



## TRAIL MANAGEMENT PLAN / ENVIRONMENTAL ASSESSMENT

SEPTEMBER 2021



This page intentionally left blank.

# CONTENTS

Chapter 1: Purpose and Need .....	1
Background .....	1
Purpose, Need, And Objectives .....	1
Purpose.....	1
Need.....	1
Objectives.....	1
Relationship to Other Planning .....	2
Impact Topics Retained for Further Analysis.....	3
Chapter 2: Alternatives.....	5
Introduction .....	5
No-Action Alternative .....	5
Alternative 1 – NPS Proposed Action and Preferred Alternative .....	8
Alternative 2.....	14
Common to All Action Alternatives – Summer and Winter Use.....	17
Trail Alignments.....	19
Trail Restoration .....	19
Mitigation Measures And Best Management Practices Common to All Action Alternatives.....	19
Trail Development.....	19
Natural Resources (General).....	20
Wildlife (General) .....	21
Northern Spotted Owl .....	22
Bull Trout.....	24
Cultural Resources.....	24
Visitor Use Management Actions Common to All Action Alternatives.....	25
Indicators and Thresholds.....	25
Visitor Capacity .....	26
Adaptive Visitor Use Management.....	26
Actions Considered But Dismissed .....	27
Cost Estimates.....	28
Chapter 3: Affected Environment and Preliminary Environmental Consequences .....	31
Introduction and General Methodology .....	31

Soils.....	31
Affected Environment (Current and Expected Future Conditions of Resources That Would Be Affected) .....	31
Environmental Consequences .....	32
Vegetation.....	34
Affected Environment (Current and Expected Future Conditions of Resources That Would Be Affected) .....	34
Environmental Consequences .....	36
Wetlands and Riparian Areas.....	39
Affected Environment (Current and Expected Future Conditions of Resources That Would Be Affected) .....	39
Environmental Consequences .....	40
Northern Spotted Owl.....	42
Affected Environment (Current and Expected Future Conditions of Resources That Would Be Affected) .....	42
Environmental Consequences .....	43
Whitebark Pine .....	47
Affected Environment (Current and Expected Future Conditions of Resources That Would Be Affected) .....	47
Environmental Consequences .....	48
Wilderness Character.....	49
Affected Environment (Current and Expected Future Conditions of Resources That Would Be Affected) .....	49
Environmental Consequences .....	52
Historic Structures and Cultural Landscapes.....	55
Affected Environment (Current and Expected Future Conditions of Resources That Would Be Affected) .....	55
Environmental Consequences .....	57
Visitor Use and Experience.....	58
Affected Environment (Current and Expected Future Conditions of Resources That Would Be Affected) .....	58
Environmental Consequences .....	62
Chapter 4: Consultation and Coordination .....	73
Agency Consultation .....	73
US Fish and Wildlife Service .....	73
National Historic Preservation Act Section 106 Compliance.....	73



Contributors .....	74
Crater Lake National Park Interdisciplinary Team .....	74
Denver Service Center .....	74

## FIGURES

Figure 1. Map Showing Trail Systems Under the No-Action Alternative.....	6
Figure 2. Map Showing Trail Systems Under Alternative 1 – NPS Preferred Alternative .....	13
Figure 3. Map Showing Trail Systems Under Alternative 2 .....	16
Figure 4. Map Showing Trail Systems Common to All Action Alternatives .....	18
Figure 5. Annual Recreational Visitation to Crater Lake National Park (1999–2019) .....	59

## TABLES

Table 1. Comparison of Alternatives by Cost and Mileage .....	5
Table 2. Existing Trails in the No-Action Alternative.....	7
Table 3. New Trails Proposed in Alternative 1 .....	9
Table 4. Trails with Changes in Use or Designation Proposed in Alternative 1.....	12
Table 5. New Summer Trails in Alternative 2 .....	15
Table 6. Summary of New Trails Common to All Action Alternatives.....	17
Table 7. Estimated Construction and Annual Operations and Maintenance Costs to Implement the Action Alternatives .....	29

## APPENDIXES

Appendix A: Indicators and Thresholds

Appendix B: Visitor Capacity

Appendix C: Impact Topics Not Carried Forward For Detailed Analysis in This  
Plan/Environmental Assessment

Appendix D: Accessibility Requirements For New or Altered Trails in the  
National Park Service

Appendix E: Crater Lake National Park Trails Program Standard Operating Procedures

Appendix F: Trail Management Objectives For Existing Trails

Appendix G: References

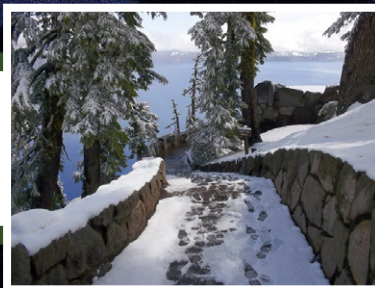
This page intentionally left blank.



# PURPOSE AND NEED

CHAPTER

1









# **CHAPTER 1: PURPOSE AND NEED**

## **BACKGROUND**

The Crater Lake trail system comprises 95 miles of trail. The most popular trails follow the rim of the lake. Other trails wind through lower elevation forests, including a 35-mile segment of the Pacific Crest National Scenic Trail. As a whole, the Crater Lake trail system provides visitors with numerous opportunities, including but not limited to: immersion in the landscape, beautiful views, solitude and self-reliance, a chance to get some fresh air and exercise, and an enhanced understanding of the park's significance.

Park visitation has increased over the last few decades and will likely continue to rise. Trends since the turn of the century best illustrate this pattern. In 2000, there were 426,883 visitors to Crater Lake. By 2015, this number had risen to 614,712. In 2016, annual visitation had risen sharply to 756,344, an increase of more than 100,000 in one year and nearly double the visitation from the year 2000 (see figure 5). With increased visitation comes increased crowding, congestion, and resource impacts. The trail system is one tool to help ease congestion, minimize resource impacts, and better disperse visitors in the park.

The 2005 Crater Lake General Management Plan / Environmental Impact Statement (2005 GMP/EIS), called for increased recreational opportunities in the park, more nonmotorized opportunities along the rim, short trails along roadways, and for transitional experiences between developed areas and the backcountry.

## **PURPOSE, NEED, AND OBJECTIVES**

### **Purpose**

The purpose of the trail management plan is to provide high-quality nonmotorized recreational opportunities while preserving park resources. The plan is intended to guide trail management and investment in trail infrastructure over the next 25 years.

### **Need**

- visitor experience is being diminished by increased crowding and congestion;
- impacts to resources are increasing in number and severity;
- existing trails and trail use are concentrated in localized areas of the park, which places stress on those resources and limits recreational in other areas of the park; and
- the park lacks comprehensive, consolidated guidance for trail management.

### **Objectives**

The plan aims to ensure that the trail system at Crater Lake National Park

- is sustainable, meaning each trail lies lightly on the land, will endure, and requires little maintenance;
- offers high-quality recreational experiences for a wide range of visitors and abilities during all seasons of the year;

- provides opportunities for visitors to experience the resources and values that contribute to the park's significance;
- offers expanded and diverse nonmotorized recreational experiences (e.g., opportunities for short- and longer-distance loops, new trails in areas where few currently exist, and expanded access for bikes and equestrians);
- provides greater trail access and connectivity between features of interest within the park and between trails;
- protects park resources and limits impacts from trail use;
- balances development with natural and cultural resource conservation by proposing new trails while reducing or eliminating redundant and underutilized trails;
- minimizes the potential for conflict among visitors using different modes of recreation (e.g., hiking, horseback riding, and biking);
- improves pedestrian circulation and offers alternatives to a vehicle-based visit;
- is integrated with trail networks outside the park; and
- is managed in collaboration with partners.

This plan/environmental assessment (plan/EA) presents different alternatives for addressing the purpose and need, including the preferred alternative. It does not rule out consideration of future trail proposals. New trail proposals would be considered based on need, including whether changes have occurred with visitation, park operations, and resource conditions since completion of this plan.

This plan/EA was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, Council on Environmental Quality regulations for the implementation of NEPA (40 CFR § 1500-1508), DOI regulations for the implementation of NEPA, (43 CFR §46), and the NPS Director's Order (DO)-12 (*Conservation Planning, Environmental Impact Analysis, and Decision-Making*).

## RELATIONSHIP TO OTHER PLANNING

This document is part of Crater Lake National Park's planning portfolio. Together, all of the documents in a park's planning portfolio comprise the park management philosophy and create a logical, trackable guide for future park management actions. This trail management plan addresses the park's trails to ensure they are sustainable, offer high-quality recreational experiences, and protect park resources.

The National Parks and Recreation Act of 1978 ([54 USC 100502](#)) requires the preparation and timely revision of general management plans for each unit of the national park system. At a minimum, each park must have a plan or series of plans that include the four statutory requirements identified in [54 USC 100502](#):

1. measures for the preservation of the area's resources;
2. indications of types and general intensities of development (including visitor circulation and transportation patterns, systems, and modes) associated with public enjoyment and use of the area, including general locations, timing of implementation, and anticipated costs;
3. identification of an implementation commitment for visitor carrying capacities for all areas of the unit; and
4. indications of potential modifications to the external boundaries of the unit and the reasons therefore.



