening would result in the negligible to minor localized loss of some herbaceous plants and shrubs, as well as a number of small trees. With the application of the treatments and their included vegetation restoration measures, there would be a long-term minor to moderate beneficial effect as these disturbed areas regained their former vegetative cover from revegetation treatments such as scarification, hydromulching, hand seeding and planting and topsoil and duff salvage and reuse. Over time, revegetation would result in a more natural appearance of the edge of the roadway as it passed through the park's various plant communities. As contrasted with the revegetated pullouts and shoulders, the paved pullouts resulting from the proposed project would become more obvious places for visitors to stop and the consequent results of stopping in former gravel pullouts (such as the creation of social trails emanating from these with their concurrent loss of vegetation) would be reduced and vegetation would begin to reestablish, resulting in an additional long-term indirect, negligible to minor, beneficial impact.

Numerous actions associated with the proposed project, including ditch line construction and rehabilitation, culvert cleaning, replacement, extension and installation, staging and spoils deposition also would result in the temporary loss of small amounts of vegetation, resulting in a minor adverse impact as the loss of competition on nutrient poor mineral soil increased the probability for non- native plants to invade and allowed for the dispersal of new or existing weed seed. As noted above (under *Wetlands*) much of this vegetation would be likely to reestablish following construction. As a result, roadside ditches, culvert ends and other areas would once again become lined with low- growing herbaceous vegetation, which would generally be allowed to remain, although cyclic removal of woody vegetation in these same areas would continue to occur. This would result in long- term negligible to minor adverse and beneficial effects.

Trees to be removed at Kings Creek Meadow (new pullout), Lake Helen Picnic Area, Summit Lake Trailhead Access Road, Dersch Meadow and Hat Creek Box Culvert are almost exclusively trees that have grown up since road and developed area construction. Most are quite small (up to about three inches in diameter and growing in clusters. Those at Dersch Meadow and the Summit Lake Access Road would not be there without the roads in those locations, which have created drier conditions for non- wetland associated trees (lodgepole pines). The removal of these trees, some of which may return, would constitute long- term negligible to minor localized adverse impacts on vegetation.

Some of the very large trees that would be removed from the Kings Creek Picnic Area, Kings Creek Falls Trailhead, and Summit Lake Parking Lot, however, are trees that were apparently purposely left during road construction, when park roads were constructed to be narrower and did not accommodate the large vehicles and volume of visitors now routinely present during the busy season. Removal of the trees at the Kings Creek Picnic Area and Summit Lake Parking Lot is necessary to accommodate the turning radius of large vehicles, and to make it possible for two standard size vehicles to pass each other when traveling in opposite directions. Removal of the trees at the Kings Creek Falls Trailhead will accommodate the construction of the rock wall, interpretive trailhead kiosk and pedestrian walkway. The removal of these trees would constitute a long- term, localized minor impact on vegetation.

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

Impact Avoidance, Minimization and Mitigation Strategies

- Equipment (including hydroseeder) used in the project would be cleaned prior to use in the park. This measure has been effective in preventing the invasion of exotic plants as a result of the first phase of the road project.
- The contractor would control exotic species prior to importing materials from quarries or borrow areas outside the park.
- No straw mulch would be used for erosion control.
- Tree wells or other protection would be used around trees to be retained, especially those that are within or directly adjacent to the limits of construction.
- A monetary damage clause for impacts to trees/vegetation not within the project area would be part of the contract for road rehabilitation.
- Fill materials 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 of silt fencing or other barriers as appropriate and would be returned to pre- construction conditions upon completion of the proposed project.
- Only native species, appropriate to the site would be used in revegetation (seeding or planting).
- Salvage of topsoil and duff would occur in and adjacent to the rehabilitated shoulders and pullouts as appropriate, subject to approval from park staff.
- Salvage of vegetation would occur to the degree possible; staff time and need permitting, however most plants would be propagated from seed collected within each plan community along the road where revegetation is needed.

Cumulative Impacts*:* Much of the area that the road traverses through is rocky, exposed and relatively devoid of forested vegetation. Volcanic eruptions of Lassen Peak in 1914 and 1915 destroyed over three square miles (640 acres) of forestland. 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, or 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 the No Action Alternative, would result in negligible adverse cumulative effects on vegetation over the long- term. Both the Preferred and the No Action alternatives would have a negligible to minor, localized and long- term adverse contribution to the total cumulative effect on vegetation in the park, while the Preferred Alternative would also have long- term negligible to minor localized beneficial effects.

Conclusion: The No Action Alternative would have long- term, but localized, negligible to minor adverse effects on vegetation from ongoing repairs in the road corridor that affect vegetation. The Preferred Alternative would also have a series of adverse effects on vegetation, primarily from the removal of that vegetation to construct needed repairs. These effects would range from negligible to minor and would be localized and long- term. This Alternative, however, would also have complementary long- term localized beneficial effects on vegetation from the restoration of approximately 6 hectares (14.8 acres) of disturbed road shoulders and pullouts, resulting in negligible to minor effects, depending on the location. There would be no impairment of vegetation or values related to it from the implementation of either alternative.

D. Wildlife

Alternative 1

Ongoing work to repair the park road (including crack sealing, asphalt overlays, etc.) would cause periodic noise and human presence that would have short- term negligible to minor impacts on wildlife presence. Continued use of the road would also result in some continued noise and mortality impacts from vehicle wildlife collisions. If catastrophic road failure occurred, wildlife habitat would be altered, water quality in nearby streams could be degraded, and longer- term noise associated with reconstruction of the roadway could result in additional short- term minor to moderate impacts on wildlife.

Alternative 2

The following specific actions called for by this alternative would affect wildlife:

- Above ambient noise and activity and emissions associated with project implementation (noise: asphalt grinding, tree removal, heavy equipment use) in staging area, along road corridor and in minor developed areas.
- Conversion of some highly disturbed road shoulders, pullouts and other areas to pavement or rehabilitation.
- Removal of a small number of trees and other changes in vegetative cover.
- Importation of fill materials.
- Restoration activities leading to plant establishment.

In general, there would be few impacts to wildlife since no intact habitat areas would be disturbed and construction would occur in areas previously impacted by road and developed area construction. There would, however, be above ambient noise and activity during project implementation. Road repair would also coincide with the visitor use season, when some of the heaviest traffic occurs on the main park road. The noise and activity associated with the construction would be similar to the noise and disruption of visitor traffic in the vicinity of the proposed project area. This activity, however, would be concentrated in various locations throughout the visitor use season. As a result, wildlife 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, deer, and squirrels might also be seen throughout the day. Since these impacts would be localized alongside an already highly modified road corridor and in the park's minor developed areas, and a great deal of suitable habitat for wildlife would continue to be present in the vicinity, these impacts would be short- term and negligible to minor.

The excavation needed to repair various portions of the road would likely result in some disturbance and elimination of small mammals and invertebrates not able to move quickly away from the project site. In addition, there would continue to be wildlife vehicle collisions on the road as a result of normal use. Because speed limits change variously through the project area and minor alignment changes would not be expected to result in faster speeds, the potential for these collisions would remain the same as in the No Action Alternative, resulting in a negligible long- term adverse effect on wildlife use in the project areas.