This trail management plan addresses the statutory requirement for indications of types and general intensities of development associated with public enjoyment and use of the area. This plan also addresses the identification of an implementation commitment for visitor carrying capacities at some areas of the unit, namely along the trail corridors.

As substantial new issues or significant changes arise, the National Park Service (NPS) may amend general management plans. This plan serves as an amendment to the 2005 GMP EIS. Specifically, this plan would amend the management zoning identified for the Cleetwood Cove and Discovery Point areas. These trail corridors would be rezoned from the backcountry zone to the frontcountry zone during the summer. All other zoning, including winter zoning for these trail corridors, would remain the same.

## **IMPACT TOPICS RETAINED FOR FURTHER ANALYSIS**

Impact topics identify resources that could be affected, either beneficially or adversely, by implementing any of the proposed alternatives. The National Park Service used an interdisciplinary review process, existing studies and data, and public comments to determine which resources would likely be affected by this project. Issues were retained for detailed analysis in this environmental assessment if they met one or more of the following criteria:

- the environmental impacts associated with the issue are central to the proposal or of critical importance;
- a detailed analysis of environmental impacts related to the issue is necessary to make a reasoned choice between alternatives;
- the environmental impacts associated with the issue are a big point of contention among the public or other agencies; or
- there are potentially significant impacts to resources associated with the issue.

The following topics are carried forward for further analysis in this trail management plan/environmental assessment:

- Soils
- Vegetation
- Wetlands and Riparian Areas
- Northern Spotted Owl
- Whitebark Pine
- Wilderness Character
- Visitor Use and Experience
- Historic Structures and Cultural Landscapes

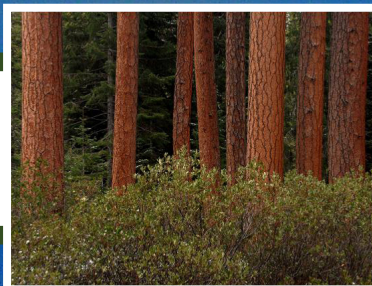
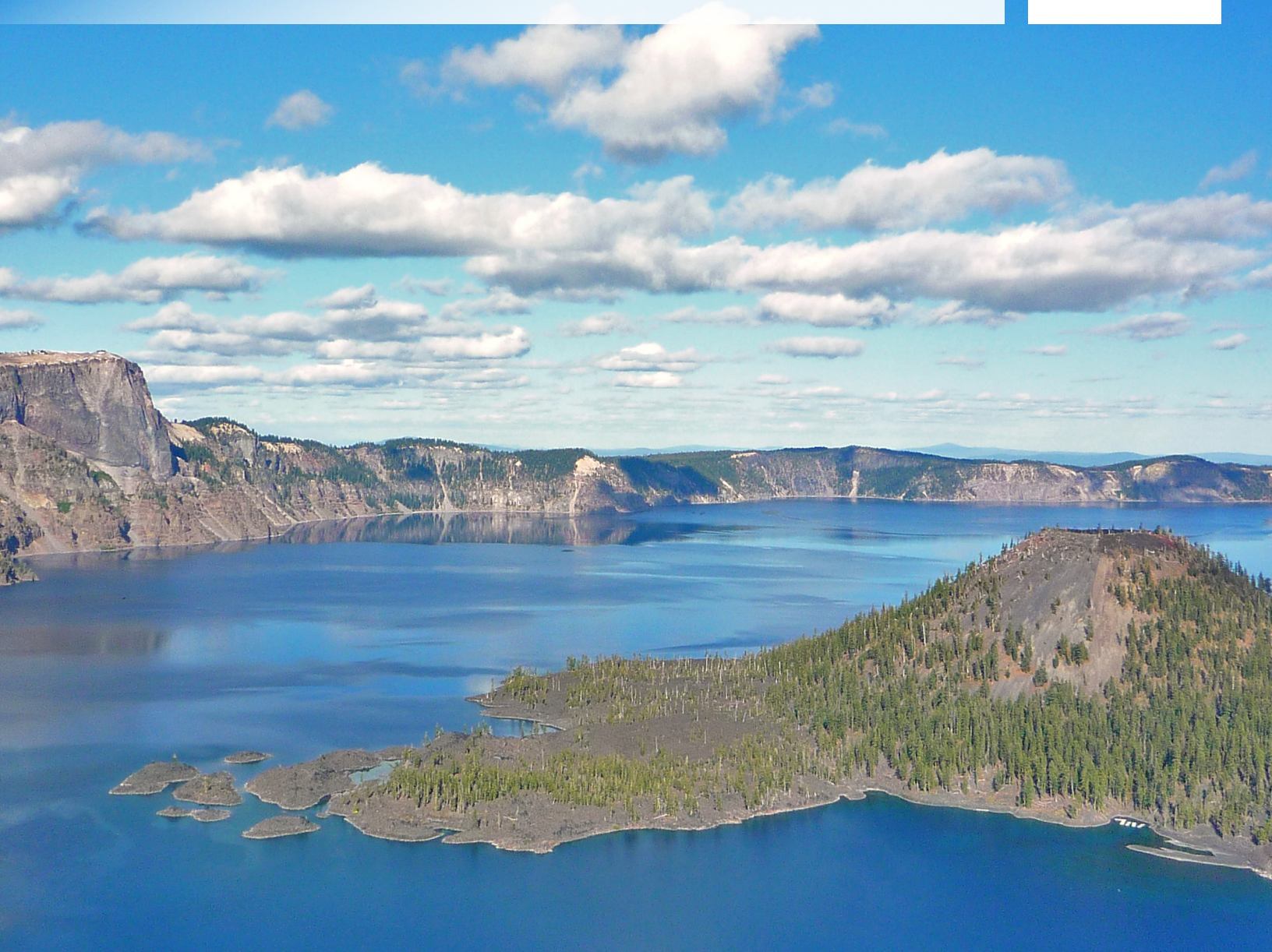
This page intentionally left blank.



# ALTERNATIVES

CHAPTER

2







## CHAPTER 2: ALTERNATIVES

### INTRODUCTION

This plan/EA analyzes a no-action alternative and two action alternatives for trail management. The elements of these alternatives are described in detail in this chapter. The no-action alternative would continue current management and provides a basis for comparing the other alternatives. The action alternatives present different approaches to address the plan's purpose and need as described in chapter 1. The alternatives presented in this section were created based on recommendations of an interdisciplinary planning team and public feedback. This chapter also includes alternatives considered but dismissed from further consideration and actions common to all action alternatives.

The following sections describe the alternatives through a series of brief narratives and tables capturing key characteristics, mileage, and allowed uses of new trails. This chapter also includes a brief summary of indicators and thresholds, visitor capacity, and cost estimates.

Table 1 compares the no-action and both action alternatives based on the number of miles of new trail construction, miles of existing road designated as trail, miles of existing trail that are subject to changes in allowed use types, and the total estimated costs of construction. Calculation of costs and mileages for the action alternatives in table 1 incorporates actions that are common to all action alternatives.

**Table 1. Comparison of Alternatives by Cost and Mileage**

Mileage/Costs	No-Action Alternative	Alternative 1 – Preferred Alternative	Alternative 2
Miles of new trail construction	0	20.63 mi	23.20 mi
Miles of existing road to be designated as trail	0	4.95 mi	4.95 mi
Miles of existing trail with changes in allowed use types		4.00 mi	0 mi
Estimated costs of construction	0	\$8.5 M	\$4.2 M

Several trails proposed in alternative 1 would feature paved or improved surfaces, which contributes to the difference in estimated costs between alternatives. Alternative 2 has a greater total mileage proposed than alternative 1 with 13.30 miles of new trail proposed that would contribute to a continuous Rim Trail.