Habitat modification (including food and cover) as a result of the proposed implementation of the project (with some isolated vegetation removal and some tree removal) 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. Therefore, among the habitat loss would be a long- term localized negligible incremental loss of a few trees that were used for perching or food.

Road work in some areas also has the potential to cause sedimentation in adjacent or nearby aquatic habitat, should best management practices fail. Sedimentation can have negative consequences on fish

and amphibian species occurring in, and downstream of, areas where sedimentation occurs. Impacts to wildlife would be minor and short- term, having no lasting effects beyond the revegetation period.

The importation of fill materials has the potential to result in changes in the microbial composition of the soil, thereby altering its utility or viability for some unknown organisms. Because no topsoil would be imported and because this effect would not be as likely to occur from the importation of gravel, small and large rocks, this effect would be unlikely to occur and would be negligible.

Finally, as a result of the restoration of former gravel pullouts and road shoulders, there would be a long-term negligible to minor, localized, beneficial impact in increasing plant cover and therefore habitat for some species of wildlife.

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. Actions proposed under the No Action Alternative or the Preferred Alternative would contribute a negligible long- term adverse effect, as well as negligible to minor beneficial effects from habitat restoration along road shoulders and pullouts from the latter alternative.

Conclusion: The No Action Alternative would have short- and long- term negligible to minor adverse impacts from retention of the roadway and from minor repairs to it. The Preferred Alternative would result in short- term negligible to moderate adverse impacts from noise and disturbance associated with the rehabilitation project and long- term negligible to minor beneficial impacts from increasing plant cover associated with changing the condition of road shoulders and pullouts. There would be no impairment of wildlife under either alternative.

E. Special Status Species

Alternative 1

There would be no additional impacts (no effect) to special status species under the implementation of the No Action Alternative.

Alternative 2

Note: Occurrence and impact information is presented in the Affected Environment section and the effects summarized below.

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 neither alternative would affect special status species, there would be no contribution to cumulative effects on these species.

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 either alternative discussed in this Environmental Assessment.

F. Prehistoric and Historical Archeology

Alternative 1

There would be no additional impacts (no effect) on known archeological resources as a result of the implementation of the No Action Alternative. Routine, ongoing maintenance of the road prism (area affected by road construction activities) would not result in additional ground disturbance. Future road failure, if the road remained in poor condition would, however, have the potential for disturbing previously unknown or undiscovered archeological resources. Because the discovery of these resources would employ mitigation measures noted below in Alternative 2 and because it is unlikely that archeological resources would be discovered in this way, there would be no adverse effect.

Alternative 2

The following specific actions called for by this alternative could affect previously unidentified prehistoric or historic archeological resources:

- Ground disturbing activities, including excavation, grading, vegetation removal, and scarification for road repair, shoulder rehabilitation and for pullout construction and obliteration/restoration.

The potential for affecting previously unidentified archeological resources would be reduced somewhat by the completed and ongoing survey of the project area for archeological resources. During surveys conducted to date, no resources have been found. No prehistoric archeological resources have previously been located in the project area that are eligible for or listed on the National Register. There are, however, historic archeological resources that are present in the vicinity of the proposed project area, but that would remain unaffected by proposed project work under this Alternative. These include the Nobles Emigrant Trail crossing and a water flume in the vicinity of Crags Campground. Isolated archeological resources, such as the Old Boundary Spring CCC Camp also exist in the vicinity but would not be affected by the proposed actions. To ensure that no undetected archeological resources would be affected, project work would not commence in unsurveyed areas until initial surveys are complete and documented.

If prehistoric or historic archeological resources were discovered during any portion of the proposed action, work in the area associated with the find would cease until evaluated by the park archeologist or designated representative. If necessary or possible, relocation of the work to a non- sensitive area would occur to enable more site testing and documentation. Every effort would be made to avoid further disturbance to the site. If relocation could not occur, then mitigation would include exhaustive documentation of the site to appropriate standards based on consultation with the State Historic Preservation Officer and other experts as applicable.

Cumulative Impacts: Archeological resources along the Lassen Volcanic National Park Highway and elsewhere in the park have been adversely impacted 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. There would be no construction- related contributions to cumulative impacts from the no- action alternative. There is a slight possibility; however, that future proposed work or landslides could affect unidentified cultural resources. Because of mitigation measures, the Preferred Alternative would also not be expected to contribute to cumulative effects on archeological resources.

Conclusion: The proposed actions under the No Action or Preferred Alternative would have no adverse effect on and would not impair park archeological resources or the values for which they have been protected.

G. Ethnography

Alternative 1 and Alternative 2

There would be no additional impacts to, no cumulative effects from, and no impairment of known ethnographic resources as a result of the implementation of either alternative.

H. Historic Structures/Cultural Landscapes

Alternative 1

This alternative would result in not rehabilitating the Lassen Volcanic National Park Highway, a road eligible for the National Register of Historic Places. As a result, there would be ongoing deterioration of the road and its associated structures, unless another comprehensive rehabilitation effort or specific measures to preserve historic culverts and headwalls or other contributing structures was undertaken. Therefore, initially, there would be no effect on the preservation of the road or its associated components as historic structures or the whole of these as a cultural landscape. As noted in the recent Cultural Landscape Inventory (NPS CLI 2001), without attention soon, it is likely that the culvert headwalls will lose integrity. Over time, benign neglect could result in adverse effects to these and other resources, including catastrophic failure of portions of the road or its associated structures. It is unlikely; however, that these effects would continue unchecked because the road is itself critical to visitor use and enjoyment of Lassen Volcanic National Park and therefore would likely continue to be the target of ongoing rehabilitation efforts to keep it in good condition. Regardless, without systematic preservation of the features that contribute to its significance, such as historic culvert headwalls, these could continue to deteriorate and some features could eventually be lost to that deterioration. The No Action Alternative could result in an adverse effect to but would likely not result in impairment of the Lassen Volcanic National Park Highway or the values for which it has been preserved.

Alternative 2

The following specific actions called for by this alternative could affect historic structures and/or cultural landscapes:

- Reducing and/or removing pullouts and constructing new pullouts by constructing new features along roadway (scattered random boulder and berm treatments);
- Replacing/removing culverts and culvert headwalls, and installation of new culverts and culvert headwalls;
- Curve widening, road widening and other changes in alignment of the road (see also cultural landscapes below);
- New feature construction in historic developed areas (rock walls, parking lot modifications, etc.); and
- Removing asphalt curbing and other non- historic features.

Of the approximately 92 pullouts that now exist on the section of the Lassen Volcanic National Park Highway proposed for project work under this alternative, 29 would be retained and 63 would be obliterated using a variety of roadside rehabilitation techniques (see Grading Treatments in Alternative 2 description). Another four would be constructed. Although rocks and other measures, including revegetation, have historically been used to deter parking along roadsides, the extent to which they would be employed in the current project surpasses any documented use. (Barrier rocks were first used along the road at lookouts and at switchbacks between Diamond Point and Lassen Peak between 1971 and 1973 (NPS CLI 2000/14). Nonetheless most (22 of 25) of the paved pullouts would be retained and another would be added to replace two removed near Kings Creek Meadow, while most (53 of 60) gravel pullouts would be removed. While information on whether the pullouts to be removed are historic is unknown

and cannot be obtained due to lack of documentation associated with their construction and use, based on their location, the pullouts that are being retained are likely the ones both designed and used to facilitate visitor access to the key features of the Lassen Volcanic National Park Highway, including trailheads, viewpoints and minor developed areas. Those being removed, on the other hand, are ones that are likely to have been created over time by repetitive visitor use and maintenance operations. Retaining the noted pullouts is consistent with the design intent of the road, while removing those that have been haphazardly created over time by driver non- compliance or other actions associated with maintaining the road is also consistent with the design intent. None of the pullouts to be removed are associated with either trailheads or significant viewpoints noted in the Cultural Landscape Inventory. As a result, pullout modifications are consistent with the Secretary's Standards and would have no adverse effect on the eligibility of the road as an historic designed landscape on the National Register.

Of the approximately 165 culverts identified in the project area, 4 would be removed (including 2 headwalls) and 7 new culverts would be installed. Another 30 would undergo headwall construction (43 headwalls) to match those with historic headwalls and new 29 riprap aprons would be constructed. Of the 165 culverts, 13 have existing rock (drystack) headwalls and 40 have existing stone (mortared) headwalls. Three headwalls proposed to be reconstructed (see below) are considered to have integrity to the historic period. Culvert modifications, including adding rock facing on headwalls and wingwalls, are consistent with other road rehabilitation projects that have occurred over time on the Lassen Volcanic National Park Highway. Because rock facing would employ the same materials as the historic rock facing and because due to differences in modern mortar would look different from the historic rock facing, it is consistent with the historic design intent of the road and would have no adverse effect on the eligibility of the road as a historic designed landscape on the National Register.

Nine existing culvert headwalls would be reconstructed, as part of work to either replace deteriorated culvert pipes or extend pipes to the toe of the fill bench, or for the specific purpose of repairing failing headwalls.

Headwall location	Masonry type	Historic integrity	Condition
Station 22+307 R	Grouted split stone	No	Poor
Station 29+822 L	Dry-stacked rubble	No	Poor
Station 30+045 L	Dry-stacked rubble	No	Fair
Station 31+147 L	Grouted split stone	Yes	Good
Station 31+147 R	Dry-stacked rubble	No	Fair
Station 32+895 L	Grouted split stone	No	Poor
Station 47+019 L	Dry-stacked rubble	No	Poor
Station 48+605 L	Grouted split stone	Yes	Fair
Station 50+458 L	Grouted split stone	Yes	Good

Minor alignment changes, including curve widening in three places, and the changes in the vicinity of Lake Helen, Kings Creek Trailhead and Dersch Meadow, would result in slight modifications to the road's original alignment. In addition, there would be some-minor construction of new features in developed areas considered part of the cultural landscape. Because these changes would primarily be made within the original road prism (area affected by road construction activities) and because there are historic precedents for gentling curves and making slight changes in alignment documented in the cultural landscape report, these changes would have no effect on the road as a historic structure or its contribution to the cultural landscape and are consistent with road rehabilitation projects during the historic period.

Removing asphalt curbing and other non- historic features would result in a slight beneficial effect on the road as a historic structure and the roadway as a cultural landscape.

Taken together, the above changes, which would adhere to the Secretary's Standards (including with respect to the design of new features and reconstruction of existing historic features using historic materials to the degree possible) would have no adverse effect on historic structures or the eligibility of the Lassen Volcanic National Park Highway as a cultural landscape. Proposed actions would result in the retention of historic designed features of the road that planners envisioned and that have contributed to visitor enjoyment dating from the historic period.

Cumulative Impacts: The historic Lassen Volcanic National Park Highway and contributing features have sustained previous loss or alteration as a consequence of repairs and modern improvements (e.g. road improvements in the 1960s, major repairs in the 1980s and 1990s, as well as rehabilitation of the first section of the Lassen Volcanic National Park Highway). The impacts from past actions in combination with the impacts of the no- action alternative would continue to result in impacts on historic structures and cultural landscapes but would, if conducted in the manner described herein, with recognition and consultation regarding the significance of the cultural landscape would have no adverse effect on the eligibility of these resources for the National Register of Historic Places. If however, under the No Action Alternative, the road was allowed to continue to deteriorate, there could be an adverse cumulative effect on the road as an historic resource and cultural landscape.

Conclusion: The No Action and Preferred alternatives would ultimately result in no adverse effect to or impairment of the Lassen Volcanic National Park Highway or the values for which it has been preserved.

J. Visitor Experience

1. Visitor Use Access/Opportunities

Alternative 1
Continuing deterioration of the road could result in road closures for emergency repairs and unsafe driving conditions for visitors and park staff, a long- term minor to moderate adverse impact. Road closures would be more likely to be complete and to affect periods of high visitation. This could result in visitors either not being able to access an area during their visit or in longer term area closures while funding and materials were secured for repairs. In the event of a catastrophic road failure, access through the park could be seriously affected for either short time periods or longer if the road could not be repaired in a single construction season before winter snows close the road. Visitors might not be able to access certain areas or might experience long detours, such as driving around the park on state highways to access northern and southern points of interest in the park. This short- term impact would range in intensity from a minor to major, depending on the severity of the road failure.

Alternative 2
The following specific actions called for by this alternative would affect visitor access and opportunities to experience park resources:

- Overall rehabilitation of the main park road and associated minor and major developed areas
- Construction delays
- Installation of accessible parking spaces/walkways at Lake Helen, Kings Creek Picnic Area, Lassen Peak Parking Lot, Hat Creek, Summit Lake Ranger Station, and Devastated Area, and accessible interpretive exhibits at Hot Rock, Sunflower Flat, and Chaos Jumbles pullouts and designation of large vehicle parking Lake Helen, Lassen Peak, and Kings Creek Picnic Area
- Rehabilitation of Summit Lake South and North Campground parking areas
- Reducing, removing and installing new pullouts

The rehabilitation of the road, in general, and of specific areas, such as the Summit Lake South and North Campground parking areas and the Summit Lake Trailhead Parking Lot would result in long- term

negligible to minor beneficial effects on visitor access through a variety of means, including constructing smoother roadways, with clearer signage and pullouts and eliminating confusion associated with features no longer used.

As a result of the road rehabilitation, summer park visitors would encounter one- lane road closures with construction delays of up to 30 minutes during the week. On weekends and holidays, construction would cease unless occasional approval for work on these days was granted by the superintendent. The project would take approximately 2- 3 seasons to complete and would likely begin in 2006. Work that would affect major visitor use areas would be scheduled at the end of the season to avoid impacts to the greatest number of people. Materials deliveries would take place in the early morning and late evening hours to minimize their impact and would proceed along the shortest route possible. Park visitors would be informed of construction delays through various means, including the park newspaper, press releases to local media, signs in the park and state highway information road condition (phone) reports. There would be short- term, negligible to moderate adverse effects on visitor access as a result of the road construction.