### NO-ACTION ALTERNATIVE

The no-action alternative would continue management of the park's existing 95-mile summer and winter trail systems as outlined in its 2005 GMP/EIS (figure 1). No new trails are proposed in this alternative, but future proposals would be evaluated on a case-by-case basis. All trails would be marked and maintained according to their assigned trail class and allowable uses. For more information on trail classes, see appendix E for an overview of trail classes and

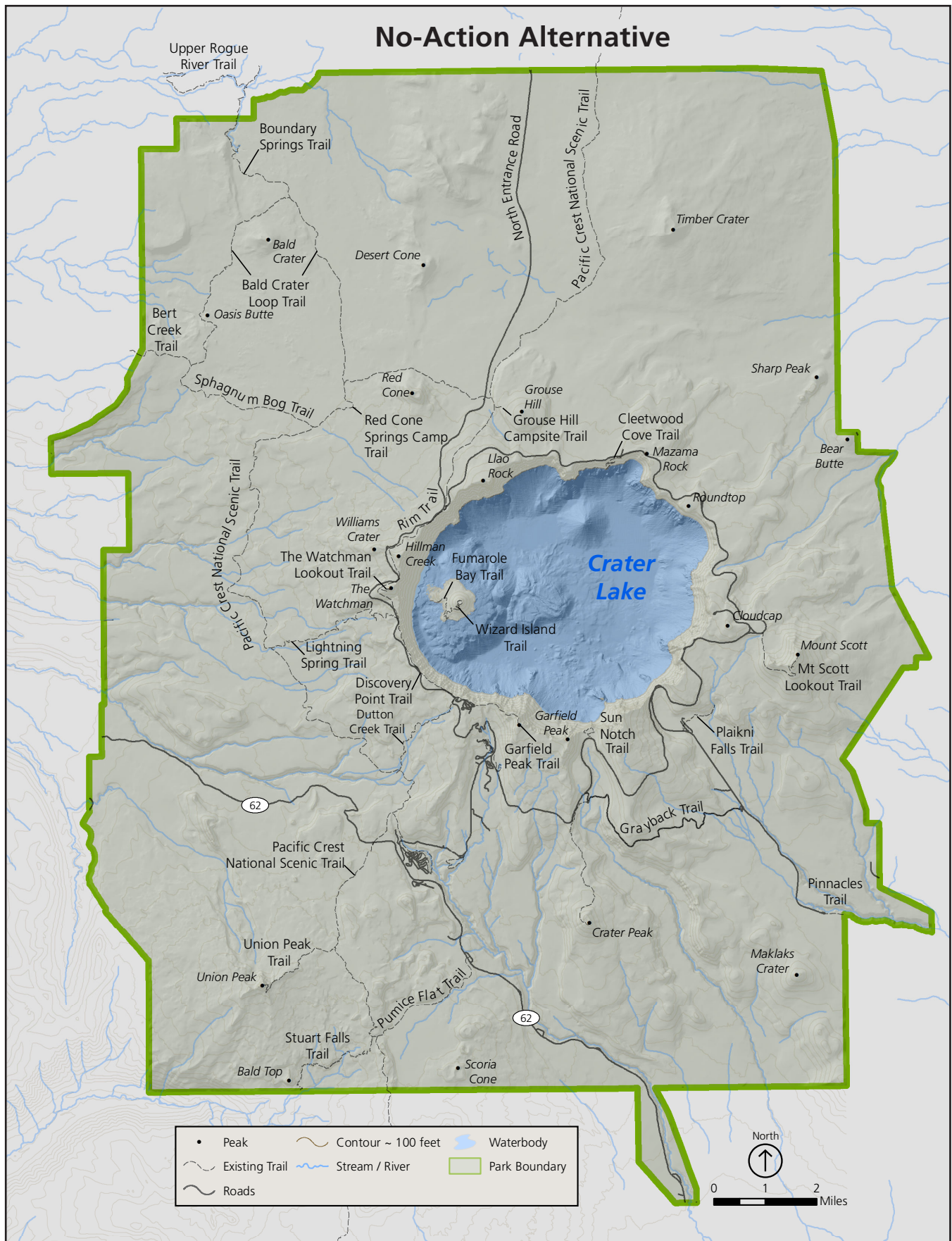


FIGURE 1. MAP SHOWING TRAIL SYSTEMS UNDER THE NO-ACTION ALTERNATIVE

current trail management objectives. No existing trails would be closed unless warranted by resource concerns or safety reasons.

Summer trail uses generally include hiking/pedestrian use on all trails, as well as bicycles, pack and saddle use, and dogs (on-leash) on some trails. Winter uses include hiking/snowshoeing, cross-country skiing, and snowmobile use. Management for winter use involves marking and grooming of some trails.

Table 2 lists existing Crater Lake trails based on trail mileage, trail class, whether the trail has frontcountry or backcountry “trail characteristics,” and allowed summer and winter uses based on current management. It should be noted that the frontcountry and backcountry “trail characteristics” defined here are distinct and different from the frontcountry and backcountry management zones that are defined in the 2005 GMP/EIS. These trail characteristics describe how park staff generally manage and maintain the trails and define desired conditions for the trails. Absent from the table is Grayback Road, which is currently classified and maintained as an administrative road but is open to hiking, biking, stock use, and dog walking.

**Table 2. Existing Trails in the No-Action Alternative**

Trail Name	Mileage	Trail Class	Trail Characteristics: Front / Backcountry	Allowed Summer Uses: Stock	Allowed Summer Uses: Bikes	Allowed Summer Uses: Dogs
Annie Creek Canyon Trail	1.80 mi	3	Frontcountry			
Annie Creek Spur Trail	0.44 mi	3	Frontcountry			
Annie Spring Trail	0.75 mi	3	Backcountry			X
Bald Crater Loop Trail	13.63 mi	2	Backcountry	X		
Bert Creek Trail	1.31 mi	2	Backcountry	X		
Boundary Springs Trail	2.62 mi	3	Backcountry			
Boundary Springs Spur Trail	0.5 mi	3	Backcountry			
Bybee Creek Horse Camp Trail	0.32 mi	3	Backcountry	X		
Castle Crest Wildflower Trail	0.42 mi	3	Frontcountry			
Castle Crest Wildflower Spur Trail	0.38 mi	3	Frontcountry			
Cleetwood Cove Trail	1.10 mi	4	Frontcountry			
Crater Peak Trail	3.24 mi	3	Frontcountry			
Discovery Point Trail	0.95 mi	3	Frontcountry			
Dutton Creek Trail	2.37 mi	3	Backcountry			
Dutton Creek Camp Trail	0.20 mi	3	Backcountry			X
Fumarole Bay Trail	0.40 mi	3	Frontcountry			
Garfield Peak Trail	1.54 mi	3	Frontcountry			
Godfrey Glen Trail	1.10 mi	4	Frontcountry			X



Trail Name	Mileage	Trail Class	Trail Characteristics: Front / Backcountry	Allowed Summer Uses: Stock	Allowed Summer Uses: Bikes	Allowed Summer Uses: Dogs
Grouse Hill Camp Trail	0.20 mi	3	Backcountry			
Lady of the Woods Historic Trail	0.68 mi	3	Frontcountry			X
Lightning Spring Trail	4.30 mi	2	Backcountry	X		
Lightning Spring Camp Trail	0.20 mi	3	Backcountry			
Mount Scott Trail	2.18 mi	3	Frontcountry			
North Junction Trail	0.1 mi	3	Frontcountry			X
Pacific Crest National Scenic Trail (PCT)	34.85 mi	3	Backcountry	X		X
Pinnacles Trail	0.38 mi	4	Frontcountry			
Plaikni Falls Trail	1.0 mi	4	Frontcountry			
Pumice Flat Trail	2.86 mi	2	Backcountry			
Red Cone Spring Camp Trail	0.20 mi	3	Backcountry			X
Rim Trail Section 1 – Discovery Point to North Junction	4.61 mi	3	Frontcountry			
Rim Trail Section 2 – North Junction to PCT	2.97 mi	3	Backcountry			
Stuart Falls Trail	2.77 mi	3	Backcountry	X		
Sun Notch Trail	0.65 mi	4	Frontcountry			
Union Peak Trail	2.54 mi	3	Backcountry			
Watchman Lookout Trail	0.83 mi	3	Frontcountry			
Wizard Island Trail	1.03 mi	3	Frontcountry			
<b>Total Mileage</b>	<b>95.42 mi</b>	<b>–</b>	<b>–</b>	<b>–</b>	<b>–</b>	<b>–</b>

## ALTERNATIVE 1 – NPS PROPOSED ACTION AND PREFERRED ALTERNATIVE

Alternative 1 introduces approximately 20 miles of new summer trails and changes of use or designation to approximately 9 miles of trails by balancing new trail development with the protection of natural and cultural resources in the park (table 3, table 4). New trail development is primarily focused on the southern and western portions of the park to disperse visitors to areas where few trails currently exist. This dispersal would have the benefit of providing visitors opportunities to experience more areas and features of interest in the park. Providing new trail opportunities in these areas would also help relieve some of the visitor crowding along Rim Drive during the summer months. New trails would also be added at the lower elevations of the park to improve year-round visitor access to areas that receive less snowfall and therefore have a longer summer season.

**Table 3. New Trails Proposed in Alternative 1**

Trail Name	Trail Mileage	Trail Class	Trail Characteristics: Front / Backcountry	Allowed Uses: Stock	Allowed Uses: Bikes	Allowed Uses: Dogs	Allowed Uses: Snowshoe	Allowed Uses: Ski	Allowed Uses: Snowmobile
Castle Creek Canyon Overlook	0.25 mi	5	Frontcountry						
Castle Creek Canyon Trail	0.70 mi	3	Frontcountry						
Falls to Flowers Trail	2.58 mi	3	Frontcountry						
Mazama Campground Loop Trail	1.41 mi	5	Frontcountry	—	X	X	—	X	—
Mazama Rock Trail	1.35 mi	3	Frontcountry						
Munson Valley Roadside Trail	3.48 mi	5	Frontcountry	—	X	X	X	X	—
Munson Valley Spur	0.53 mi	3	Frontcountry						
Panhandle Trail	3.09 mi	3	Frontcountry	—	—	—	—	—	—
Ponderosa Pine Trail	0.45 mi	3	Frontcountry						
Raven Trail	1.54 mi	3	Frontcountry						
Union Peak to Stuart Falls Connector Trail	5.00 mi	3	Backcountry	X					
<b>Total Mileage</b>	<b>20.38 mi</b>								

Nonmotorized connectivity would be improved between Mazama Campground, Park Headquarters, and Rim Village—three critical nodes for visitors. New trails would improve user circulation and safety between these heavily used areas. They would also protect adjacent resources by replacing user-created trails with formalized trails that would direct users away from fragile natural and cultural resources.