Visitor access and especially opportunities for visitors with walking difficulties or those with large vehicles would be improved by the rehabilitation (including paving or repaving and striping) of parking lots to include large vehicle and handicapped accessible parking spaces, as well as accessible walkways. On the whole visitors would find clearer parking access from the paving of now largely gravel parking areas. Although the space allotted to parking would be reduced at areas such as Lake Helen, large vehicle parking and accessible parking spaces would both be improved at Lake Helen, Lassen Peak and Kings Creek Picnic Area, while handicapped spaces would also be improved at all officially designated parking lots, including Hat Lake and the Devastated Area. Accessible restroom walkways would be created or improved at Lake Helen, Kings Creek Picnic Area, Lassen Peak Parking Lot, Hat Lake, Devastated Area, and Summit Lake Ranger Station, and accessible interpretive waysides would be created or improved at Kings Creek Falls Trailhead, Hot Rock, Sunflower Flat and Chaos Jumbles pullouts. These actions would result in minor beneficial effects on visitor access and opportunities.

Changing the configuration of pullouts would result in negligible to minor adverse and beneficial effects on visitor access and opportunities. Overall, visitors would find fewer pullouts along the roadway, but remaining pullouts would be paved and would be close to areas where most visitors would want to leave the main roadway to take in views or to take advantage of minor developed areas. Repeat visitors could also find some favorite pullouts obliterated, however those that access formal trails and viewing areas would remain.

2. Visitor and Employee Safety

Alternative 1

Not rehabilitating the road could fail to meet one objective of the road's use – that is to provide a safe road condition for all travelers and to reduce the possibility of catastrophic road failure. Current roadway problems, such as, settling, pavement cracking, and slumping are being caused by weather conditions and the age of the road. These conditions will continue to cause similar distress if stabilization repairs are not implemented. Catastrophic failures of this road have occurred in the past, causing closures, incurring expenses, threatening safety and health, and increasing traffic on portions of the park's road system. Failure to correct structural and design deficiencies would result in an increased potential for accidents. If the roadway is not repaired it will continue to deteriorate and likely continue to result in relatively higher accident rates and/or catastrophic failures that may impact other park resources. This could result in a long- term negligible to moderate adverse impact on visitor and employee safety.

Alternative 2

The following specific actions called for by this alternative could affect visitor and/or employee safety:

- Pavement rehabilitation
- Pullout and road shoulder improvements
- Sign replacement
- Road widening at Kings Creek Picnic Area, Summit Lake Trailhead parking and Dersch Meadows
- Installation of walkway at Kings Creek Falls Trailhead
- Installation of rock wall at Lassen Peak
- Constructing one- way loops and/or paving and striping parking areas at Lake Helen, Kings Creek Picnic Area, Lassen Peak Parking Lot, and Summit Lake Trailhead
- Installation of left turn lane at Lake Helen

The proposed project under the preferred alternative would contain a number of improvements to visitor safety. Among these would be the rehabilitation of the road itself, which would result in a smoother, more uniform travel width for vehicles as well as clearer directional signage and improved pullouts/recovery zones and road shoulders. Overall, visitors would find a safer road, wider in some places (Kings Creek Picnic Area, Summit Lake Trailhead Access Road and Dersch Meadows), with fewer tight radius curves and improved way- finding signage and features. The paving of parking areas at Lake Helen, Kings Creek Picnic Area and Summit Lake Trailhead would result in obvious pull- in and large vehicle parking and turnarounds and reduce confusion about which way to go. These changes would result in minor to moderate improvements to visitor safety, lessening confusion and improving the ability of visitors to enjoy accessing these areas.

Installation of the walkway at Kings Creek Falls Trailhead would separate visitors and vehicles and reduce slope cutting travel hazards. Construction of the rock retaining wall at the Lassen Peak parking area would also reduce slope cutting. Both would result in negligible to minor beneficial impacts to visitor safety. In the same way, constructing a left turn lane at Lake Helen would result in long- term moderate beneficial effects on park visitors by eliminating the sight distance/blind curve problems now associated with using this area.

As with most road projects visitor could experience travel delays of up to 30 minutes. Evening, weekend and holiday work/construction delays or total road closures could also occur with permission of the superintendent. After the primary visitor use season (after Labor Day), the following areas would be closed to allow needed work to take place prior to snow fall:

- Kings Creek Picnic Area,
- Manzanita Lake Access Road, and
- Summit Lake North and South campgrounds.

Lake Helen would be closed for approximately three weeks during the primary visitor use season (during the week) but would be open on Saturdays and Sundays during this time.

Cumulative Impacts: The majority of park visitation occurs along the main park road, where most of the park's recreational facilities and interpretive displays are found. Over time, new facilities (limited by the current developed footprint) could continue to be added or old facilities improved, resulting in negligible to minor adverse and beneficial cumulative impacts. Because the roadway would continue to deteriorate, the No Action Alternative would continue to contribute to a potential long- term minor to moderate adverse impact on visitor access and opportunities and a negligible to moderate adverse impacts on visitor safety, while the Preferred Alternative would have some short- term negligible to minor adverse effects on visitor access and an array of negligible to moderate beneficial effects on visitor access and opportunities and visitor and employee safety.

Conclusion: The proposed rehabilitation under the Preferred Alternative would result in negligible to moderate adverse, primarily short- term, effects on visitor access, opportunities and safety and negligible to moderate long- term beneficial effects on access, opportunities and safety. Improvements to the roadway would compensate for the short- term inconvenience to visitors and would result in a better road

for many years. There would be no impairment of the visitor experience as a result of the proposed project under Alternative 2.

K. Park Operations

Alternative 1

This alternative would not result in comprehensive improvements to the Lassen Volcanic National Park Highway and would therefore continue to cost the park an average of approximately $50,000 per year to maintain the road, including the ongoing and increasing need for emergency repairs to remedy failed sections of roadway. Asphalt deterioration, warped pavement, pavement cracking, spalling on the edge of the road and potholing would increase. Without a comprehensive project that would improve the road, opportunities to improve visitor access to minor and major developed areas also would not occur and would result in ongoing difficulties for park managers in maintaining these areas due to poorly laid out parking areas, difficulties in providing handicapped access to facilities and the likelihood of continuing accidents or incidents associated with the deteriorating condition of these areas. Impacts to park resources, including wetlands, opportunities for social trails to persist and increase (such as at Kings Creek Falls Trailhead and the hillside adjacent to the Lassen Peak Parking Lot), and vegetation damage would continue, increasing the need for restoration efforts.

The management of melt- out at the Lassen Peak Parking Lot would continue to result in a rush of sediment- laden water toward Lake Helen, over the surface of the road, rather than through appropriate drainage channels, continuing to result in the potential for damage to this section of the road and continuing to result in ongoing short- to long- term adverse effects on the road surface and or drainage structures.

Incremental effects on the character of the road as the Lassen Volcanic National Park Highway would also continue to occur, potentially altering the ability of the park to retain some character defining features of the road and therefore possibly jeopardizing the road's eligibility for inclusion on the National Register of Historic Places as a cultural landscape.

Taken together the effects of not repairing the road would result in a long- term moderate to major effect on park operations, with annually increasing costs to maintain the road and potential failure to protect significant resources from damage.

Alternative 2

The following specific actions called for by this alternative would affect park operations:

- Overall rehabilitation of the main park road and associated minor and major developed areas (including new paving, striping, signage, drainage improvements, pullout and road shoulder rehabilitation and other actions).
- Drainage improvements, including installation of a larger culvert that allows water from the melt out of the Lassen Peak Parking Lot to flow into a catch basin
- Pullout paving, obliteration and creation
- Safety improvements, such as the installation of left turn lane at Lake Helen
- Interpretive improvements at Lake Helen, Hat Creek, Hot Rock, Sunflower Flat, Chaos Jumbles

The systematic improvements to the main park road and associated minor and major developed areas, would result in long- term improvements that would cost the park less to maintain annually, a minor to moderate beneficial effect. Instead of improvements funded out of special project or emergency funding and the annual park operations budget, improvements would be funded through the federal highways program and would be comprehensive. The project would take approximately two to four seasons to complete and would likely begin in 2006 or 2007, depending on funding availability.

Drainage improvements, including the replacement of culverts throughout this section of roadway, drainage ditch creation and cleanout, and the modification of drainage at the Lassen Peak Parking Lot, as well as the rehabilitation of the Hat and Lost Creek culverts would reduce the potential for washout or catastrophic failure at these areas and would therefore diminish future long- term costs for maintenance and emergency repairs, resulting in a long- term minor to moderate beneficial effect on park operations.

The creation, retention and obliteration of pullouts would have varying effects on park operations. Creating pullouts in more appropriate locations would result in better management of visitors, who would then stop close to points of interest, rather than trying to access those areas from areas further away and having to cross the main road or creating social trails to get to the points of interest, resulting in long- term negligible to minor beneficial effects.

Retaining and paving pullouts would aid in visitor management by enabling visitors to get to the places they want to be and by hardening surfaces so pullout widening would not occur during heavy visitor use periods, resulting in long- term negligible to minor beneficial effects on resource preservation (and the subsequent need not to restore these areas). Obliterating some pullouts and rehabilitating road shoulders would limit the amount of disturbed area available for non- native species to colonize and would, over time, result in a more vegetated roadside, thus decreasing the need for future revegetation or restoration of these disturbed areas and resulting in a long- term negligible to minor beneficial effect. Lastly, obliterating pullouts could result in a negligible to minor adverse effect on park operations by eliminating some pullouts used by slow moving vehicles or for traffic stops by park law enforcement staff.

Safety improvements to the roadway, including selected roadway widening, decreasing tight radius curves, installation of a left turn lane at Lake Helen and construction of one- way turnaround loops at various areas would result in long- term beneficial impacts to park operations by reducing the potential for accidents in these areas, therefore freeing park and law enforcement staff to do other work to preserve park resources, such as spending more time in high visitor use areas when visitors are present.

Finally, while actual interpretive improvements would be made via the implementation of the wayside exhibit plan, these improvements would be facilitated by the accessible walkway, parking and pullout improvements in this alternative, resulting in a long- term minor to moderate beneficial effect on park operations by allowing the park to disseminate interpretive messages aimed at giving visitors a better understanding of park resources and giving them the tools to better protect park resources.

Cumulative Impacts: Park operations are currently hampered by lack of adequate facilities in some areas of the park. A number of development projects (e.g. new administration and maintenance facilities and upgraded utility systems could occur within the park that would enhance the efficiency of park operations. Regardless, the efforts needed to maintain the road, over time, would remain the same, with periodic systematic rehabilitation needs. The No Action Alternative would contribute a minor, long- term, adverse increment to total cumulative effects on park operations (drawing time and money away from the management of other park resources to maintain an ever deteriorating roadway), while the Preferred Alternative would initially result in an easy to maintain roadway before once again contributing to increased expenditures for maintenance as the road deteriorated, ending its service life before repairs were needed once again.

Conclusion: The No Action Alternative would have a minor, long- term, adverse effect on park operations. Under the Preferred Alternative, visitors would be inconvenienced during road repairs, but the road would remain open and access to the park would continue over the long- term. The Preferred Alternative would have primarily long- term beneficial negligible to minor impacts, benefiting park cultural and natural resources by enhancing their preservation and enhancing visitor safety and visitor enjoyment while reducing the need for day- to- day maintenance. Neither would impair park operations.

VII. 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, FHWA, and resource professionals of the NPS Denver Service Center and 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.

A press release initiating the public scoping process and comment period was issued on March 4, 2004. No comments or questions were received as a result of issuing this press release, which was published in the following newspapers: *Chester Progressive* (3- 10- 04) and *Redding Record Searchlight* (3- 14- 04).

A series of meetings were held among Federal Land Highway Program, park and other National Park Service staff and consultants to identify project objectives and to evaluate designs for specific project components.

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 Rancheria. These five tribes were sent letters in August 2003 and in April 2004 noting the likely undertaking in the proposed project area. No comments were received.

California State Historic Preservation Office

Consultation, noting determinations of effects on cultural resources will be sent to the State Historic Preservation Office pending the release of this Environmental Assessment to determine concurrence with the determinations of effect noted herein.

U.S. Fish and Wildlife Service

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 projects.

This Environmental Assessment is available for a **thirty- day** public review period. At that time, a press release will be distributed to a list of persons, businesses and agencies that have expressed interest in Lassen Volcanic National Park proposed actions and events. The Environmental Assessment will also be mailed to local libraries, organizations and individuals that have requested to receive a copy of the EA as well as others who request copies during the review period. The Rehabilitate a Portion of the Lassen Volcanic National Park Highway Environmental Assessment will also be available on the park's website, located at http://www.nps.gov/lavo.html.

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 Chief of Maintenance, Dan Jones at (530) 595- 4444, extension 5120 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 5101.

The following people (organizations and agencies noted) were consulted and provided comments during the preparation of this Environmental Assessment:

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Appendix 1
Summary of Impact Avoidance, Minimization and Mitigation Measures

The mitigation measures listed below 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 Volcanic National Park Highway would be phased to avoid the rainy season and snow conditions, thus construction would occur over 2- 3 seasons and typically occur from May through November or December. Phasing construction is necessary due to heavy snows, which close the road during the winter and to avoid the wetter periods when road construction has the potential for adding to natural erosion and sedimentation. Other general measures include: (1) Limiting rehabilitation work within the existing road prism (area affected by road construction activities), (2) Using construction materials (design, types, and colors) that blend with the surroundings, and (3) Roughening cut and fill slopes and revegetating disturbed areas to blend with the natural environment.