Existing and new trails would be developed to expand opportunities for a wide range of visitors and for recreational modes within the park (figure 2). Accessibility would be improved with several new trails having firm and stable surfaces on gentle grades, including the Munson Valley Roadside Trail and the Mazama Campground Loop Trail. Equestrians would gain additional trail access on the Pumice Flat Trail, Union Peak to Stuart Falls Connector Trail, and lower portion of the Union Peak Trail. Cyclists would also gain opportunities on more trails, including the Munson Valley Roadside Trail and Mazama Campground Loop Trail.

The following new summer trails would be established and opened for visitor use:

- Castle Creek Canyon Overlook** – Near the existing Old West pullout, this approach would provide a short route to a viewpoint for visitors seeking a more vehicle-based experience at the park. Near the existing Old West pullout, a separate hardened trail would be built on the north side of Highway 62 leading to a new overlook of Castle Creek Canyon. A crosswalk would potentially be built across Highway 62 for pedestrian safety, though other design solutions may be considered during implementation.

- **Castle Creek Canyon Trail** – This trail would provide visitors with a short, 0.7-mile, out-and-back hike on gentle terrain shortly after entering the park’s western entrance. The hike would offer scenic views into Castle Creek Canyon and provide opportunities for interpretive exhibits relating to the formation of the canyon. The trail’s location, away from dense visitor use along the rim, aligns with the plan’s need to disperse visitor use at the park. To support visitor use of the Castle Creek Canyon trail, a pullout parking area with capacity for up to 10 cars would be established on the north side of Highway 62.
- **Falls to Flowers Trail** – This 2.5-mile trail would connect the Grayback Trail with several trails to the west. The trail would traverse moderate terrain, while avoiding sensitive vegetation along the rim. This hiking trail would serve primarily as a connector, but ultimately would lead visitors to Vidae Falls near the trail’s eastern terminus.
- **Mazama Campground Loop Trail** – This short, 1.4-mile paved trail on gentle terrain would offer a variety of accessible recreational opportunities for campers and families as well as dog walkers. The trail would loop through the campground with views of Annie Creek Canyon and old growth hemlock trees. This trail would be marked for winter use and open to skiers. The trail would be open to pets in summer and closed to pets in winter. The trail would tie into an existing trail to create a loop experience. The trail would also link to other trails, providing longer excursions to the park headquarters and Rim Village. In developing this trail, the park may wish to consider interpretive opportunities for campers.
- **Mazama Rock Trail** – This 1.3-mile trail would offer visitors a loop experience away from the lake in an area featuring geologic spires. The hike would offer a challenging hiking experience in the northeastern portion of the park, where fewer recreational opportunities are currently provided. The existing pullout at Mazama Rock would serve as the trailhead for the Mazama Rock Trail.
- **Munson Valley Roadside Trail** – This trail would provide family and multiuse access from the Mazama campground area to the Steel Visitor Center and connect beyond to the Rim Village Visitor Center via the Munson Valley Spur Trail and the Raven Trail. This out-and-back trail would feature gentle terrain and offer a variety of experiences based on mode of transportation, ranging from short rides for cyclists to longer experiences for those walking to Rim Village. As one of the few paved trails proposed in the plan, it would offer a unique experience for a wide variety of users. For the safety of pedestrians, a crosswalk would be built, allowing trail users to move from the Mazama campground area to the start of the trail. To minimize environmental impacts, the trail would use the existing vehicular bridge at Annie Spring. Beyond that point, the trail would be offset from the roadway and follow an old road corridor to the maximum extent practical. In winter months, the trail would be ungroomed, marked for winter use, and open to snowshoeing/hiking and skiing.
- **The Munson Valley Spur** – This hiking trail would connect the park headquarters area to the major visitor attractions at Rim Village and offer spectacular rim views. This short, 1.5-mile route would traverse moderate terrain, utilizing the route of an old horse trail.

- **Panhandle Trail** – This trail would provide visitors with a 3-mile loop experience along easy terrain through stands of old-growth trees. The trail’s proposed location in the southernmost part of the park would disperse visitor use into an area currently lacking recreational experiences. To support visitor use of this new trail, a pullout parking area with capacity for approximately 10 cars and a trailhead would potentially be established on the west side of Highway 62, though other design solutions may be considered during implementation.
- **Ponderosa Pine Trail** – This trail would offer visitors a relatively short, half-mile hike, shortly after entering the park from the south. Unique interpretive opportunities at the site would showcase rare stands of old-growth trees within the park boundary and discuss aquatic habitat in Annie Creek. This low elevation trail would follow easy terrain along the creek.
- **Raven Trail** – The 1.5-mile Raven Trail would connect the park headquarters to Rim Village and Crater Lake Lodge on steeper terrain. The northern destination would offer visitors excellent views of the lake. The proposed alignment would offer visitors an alternative nonmotorized route to connect major points of interest in this area of the park. With establishment of the Raven Trail, trail connectivity is significantly increased to the south, east, and northwest areas of the park.
- **Union Peak to Stuart Falls Connector Trail** – This 5-mile connector trail would create a loop experience for both hikers and equestrians by connecting the Union Peak Trail and the Stuart Falls Trail along steeper terrain. Together with a segment of the Pacific Crest National Scenic Trail (PCT), this would create a loop of approximately 11.5 miles. Users could incorporate this loop into a multiday backcountry experience by connecting to it via the Pumice Flat Trail and/or the Pacific Crest National Scenic Trail from Highway 62. The trail’s location in the southwest portion of the park would fall within recommended wilderness and offer a higher degree of solitude than other trail locations in the park. This connector trail would link key points of interest in this part of the park: Union Peak, Bald Top, and Stuart Falls.

Uses or designation would change on the following road and trails:

- **Grayback Trail** – This 4.95-mile trail would repurpose the existing Grayback Road to allow for hikers, bikes, dogs, and equestrians, while retaining vehicular access for administrative use. (Note that this change would categorize the Grayback Road as a trail for the purposes of defining visitor use; Grayback Road would continue to be maintained as a road, however, and there would be little to no change in alignment, configuration, materials, or design.)
- **Pumice Flat Trail** – This is currently a hiker-only trail, and the alignment and signage has recently been updated. Allowed uses would be expanded to include equestrians. With construction of the Union Peak to Stuart Falls Connector Trail, a 17-mile backcountry loop experience would be possible for hikers and equestrians from the Pumice Flat trailhead. At the crossing of Highway 62, a crosswalk may be added to better accommodate equestrian use.



- **Union Peak Trail** – This is currently a hiker-only trail. Allowed uses on the lower portion of the trail, east of the junction with the proposed Union Peak to Stuart Falls Connector Trail, would be expanded to allow equestrians. When combined with construction of the Union Peak to Stuart Falls Connector Trail, this change would make possible a backcountry loop experience that is open to equestrians and hikers from either the Pumice Flat Trail or the Pacific Crest National Scenic Trail.

**Table 4. Trails with Changes in Use or Designation Proposed in Alternative 1**

Trail Name	Trail Mileage	Trail Class	Trail Characteristics: Front / Backcountry	Allowed Uses: Stock	Allowed Uses: Bikes	Allowed Uses: Dogs	Allowed Uses: Snowshoe	Allowed Uses: Ski	Allowed Uses: Snowmobile
Grayback Trail	4.95 mi	4	Frontcountry	X	X	X			
Pumice Flat Trail	2.86 mi	3	Frontcountry	X					
Union Peak Trail (eastern portion, between Union Peak to Stuart Falls Connector Trail and the PCT)	1.14 mi	3	Backcountry						
<b>Total Mileage</b>	<b>8.95 mi</b>								

The following supporting infrastructure would be expanded to support visitor use:

- **Pinnacles Parking Area** – This existing parking area would be expanded to accommodate up to 20 vehicles. A vault toilet and picnic area would also be added near the parking area.