The following overall strategies would be employed to minimize impacts to park resources:

- The contractor would conduct a project orientation for all workers to increase their understanding and sensitivity to the challenges of working in a national park environment. At this training, construction workers and supervisors would be informed about the sensitivity of park values, regulations, and appropriate housekeeping.
- All protection measures would be clearly stated in the construction specifications and workers would be instructed to avoid conducting activities beyond the construction zone.
- Contractor- selected non- commercial material source, staging or spoils areas not identified within this Environmental Assessment for project work would, at a minimum, prior to any use have written documentation submitted by the contractor (under the laws noted) to ensure that potential effects on rare, threatened or endangered species (Endangered Species Act), waters of the United States (Clean Water Act), or prehistoric or historic resources (National Historic Preservation Act) have been evaluated as to presence and effects of the proposed activity(ies).

The following Construction Best Management Practices (BMPs) would be used to control impacts from construction:

- Construction limits would be clearly marked with stakes prior to the beginning of ground disturbing activities. No disturbance would occur beyond these limits. Temporary construction fencing would be installed where determined necessary by FHWA and NPS.
- Vegetation and soil disturbance would be minimized to the maximum extent possible.
- Erosion control measures would include the use of some or all of the following: sediment traps, silt fencing, and check dams. Disturbed and/or stockpiled soils may be temporarily covered with straw, jute matting, and erosion control netting, or plastic sheeting.
- Waste and excess excavated materials would be stockpiled outside of drainages.
- Regular site inspections would be conducted during construction to ensure that erosion control measures remain in place and are functioning properly.
- Controls would be implemented to eliminate the discharge of pollutants into storm water and into streams, lakes reservoirs or other waters from project construction materials.
- Chemicals, fuels, and other toxic materials would be properly stored, used and disposed of.
- Construction equipment would be refueled only in upland areas only to prevent fuel spills near drainages and would be inspected for hydraulic and oil leaks regularly as well as prior to use in the park.
- The application of water would be used to control dust during land- disturbing activities.
- The asphalt batch plant would be located outside the park.

Measures specific to potential impacts on soils would include:

- Limiting work to the existing road prism (area affected by road construction activities);
- Using excavated soil from the proposed grading treatments within other grading treatments;

- Scarifying (ripping) soils to decrease compaction wherever restoration treatments are prescribed;
- Sculpting revegetated areas to blend with surrounding terrain;
- Applying hydromulch and seed or plants to areas to be restored;
- Reusing of excavated material to construct berms or to use in regrading areas of impact;
- Revegetating obliterated pullouts through seeding or planting (using soil additives where appropriate or needed);
- Constructing naturally appearing undulating berms and scattered random rock placement in obliterated pullouts; and
- Importing only weed- free specified clean fill materials.

To minimize the potential for water resources (water quality and wetlands) impacts to occur, the following Best Management Practices (BMPs) would include:

- Using temporary sediment control devices such as filter fabric fences, sediment traps, or check dams as needed during culvert replacement.
- Limiting dust formation from construction activities. Magnesium chloride would not be used; however, dust abatement may include use of a dust palliative, such as a lignin based product to reduce the amount of water used on disturbed areas.
- Covering stockpiled soil and rock throughout the duration of the project with semi- permeable matting or another type of erosion control material as needed.
- Minimizing soil disturbance and re- seeding or revegetating disturbed areas as soon as practical.
- Retaining silt fencing in disturbed areas until stabilization by reseeding or revegetation.
- Using swales, trenches, or drains to divert storm water runoff away from disturbed areas.
- Locating staging areas away from areas where water would runoff to adjacent rivers and streams.
- Using tackifier, paper mulch, silt fencing or seed- free curlex logs as needed for erosion control in revegetated areas.
- Submitting an erosion control plan and storm water pollution prevention plan (required by California Water Quality Control Board).

To minimize effects on vegetation, the following measures would be used:

- In many areas soils and vegetation are already impacted to various degrees by various human and natural activities. Construction would take advantage of these previously disturbed areas wherever possible.
- Staging areas would be protected from spillover impacts by the placement of silt fencing or other barriers as appropriate and would be returned to preconstruction conditions following use.
- Revegetation work would use topsoil conserved along the corridor and seeds of propagules from native species (genetic stock originating in Lassen Volcanic National Park).
- Sources of rock, sand, gravel, earth, topsoil or other natural material would be inspected for noxious weeds prior to use in the proposed project.
- Materials used in project work would be transported and stored so as not to acquire noxious weed seeds from adjacent areas.
- Revegetation plantings would use native species that are slower to establish naturally (e.g. red/white fir, ponderosa pine, pinemat manzanita) and would be from genetic stocks originating in the park.
- Undesirable plant species (exotics) would be monitored and control strategies implemented if such species occur.
- Soil disturbance would be minimized and revegetation of disturbed sites would follow construction.
- Construction equipment would be washed to thoroughly removal all dirt, plant and other foreign material before it is brought into the park and prior to working with or transporting weed free materials. Particular attention would be shown to the under carriage and any surface where soil containing exotic seeds may exist.
- No straw mulch would be used for erosion control.
- Tree wells, or other protection measures, would be used around trees to be retained, especially those within or directly adjacent to the limits of construction.

- Construction vehicle parking would be limited to existing roads, pullouts and parking lots, and the staging area(s).
- Aggregate would be supplied from solid rock or deep layers of quarry sites to avoid material potentially contaminated with weed seeds and to minimize the potential introduction of exotic species. Or, the contractor would control exotic species prior to importing materials from quarries or borrow areas outside the park.
- Topsoil and duff would generally be acquired from within the project area. The use of conserved topsoil would help preserve micro- organisms and seeds of native plants. The topsoil would be spread in as near the original location as possible, and supplemented with scarification, mulching, seeding, and/or planting with species native to the immediate area.
- The treatment of exotic vegetation would be completed in accordance with NPS- 13, Integrated Pest Management Guidelines.
- Salvage of vegetation would occur to the degree possible, staff time, money and need permitting.
- A monetary damage clause for impacts to trees/vegetation not within the project area would be part of the contact for road rehabilitation.

Wildlife Effects would be minimized through the following measures:
- Above ambient noises from road repair would coincide with the busy summer season.
- Evening work would not occur or would be rare, subject to specific approval from the superintendent.
- The potential for sedimentation would be avoided through the use of best management practices in work near water.
- There would be no widening of the road which would encroach on intact habitat.

Archeological, historic and cultural landscape resources conservation measures would include:
- Work in the vicinity of the Sunflower water flume and Nobles Emigrant Trail would not affect these resources.
- Project work would not commence until archeological surveys are complete and documented.
- Any contributing feature that is to be modified or removed would be documented before and after construction to HABS/HAER standards.
- Documentation of culverts and their modifications would occur prior to construction to ensure as much as possible is known about the historic culverts and headwalls 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.

The following measures would pertain to the disposition of archeological resources, should they be uncovered during 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 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 National Park Service 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.