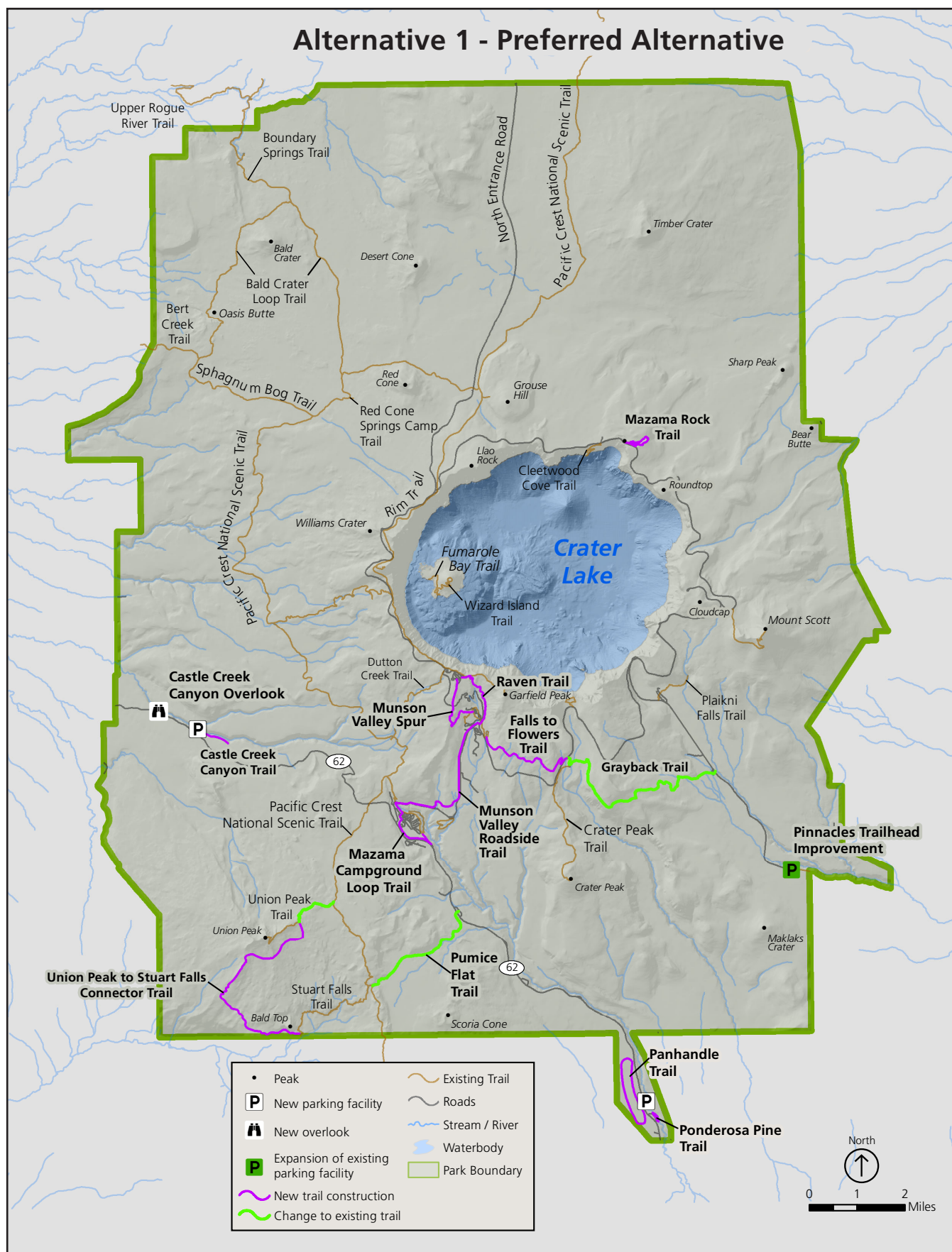


FIGURE 2. MAP SHOWING TRAIL SYSTEMS UNDER ALTERNATIVE 1 – NPS PREFERRED ALTERNATIVE

## ALTERNATIVE 2

Alternative 2 introduces almost 23 miles of new summer trails with a focus on trail development in the eastern portion of the park (table 5, figure 3).

The development of the Vidae Ridge Trail and a Rim Trail segment around the northern, eastern and southeastern edges of the lake would improve nonmotorized connectivity in some of the park's most popular areas near the rim of the caldera. The complete Rim Trail would provide an additional way for visitors to circumnavigate around the lake and through the park.

One additional loop trail, the Maklaks Crater Loop, would be constructed on the east side of the lake. An underutilized trail, the East Bald Crater Loop would be removed from the trail system. Existing infrastructure and areas of disturbance would be used on these new trail routes where practicable.

The following new summer trails would be established and opened for visitor use:

- **Vidae Ridge Trail** – This 2.85-mile trail would connect the proposed east side Rim Trail with the Garfield Peak Trail to the west, creating a continuous, 30-mile network. The trail would traverse moderate terrain, while avoiding sensitive vegetation along the rim. This hiking trail would serve primarily as a connector but ultimately would lead visitors to Vidae Falls near the trail's eastern terminus.
- **Maklaks Crater Loop** – This 6.8-mile loop would start at the existing Pinnacles Trailhead and circumnavigate the area surrounding Maklaks Crater near the southeastern border of the park on mild terrain, providing a less difficult experience for hikers and pack and saddle use.
- **Rim Trail (East Side)** – This section of trail would connect 18 miles of trail on the south, east, and north side of Crater Lake with the existing 9-mile portion of Rim Trail on the western side of the lake and the Vidae Ridge Trail to create a continuous, 30-mile network. The 18 miles on the south, east, and north sides would include 13 miles of new trail construction and approximately 5 miles that would utilize the existing Grayback Road. Overnight use would be allowed by permit only, with those hiking the entire trail using four camps: Grouse Hill Camp, Palisades Camp, Lost Creek Campground, and Lightning Springs Camp. Up to 15 hikers would be allowed at each camp per night. The Palisades camp would be new construction, and the existing camps at Grouse Hill, Lightning Springs, and Lost Creek would be expanded to accommodate additional users.

The following existing summer trails would be removed from the trail system:

- **East Bald Crater Loop Trail** – This trail would be removed because of low use and high-maintenance requirements.

Designation would change on the following road:

- **Grayback Road** – This 4.95-mile section of the Rim Trail would repurpose the existing Grayback Road to allow for hikers, bikes, dogs, and equestrians, while retaining vehicular access for administrative use. (Note that this change would categorize the Grayback Road as a trail for the purposes of defining visitor use. Grayback Road would continue to be maintained as a road, however, and there would be little to no change in alignment, configuration, materials, or design.)

**Table 5. New Summer Trails in Alternative 2**

Trail Name	Trail Mileage	Trail Class	Trail Characteristics: Front / Backcountry	Allowed Summer Uses: Stock	Allowed Summer Uses: Bikes	Allowed Summer Uses: Dogs
Vidae Ridge Trail	2.85 mi	3	Frontcountry			
Maklaks Crater Loop	6.80 mi	2	Backcountry	X		
Rim Trail (East Side) (not including that portion that utilizes Grayback Road)	13.30	3	Frontcountry	*	*	*
<b>Total Mileage</b>	<b>22.95 mi</b>	–	–	–	–	–

\*On the Rim Trail (East Side)—stock, bikes, and dogs would continue to be allowed summer uses on the portion of the trail that aligns with the existing Grayback Road. These uses would not be allowed on the remainder of the trail.



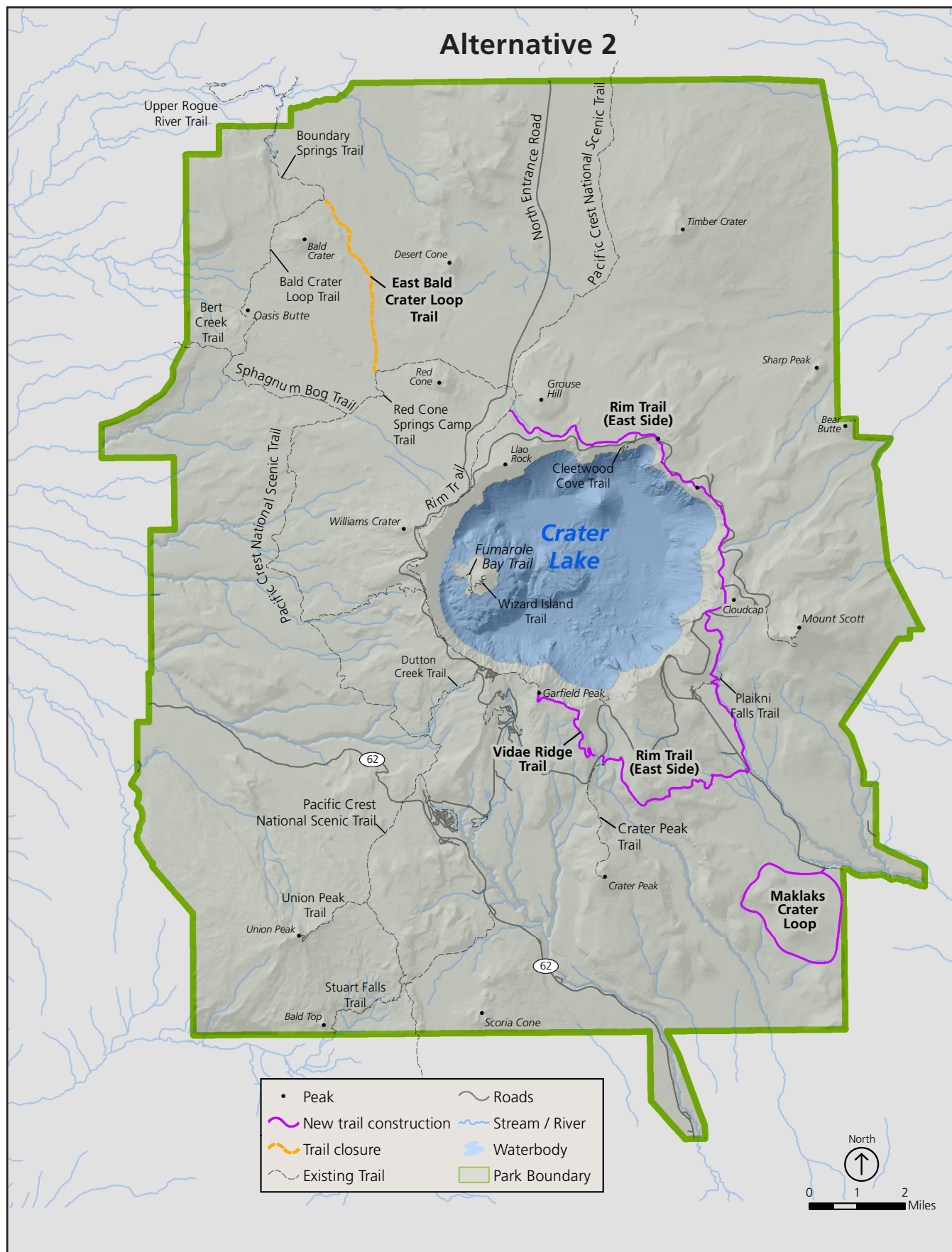


FIGURE 3. MAP SHOWING TRAIL SYSTEMS UNDER ALTERNATIVE 2

## COMMON TO ALL ACTION ALTERNATIVES – SUMMER AND WINTER USE

The following actions are proposals found in both action alternatives. Items addressed include the addition of new winter trails and a summer trail for administrative use (table 6), modifications to parking lots, management and maintenance practices, and implementation standards. A map showing trail systems common to all action alternatives is provided as figure 4.

**Table 6. Summary of New Trails Common to All Action Alternatives**

Trail Name	Trail Mileage	Trail Class	Trail Characteristics: Front / Backcountry	Allowed Uses: Stock	Allowed Uses: Bikes	Allowed Uses: Dogs	Allowed Uses: Snowshoe	Allowed Uses: Ski	Allowed Uses: Snowmobile
Chevron Trail (Summer)	0.25 mi	2	Frontcountry			X			
Lady of the Woods Trail (Winter)	1.30 mi	N/A	Frontcountry	–	–	X	X	X	–
North Entrance Road (Winter)	9.13 mi	N/A	Backcountry		X	X	X	X	X
<b>Total Mileage</b>	<b>10.68 mi</b>								

The following new winter trails would be established and opened for visitor use:

- **Lady of the Woods Trail** – This existing 1.3-mile trail would be ungroomed, marked for winter use, and open to snowshoeing/hiking, skiing, and dog walking. Cultural resources and values found in this area would be interpreted via publications and/or digital media.
- **North Entrance Road** – In winter, the existing 9-mile North Entrance Road would continue to be open to snowmobiles, skiing, and hiking. The superintendent's compendium would be clarified so that pets, dog-sledding, skijoring, and snow bikes are allowed. Increased information regarding the availability of these winter recreational opportunities on the road would be provided. Snowmobile-use route monitoring and law enforcement patrols of the road would continue to inform future management.

The following new summer trail would be established and opened for administrative use:

- **Chevron Trail** – This quarter-mile trail on mild terrain would connect existing employee areas and be open to hiking and dog walking.

### Modifications to Parking and Infrastructure

- Additional horse trailer parking, with up to four oversized-vehicle parking spaces, would be available at the Red Cone Trailhead (North PCT Lot).
- Additional modifications to parking, crosswalks, and supporting infrastructure would be handled on a case-by-case basis. In areas where additional improvements to infrastructure are necessary, existing parking areas, trailheads, and previously disturbed areas would be used where practicable to avoid or minimize new impacts to natural and cultural resources in the park. In areas where crosswalks are proposed, the park would work with the Federal Highway Administration to evaluate safety concerns and appropriate design solutions.

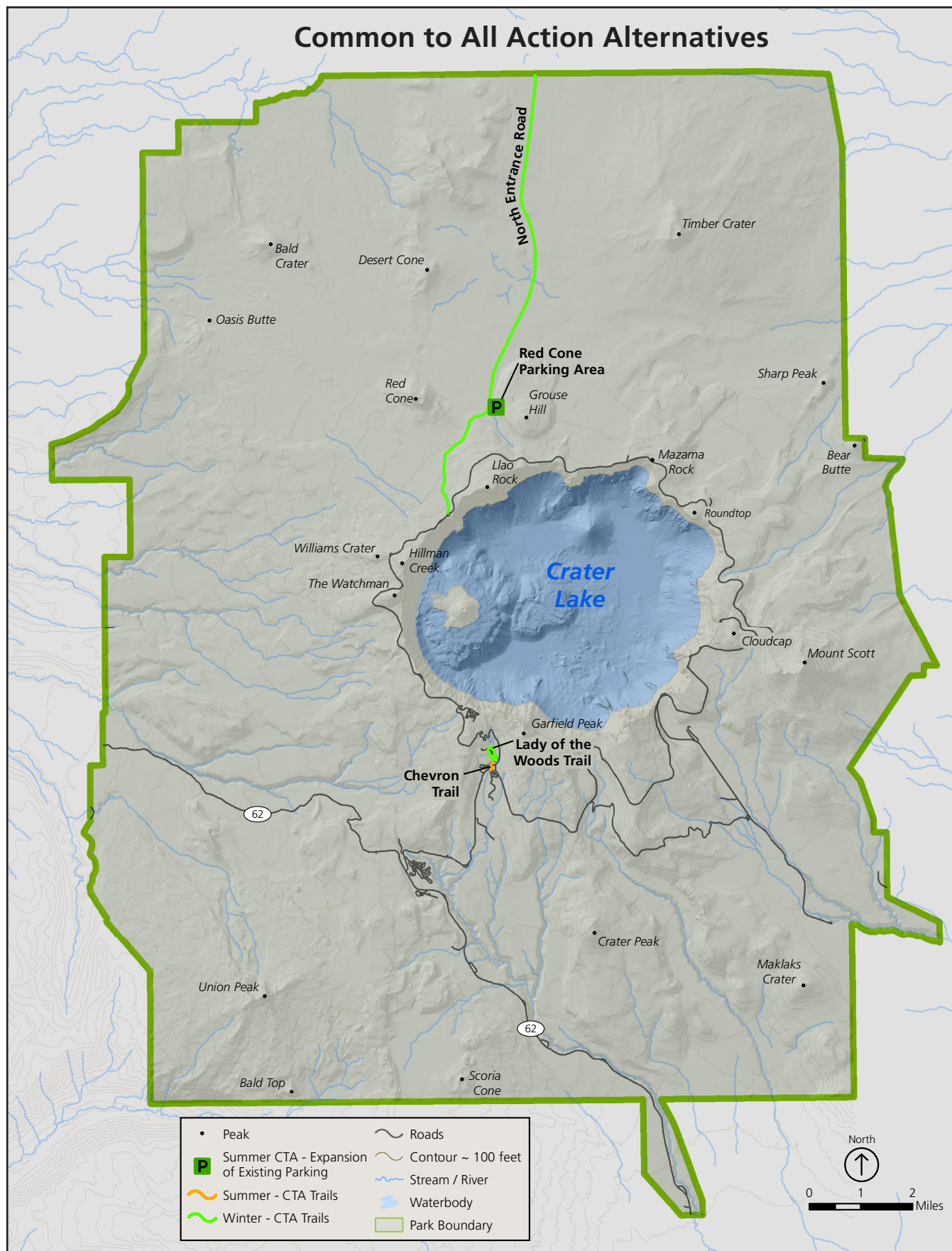


FIGURE 4. MAP SHOWING TRAIL SYSTEMS COMMON TO ALL ACTION ALTERNATIVES



## Trail Alignments

The new trail alignments shown on the alternative maps and mileages included in tables 2–7 are based on GIS analysis and limited field surveys. Final alignments would be determined on the ground that could result in minor adjustments to the trail locations shown on the alternative maps. Before construction activities begin, the final alignments would be reviewed by the park’s natural and cultural resources experts to ensure impacts to sensitive resources are avoided or minimized.

## Trail Restoration

Trails to be removed from the trail system would be obscured and blocked from public access to avoid continued use on a trail-by-trail basis as funding allows. Temporary educational signs may also be placed to discourage use. Once removed from the system, trails would be revegetated as necessary. The extent of revegetation efforts would depend on the specific conditions for each route. Natural recovery by native plant species is preferable to planting or seeding; however, planting or seeding would be used as necessary to prevent unacceptable erosion or resist competition from nonnative invasive species.

## MITIGATION MEASURES AND BEST MANAGEMENT PRACTICES COMMON TO ALL ACTION ALTERNATIVES

Congress has charged the National Park Service with managing the lands under its stewardship “*in such manner and by such means as will leave them unimpaired for the enjoyment of future generations*” (NPS Organic Act, 16 USC 1). As a result, the National Park Service routinely evaluates and implements mitigation measures whenever conditions occur that could adversely affect the sustainability of national park system resources.