The following measures would be taken to limit impacts on park visitors and park operations:

- Construction delays and one- lane closures would be enacted but would be no longer than 30 minutes per passage through the project.
- Evening, weekend and holiday work/construction delays or total road closures could occur with permission of the superintendent.
- 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.
- Press releases to local media, signs in the park and state highway information recordings would inform visitors about road conditions in the park during the project.
- Work that would affect or close major visitor use areas would be scheduled at the end of the primary visitor use season to avoid impact to the greatest number of people.
- Road rehabilitation would be accompanied by increased opportunities for interpretation, increased road safety features, and delineated parking, with more accessible and large vehicle parking.

Appendix 2
Proposed Pullout Modifications

Station/Name	Side of Road	Approximate Length	Anticipated Treatment	Type
21112	R	32 m	Construct	n/a
21300+	L		Remove Type 4	Gravel
21800+	L		Remove Type 4	Gravel
22168	L	30 m	Construct	n/a
22150+	R			Gravel
23004+	R		Remove Type 3	Gravel
23447	R	Match	Repave	Paved
23503	R	Match	Repave	Paved
23878	R	25	Construct	n/a
24737	R	Match	Repave	Paved
24916	R	Match	Repave	Paved
25100-	R		Remove Type 3	Gravel
25389+	L		Remove Type 4	Gravel
25641	L	45	Repave	Paved
25770	L	30	Regrade Repave	Paved
26332+	R		Remove Type 1	Gravel
26744	R	33	Repave	Paved
27368	R	17	Repave	Paved
27537+	R		Remove Type 4	Gravel
27657+	R		Remove Type 3	Gravel
27829	L	Match	Repave	Paved
28269	L	27	Repave	Paved
28627-	L		Remove Type 3	Gravel
28669-	L		Remove Type 1	Gravel
28822-	L		Remove Type 1	Gravel
28890	L	25	Reduce Repave	Paved
29138	L	Match	Repave	Paved
29562	R	28	Repave	Paved
30109	L	Match	Repave	Paved
30524	R	35	Construct	Gravel
30618	L		Construct	Paved
30669+	L		Remove	Paved
30923+			Remove Type 2	Gravel/Paved

Station/Name	Side of Road	Approximate Length	Anticipated Treatment	Type
30950+	L		Remove Type 2	Gravel
30993	R	Match	Repave	Paved
31090 Kings Creek Trailhead	L		Regrade Pave	Gravel
31090 Kings Creek Trailhead	R		Regrade Repave Pave	Gravel/Paved
31573+/-	L		Remove Type 4	Gravel
31692	R	45	Pave	Gravel
31820+	L		Remove Type 3	Gravel
31889-	R		Remove Type 4	Gravel
32204+	R		Remove Type 3	Gravel
32658+	R		Remove Type 3	Gravel
33000	R	Match	Repave	Paved
33852+	R		Remove Type 3	Gravel
34410-	L		Remove Type 4	Gravel
34460+	R		Remove Type 3	Paved
34564+	R		Remove Type 3	Gravel
34857-	R		Remove Type 4	Gravel
35295	R	Match	Regrade Pave	Gravel
35300+	L		Remove Type 3	Gravel
35900+	R		Remove Type 3	Gravel
36000+	R		Remove Type 3	Gravel
36653- Summit Lake North Entrance Road	R		Remove Type 4	Gravel
36970-	R		Remove	Gravel
37118	R	20	Repave	Paved
37167	L	Match	Repave	Paved
38600+	L		Remove Type 3	Gravel
38959-	L		Remove Type 4	Gravel
39124	R	72	Repave	Paved
39600+	R		Remove	Gravel

Station/Name	Side of Road	Approximate Length	Anticipated Treatment	Type
			Type 4	
40500+	R		Remove Type 3	Gravel
40692	R	72	Repave	Paved
41100+	R		Remove Type 3	Gravel
41243+	R		Remove Type 3	Gravel
41510	R		Retain, pave	Gravel
41652- Devastated Area	L		Remove Type 2	Gravel
42,900-	R		Remove Type 4	Gravel
43103	R	Match	Repave	Paved
43126+	L		Remove Type 3	Gravel
43460-	L		Remove Type 3	Gravel
43516+	L		Remove Type 3	Gravel
43758	L		Remove Type 4	Gravel
43758	R	50	Pave	Gravel
43861+	R		Remove Type 4	Gravel
44172+	L		Remove Type 4	Gravel
44700-	L		Remove Type 2	Gravel
44800+ Hot Rock Pullout	L		Regrade Repave	Paved/Gravel
44900+	L		Remove Type 2	Gravel
45000+			Remove Type 2	Gravel
45300-	L		Remove Type 2	Gravel
45548+/-	R		Remove Type 3	Gravel
46709-	R		Remove Type 3	Gravel
48132+	R		Remove Type 4	Gravel
48950	R		Remove Type 2	Gravel
49200+	L		Remove	Gravel
49400	R		Remove Type 2	Gravel
49500+	R		Remove Type 4	Gravel

Station/Name	Side of Road	Approximate Length	Anticipated Treatment	Type
49600-	R		Remove Type 4	Gravel
50500+	L		Remove Type 2	Gravel
50700+	L		Remove Type 3	Gravel
50800+	R		Remove Type 4	Gravel
51981- Sunflower Flats Pullout	L		Reduce Pave	Gravel
52900+	R		Remove Type 2	Gravel Loop
54087 Chaos Jumbles Pullout	R	40	Repave	Paved
54400+	L		Remove Type 4	Gravel
55200	L		Remove Type 3	Gravel
55473+	L		Remove Type 4	Gravel
55554+	L		Remove Type 4	Gravel

Appendix 3
Culvert Modifications

Culvert Name or Station	Type Size	Clean L/R	Repair /Remove HDWL	Construct Culvert or Headwalls	Remove /Realign /Extend	Construct Riprap Apron
22307 *no historic integrity*	CMP 600		Remove R	Construct new headwall R	Extend (R)	Apron R
22502	*CMP 600*	*L/R*				
22525	ALUM 1650mm arch pipe			*Construct new culvert*		Riprap
22549	*CMP 600*	*L/R*				
23064	CMP 600	L/R				
23348	*CMP 450*	*L/R*				
23922	*CMP 450*	*L*				
25005	*CMP 450*	*L*				
25562	*CMP 450*	*L*				
25694	*CMP 450*	*L/R*				
26105	*CMP 450*	*R*				
27105	*CMP 450*	*L/R*				
27479	CMP 450	L		Construct new headwall R	Remove (R) 1.2 m Extend (R) 2.0	Apron R
28330	*CMP 450*	*L/R*				
28480	*CMP 450*	*R*				
28784	CMP 600					Apron L scour hole
28867	CMP 600				Extend (L) 2.0	Apron L
29046	CMP 600	R				
29525	*CMP 450*	*Buried R*				
29705	*CMP 450*	*L*				
29822 *no historic integrity*	CMP 450		Repair L			
30045	CMP		Repair L			