To ensure that implementation of the trail management plan protects natural and cultural resources unimpaired for future generations and provides for a high-quality visitor experience, a consistent set of mitigation measures and best management practices that align with federal regulations and NPS *Management Policies* (2006) would be applied to all management actions associated with the proposed action. The following measures are considered common to all action alternatives:

## Trail Development

- Per NPS standards, NPS trail crews would coordinate and supervise any trail construction or maintenance. Specifically, the National Park Service would monitor and/or direct water bar placement, drainage placement, brushing and clearing, revegetation, where to obtain fill and other materials for trails, and how to apply fill materials such as soil, gravel, and rocks. Park staff would be responsible for ensuring that crews perform the necessary work in accordance with NPS instructions and standards.

According to NPS *Management Policies 2006*, the National Park Service would construct the proposed trail system with a sustainable design to minimize potential environmental impacts. Development would not compete with or dominate park features or interfere with natural processes, such as the seasonal migration of wildlife, forest regeneration, hydrologic activity, and geological processes. To the extent possible, the design and management of the proposed trail system would emphasize environmentally sensitive construction, use of



nontoxic materials, resource conservation, recycling, and integration of visitors with natural and cultural settings.

- The National Park Service would implement timely and accurate communication with visitors such as changes to programs, services, sites, or permitted activities via news releases, visitor contacts, web, and social media, as well as signage.
- All crew members and volunteers assisting in the trail work efforts would be educated about the importance of avoiding impacts on sensitive resources that have been flagged for avoidance, which may include natural and cultural resources.
- The National Park Service would implement measures to reduce adverse effects of construction on visitor safety and experiences. Measures may include, but are not limited to, noise abatement, visual screening, and directional signs that aid visitors in avoiding construction activities.
- Construction activities would be scheduled to minimize construction-related impacts on visitation and wildlife behavior (e.g., nesting seasons, etc.). Areas not under construction would remain accessible to visitors as much as is safely possible.
- To minimize new ground disturbance, staging areas would be located in previously disturbed areas, away from visitor use areas to the extent possible. All staging areas would be returned to preconstruction conditions and/or revegetated following construction. Parking areas for construction vehicles would be limited to these staging areas, existing roads, and previously disturbed areas.
- A construction zone for installation of the proposed trail system, as well as staging areas and work zones, would be identified and demarcated with construction tape or some similar material prior to any construction activities. The tape would define the zone and confine the activity to the minimum area needed for implementing the project.

### **Natural Resources (General)**

- Removal of or impact on native vegetation adjacent to trails would be minimized as much as possible to protect native plants and to prevent the spread of nonnative species. Noxious weed and invasive plant monitoring and treatment would be conducted prior to and following construction, and native topsoil and plant materials would be salvaged and reused during construction.
- To avoid introduction of nonnative plant species, only certified weed-free materials would be used for erosion control. No foreign materials with the potential to introduce invasive plant species would be brought into the area. Any proposed materials would be reviewed on a case-by-case basis; allowable materials for erosion control may include materials determined by NPS staff to be weed-free purchased from a certified source, , such as coir logs and wood excelsior bales.
- Construction equipment and gear would be cleaned prior to its use to prevent the introduction and spread of invasive vegetation. A weed wash would be used if deemed necessary by resource staff.
- Park staff would stage facility and trail construction equipment away from known invasive plant infestations and would construct trails away from known invasive plant populations.

- Soil erosion would be minimized by limiting the time soil is left exposed and by applying other erosion control measures such as erosion matting, silt fencing, and sedimentation basins in construction areas to reduce erosion, surface scouring, and discharge to water bodies.
- Topsoil would be re-spread in as near to the original location as possible and supplemented with scarification, mulching, seeding, and/or planting with species native to the immediate area. Conserving native topsoil would minimize vegetation impacts and potential compaction and erosion of bare soils. The use of conserved topsoil would help preserve microorganisms and seeds of native plants.
- Revegetation efforts would reconstruct the natural spacing, abundance, and diversity of native plant species in the trail corridor to the extent feasible. Monitoring of revegetated areas following construction would be conducted to ensure successful revegetation, maintain plantings, and replace plants that do not survive.
- Studies by qualified biologists to determine if rare, threatened, or endangered state or federally listed plant species are present would be conducted before ground disturbance to avoid adverse impacts and ensure appropriate locations and design of facilities. The US Fish and Wildlife Service would be consulted when required for surveys prior to the commencement of construction activities. A buffer surrounding the plants would be imposed that prohibits physical damage to the identified population during construction activities. The Resource Management Division (Botanist or Division Chief) would be consulted when determining the appropriate buffer. If avoidance is infeasible, adverse effects on rare, threatened, and endangered species would be minimized and compensated as appropriate and in consultation with the appropriate resource agencies.
- Efforts would be made to avoid cutting five-needle pines, aspen and oak species and avoid constructing trails near old legacy trees or healthy five-needle pine trees to minimize damage to root systems.
- Footbridges, if necessary, would be designed in such a way as to completely span the channel and associated wetland habitat (i.e., no pilings, fill, or other support structures in the wetland/stream habitat). If footbridges could not be designed in such a way as to avoid wetlands, then additional compliance (e.g., a Wetland Statement of Findings) would be done to assess impacts to wetlands and ensure no net loss of wetland area.

## **Wildlife (General)**

- Plant surveys by qualified biologists to determine if rare, threatened, or endangered state or federally listed plant species are present would be conducted before ground disturbance to avoid adverse impacts and ensure appropriate locations and design of facilities. The US Fish and Wildlife Service would be consulted when required for surveys prior to the commencement of construction activities. A buffer surrounding the plants would be imposed that prohibits physical damage to the identified population during construction activities. The Resource Management Division (Botanist or Division Chief) would be consulted when determining the appropriate buffer. If avoidance is infeasible, adverse effects on rare, threatened, and endangered species would be minimized and compensated as appropriate and in consultation with the appropriate resource agencies.

- Care would be taken not to disturb any sensitive wildlife species (raptors, migratory birds, bats) found nesting, hibernating, foraging, or otherwise living in or immediately nearby the worksites. To reduce noise disturbance and limit impacts on breeding avian and mammalian species, all vegetation clearing and trail construction would be conducted from August 10 to March 1, as feasible. If clearing/construction needed to occur outside of this time frame (i.e., during nesting season), those sections of trail would be surveyed by a qualified biologist for nesting or roosting use. If nesting or roosting is found, resource management personnel would be consulted, and measures would be identified to avoid impacts. Timing of construction activities outside of nesting season, for example, could mitigate impacts and may eliminate the need for nesting bird surveys. Resource management personnel would be notified/consulted when wildlife would be disturbed by proposed trail construction or maintenance activities.
- Where possible, natural features with obvious high value to wildlife would be preserved (e.g., tree snags).
- The National Park Service would employ various visitor education techniques and media to reduce visitor use impacts on wildlife habitat and plant communities near existing and proposed trails.
- The National Park Service would use temporary or seasonal visitor use restrictions or area closures to protect sensitive wildlife habitat and sensitive wildlife behavior or life stages from trail use.
- If sensitive natural resources are discovered during trail construction, construction would cease and the area would be surveyed in more detail so that impacts could be avoided or minimized and/or an alternate route established.

## **Northern Spotted Owl**

### **Habitat Removal.**

- All projects will be reviewed by the terrestrial ecologist to determine potential impacts to northern spotted owls. Any trail construction project or other project with significant amount of vegetation removal (e.g., clearing out snags in backcountry campsites) occurring within 1.2 miles of northern spotted owl habitat will require surveys for northern spotted owl if northern spotted owl habitat will be altered. A minimum of two summers will be needed for habitat disturbance projects (six surveys/year for two years).
- If vegetation removal occurs within 100 meters of an identified spotted owl nest tree or nesting area (regardless of status – active/inactive), then within that 100 meter buffer efforts would be made to protect the trees that contribute to the microclimate features of the nest tree stand (i.e., contribute to shading of nest tree, leaners that are ramps for young owls looking to get off the ground, etc.) and to ultimately protect the nest tree from damage.
- Within 0.5 miles of any known spotted owl nest site or activity center (regardless of status – active/inactive), 50% of the area would be protected from extensive vegetation removal.
- Activities in occupied habitats or unsurveyed habitats for the northern spotted owl would not result in: (a) changing suitable habitat to unsuitable; (b) changing spotted owl dispersal habitat to non-dispersal; and (c) the significant degradation of habitat for the spotted owl

(activities may modify some components of owl habitat such as potential nest trees, logs, snags, mistletoe structure, etc., but not to a degree that would change the habitat classification or function of the stand).