Culvert Name or Station	**Type Size**	**Clean L/R**	**Repair /Remove HDWL**	**Construct Culvert or Headwalls**	**Remove /Realign /Extend**	**Construct Riprap Apron**
no historic integrity	450					
30362 ponding	*CMP 450*	*L/R*				
30415 ponding	*CMP 450*	*L/R*				
30656	*CMP 450*	*R*				
30759	*CMP 450*	*R*				
Kings Creek Falls Trailhead 31015				*Construct new headwall R*	*Construct catch basin (R)*	*Apron R*
31051	HDPE 450			Construct new culvert with headwalls L/R	Realign – outlet pipe through retaining wall	Apron R Catch basin with 4.0 m pipe
31147 *historic integrity left (not right)*	CMP 450	L/R				Apron
31220	*CMP 450*	*L*				
31325	*CMP 450*	*L*				
31673	CMP 450	R			Ditch excavation (L) 6.0 m	
31790	CMP 450			Construct new headwall R		Apron R
31901	CMP 450			Replace with longer (900 mm) culvert Construct new headwalls L/R	Remove/ Replace	Apron R
32108	CMP 450	L				
32573	UNK				Remove existing pipe in roadway (R) Backfill with aggregate	
32895 *no historic*	*CMP 450*	*L/R*	*Repair L*			

Culvert Name or Station	**Type Size**	**Clean L/R**	**Repair /Remove HDWL**	**Construct Culvert or Headwalls**	**Remove /Realign /Extend**	**Construct Riprap Apron**
integrity						
33034	*CMP 450*	*L/R*				
33402	*CMP 450*	*R*				
33975	*CMP 450*	*L*				
34630	*CMP 450*	*R*				
34762	*CMP 600*	*R*				
36193		*R*		*Construct new headwalls L/R*	*Remove w/FES's Ditch excavation (R) 15.0 m*	*Apron*
Summit Lake South Road 1 36343	CMP 450			Construct new headwalls L/R	Remove/ Replace w/FES's Ditch excavation	Apron (at outlet)
Summit Lake South Road 2 36535	CMP 450	L/R				
Summit Lake North Road 36620	CMP 300	R		Construct new culvert and headwalls L/R	Remove/ Replace (slightly smaller)	Apron
36640	*CMP 450*	*R*				
Summit Lake Trailhead Parking	*?*			*Construct new headwalls L/R*	*Remove/ Replace (smaller)*	*Apron (at outlet)*
37139 wetland	CMP 750					Apron R Scour hole
37975	CMP 450	R			Ditch excavation (R)	
Dersch Meadow 38086	HDPE 450			Construct new culvert and headwalls L/R		
Dersch 38128 wetland	HDPE 450			Construct new culvert and headwalls L/R		
Dersch	HDPE			Construct		

Culvert Name or Station	Type Size	Clean L/R	Repair /Remove HDWL	Construct Culvert or Headwalls	Remove /Realign /Extend	Construct Riprap Apron
38150 wetland	450			new culvert and headwalls L/R		
Dersch 38182	CMP 2- 750			Construct new culvert and headwalls L/R	Extend NW culvert	
Dersch 38185	HDPE 450			Construct new culvert and headwalls L/R		
Dersch 38220	HDPE 450			Construct new culvert and headwalls L/R		
38662	*CMP 450*	*L*				
38925	*CMP 300*	*R*				
39037	*CMP 450*	*R*				
39074	CMP 600	R				Apron R Scour hole
39230	*CMP 600*	*L*				
40320	CMP 450	L/R	Repair L			
40435	CMP 450			Construct new headwall R	Remove 0.6 m	Apron R
41850	*CMP 450*	*R*				
42193	*CMP 450*	*R*				
42939	*CMP 450*	*L/R*				
42989	*CMP 450*	*L*				
43090	*CMP 600*	*R*				
43323	*CMP 450*	*L/R*				
43758	*CMP 450*	*R*				
44128	CMP 450	L/R			Ditch excavation 3.0 m (R)	
45239	CMP	L/R			Ditch excavation	

Culvert Name or Station	Type Size	Clean L/R	Repair /Remove HDWL	Construct Culvert or Headwalls	Remove /Realign /Extend	Construct Riprap Apron
	450				23.0 m (L)	
45456	CMP 300				Remove 5.0 m (from top of slope) (R)	
45703	CMP 450			Construct new headwall R (hanging pipe)	Remove (R)	Apron R
45908	CMP 450			Construct new headwall R (hanging pipe)	Remove (R)	Apron R
46060	*CMP 450*	*R*				
46202	*CMP 450*	*L/R*				
46337	*CMP 450*	*L/R*				
46653	CMP 450			Construct new headwall R (hanging pipe)	Remove (R) 2.0 m	Apron R
46851	CMP 450			Construct new headwall R	Extend (R) 1.2 m	Apron R
47019 *no historic integrity*	CMP 450	L	Repair L			
47273	*CMP 600*	*R*				
47777	*CMP 450*	*R*				
47962	CMP 450			Construct new headwall R	Extend (R) 1.2 m	Apron R
48099	*CMP 750*	*L*				
48605 *historic integrity*	CMP 450		Repair L			
49565	CMP 450		Remove L		Remove Relocate pipe Log road	
49574	HDPE 450			Construct new culvert and headwalls L/R		Apron R

Culvert Name or Station	**Type Size**	**Clean L/R**	**Repair /Remove HDWL**	**Construct Culvert or Headwalls**	**Remove /Realign /Extend**	**Construct Riprap Apron**
49658	CMP 750	R				
50200	CMP 450			Construct new headwall L	Remove (L) 0.6 m Extend (L) 1.2 m	Apron L
50458 *historic integrity*	CMP 450			Construct new headwall L	Extend (L) 1.2 m	Apron L
51689	CMP 450			Construct new headwall L	Extend (L) 2.0 m	Apron L
51806	CMP 450			Construct new headwall L	Extend (L) 2.0 m	Apron L
52406	*CMP 450*	*L*				
52528	CMP 450			Construct new headwall L	Extend (L) 2.0 m	Apron L
53138	CMP 450			Construct new headwall R	Extend (R) 2.0 m	Apron R
55470	CMP 450			Construct new headwall L	Extend (L) 2.0	Apron L
Lassen Peak Trench Drain			Remove pipe culvert	Construct trench drain		Riprap
Kings Creek 5196-5308				Install underdrain (L) side of access road		
Kings Creek 5310	CMP 600		Remove 2 pipe culverts	Install stone veneer headwalls and wingwalls	Remove replace with arch plate 2700 mm	Riprap
Summit Lake South Entrance 5065	CMP 300		Remove pipe culvert		Replace (L) 3.0 m Clean ditch to main road (18 m)	Riprap
Summit Lake South Entrance 5149	*CMP 460*	*L/R*				
Summit Lake	CMP 450		Remove pipe culvert	Construct new	Replace with HDPE	

Culvert Name or Station	Type Size	Clean L/R	Repair /Remove HDWL	Construct Culvert or Headwalls	Remove /Realign /Extend	Construct Riprap Apron
Trailhead 5084				headwalls L/R		