#### **Individual Trees.**

- Known occupied or unoccupied spotted owl nest trees would not be removed.
- If 'potential nest tree' removal is to be done within suitable owl habitat during the spotted owl early breeding season (March 1 to August 15), review by a CRLA terrestrial ecologist and consultation would be required.
- Within 0.5 miles of any known spotted owl nest site or activity center, snags greater than 30" diameter at breast height (dbh) would be left standing.
- When feasible, the National Park Service would minimize the number of large conifers (21" dbh or larger) removed and would fall trees in a manner to minimize impacts to surrounding trees—away from suitable habitat if it is possible and safe to do so.
- Any proposed removal of any tree larger than 30" dbh within suitable spotted owl habitat would require CRLA terrestrial ecologist review.

#### **Active Nest.**

- If an active spotted owl nest is found, a CRLA terrestrial ecologist would be notified immediately.
- If an active nest is found with 0.25 miles of a trail during the spotted owl breeding season (March 1 – August 10), the park would assess the potential impacts of trail maintenance and/or visitor use and then determine if the trail would need to be temporarily closed.

#### **Ground-Level Disturbance.**

- During the spotted owl breeding season (March 1 – August 10), trail or parking lot construction projects with potential noise disturbance (e.g., chain saw, compaction devices, field crews > 3 people) but very limited or no vegetation removal (live trees or standing snags) would not be conducted in those portions of treatment units that are within 0.25 miles of an active spotted owl nest site or activity center. Active / inactive nesting status would be determined via standard protocol surveys (USFWS 2011). A minimum of two months will be needed to complete noise disturbance surveys (six surveys, each a week apart). In addition, no vegetation removal will occur within potential spotted owl habitat before protocol surveys are completed.
- When feasible, the National Park Service would begin activities in the area farthest from spotted owl suitable habitat when conducting activities that must occur during the breeding season.
- When feasible, the National Park Service would adjust the location of activities to utilize topographic and vegetative buffers, where it is necessary to conduct activities that would increase noise levels within the adverse-effect threshold distance of suitable habitat during the nesting season. Consultation with the terrestrial ecologist should occur to determine feasibility of such actions. For example, location of activity upslope of suitable habitat is likely to be less severe than locating the activity downslope of suitable habitat.



### **Aircraft Use.**

- When fixed wing or rotary aircraft are used, the Terrestrial Branch (terrestrial ecologist) would be consulted to identify known active spotted owl nest sites/activity centers (ACs). No direct overflights of the identified nest sites/ACs would be allowed below 1,500 feet above ground level during the spotted owl breeding season (March 1 – August 10).
- The National Park Service would minimize the number of overflights over suitable habitat and minimize the use of the same flight paths or the amount of time hovering over the same suitable habitat during the breeding season.
- The National Park Service would use the smallest, quietest helicopters that can accomplish the task efficiently and safely.

### **Bull Trout**

- If vegetation removal occurs within 100 feet of designated bull trout critical habitat, efforts would be made to preserve standing live and dead trees that might ultimately fall in the creek to maintain in-stream habitat quality. If hazard trees need to be removed for public safety, those trees would be felled toward the creek, or into it if possible.
- If vegetation removal occurs within 100 feet of designated critical habitat, efforts would be made to maintain riparian vegetation community and stream shading.

### **Cultural Resources**

- Because this plan involves phased implementation of actions not yet designed to allow full impact analysis, the National Park Service would pursue phased compliance with the Oregon State Historic Preservation Officer and other consulting parties in accordance with Section 106 of the National Historic Preservation Act. Phased implementation activities concerning cultural resources would include the following best management practices:
  - All construction projects and infrastructure associated with trail development would be designed to avoid known cultural resources and areas with high potential for archeological or ethnographic resources as much as possible.
  - Before any ground-disturbing action by the National Park Service, pedestrian surveys and/or remote sensing of the areas planned for construction or other ground-disturbing development would be conducted in compliance with Archaeological Resources Protection Act of 1979, as amended, and the National Historic Preservation Act. The survey would help determine the presence or absence of archeological deposits in the footprint of disturbance. Any archeological resources discovered during these investigations would be evaluated for significance and potential effects and in consultation with the Oregon State Historic Preservation Officer. The National Park Service would adjust project locations, designs, and/or construction activities to avoid NRHP-eligible archeological resources discovered during preconstruction survey as much as possible. If cultural resources or adverse effects to those resources could not be avoided, additional consultation would occur to identify how to resolve concerns and mitigate impacts.
  - Known archeological sites would be monitored to assess and document the effects of natural processes and human activities on the resources. Archeological resources would

be left undisturbed and preserved in a stable condition to prevent degradation and loss of research values unless intervention could be justified based on compelling research, interpretation, site protection, or park development needs. Recovered archeological materials and associated records would be treated in accordance with NPS *Management Policies 2006*, NPS Museum Handbook, and 36 CFR Part 79.

- The National Park Service would consult with associated American Indian tribes to ensure that project actions are conducted in a way that respects the beliefs, traditions, and other cultural values of the tribes who have ancestral ties to park lands. Sensitive, sacred, or traditional use areas would be protected to the greatest extent possible by avoiding areas with ritual features, mitigating adverse impacts to ethnographic resources through resource protection efforts, retaining site confidentiality as appropriate, and continuing to provide tribal access to resources and places of cultural importance.
- Should construction unearth previously undiscovered cultural resources, work would be stopped in the area of discovery and a qualified archeologist would be contacted to assess the artifacts and/or site. The National Park Service would consult with the state historic preservation officer and the Advisory Council on Historic Preservation, as necessary, according to 36 CFR 800.13. In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act (25 USC 3001) of 1990 would be followed.
- Cultural landscape inventories and cultural landscape reports would be completed as necessary to inform any alterations to cultural landscapes that may impact contributing features.
- NPS staff would continue to inform visitors and others of the importance of protecting and not disturbing archeological resources and historic resources. Visitors would be informed (through NPS educational and interpretive programs and/or interpretive media products, and ranger contacts) of the penalties for illegally collecting artifacts or otherwise causing resource damage.

Additional mitigation measures and best practices for trail maintenance can be found in appendix E.

## **VISITOR USE MANAGEMENT ACTIONS COMMON TO ALL ACTION ALTERNATIVES**

This plan incorporates aspects of the Visitor Use Management Framework to develop long-term strategies for monitoring and managing visitor use within the park (IVUMC, [www.visitorusemanagement.nps.gov](http://www.visitorusemanagement.nps.gov)). Key aspects of visitor use management incorporated into the action alternatives include the identification of indicators and thresholds and visitor capacity.

### **Indicators and Thresholds**

Monitoring in this plan is accomplished through establishment of ‘indicators’ and ‘thresholds.’ ‘Indicators’ are specific resource or experiential attributes that can be measured to track changes in conditions so that progress toward achieving and maintaining desired conditions can be assessed. ‘Thresholds’ are the minimum acceptable conditions associated with each indicator. Indicators and thresholds provide park managers with monitoring protocols to ensure desired conditions for resources and visitor experiences are achieved and maintained over time.

The planning team considered many potential indicators related to visitor use-related impacts but ultimately identified four that are the most important to monitor the effectiveness of the plan's management strategies. The four indicator topics include Visitor-Created Trails, Percent Change in Trail Width, Presence of Waste, and Mechanized Winter Recreation. These indicators and the associated thresholds are considered common to all action alternatives.

The planning team also identified management strategies associated with each indicator. The impacts of these management strategies are analyzed in chapter 4. Several of these strategies are currently in use and may be increased in response to changing conditions. Other strategies would be implemented upon completion of the plan to ensure conditions do not approach thresholds. Some management strategies would be implemented if and when monitoring indicates that conditions are changing and thresholds are being approached or exceeded. See appendix A for detailed descriptions of the indicators and thresholds, associated rationales and monitoring protocols, and descriptions of the management strategies.

## **Visitor Capacity**

Visitor capacity is defined as the maximum amount and types of visitor use that an area can accommodate while sustaining desired resource conditions and visitor experiences consistent with the purpose for which the area was established. By establishing visitor capacities and implementing them with appropriate management strategies, the National Park Service can help ensure that resources are protected and that visitors have the opportunity for a range of high-quality experiences. The management strategies to implement the visitor capacities for the five analysis areas in the planning area are analyzed in chapter 4.

Under the new (2012) NPS planning portfolio, trail management plans are considered to be implementation level plans that meet the legal requirements for general management plans (1978 NPRA, 54 U.S.C. 100502) to identify and implement visitor capacities for all areas of a system unit. Crater Lake National Park's trails have no prior identification of visitor capacity. See appendix B for the identification of visitor capacities for trails included in this plan and associated implementation strategies.

## **Adaptive Visitor Use Management**

Visitor use management is an iterative process in which management decisions are continuously informed and improved through monitoring to determine the most effective way to manage visitor use. Assessing the outcome of management actions is necessary to ensure management actions are having their intended effects and desired conditions are maintained.

As monitoring of conditions continues, managers may decide to modify or add indicators and/or thresholds if better ways are found to measure important changes in resource and experiential conditions. Likewise, visitor capacities may need to be adjusted over time in response to improved understanding of the relationship between visitor use and impacts to desired conditions. The rationales to adapt any indicators, thresholds, visitor capacities, or their associated management strategies would be documented appropriately, undergo any necessary additional compliance reviews, and be made available to the public.

## ACTIONS CONSIDERED BUT DISMISSED

- **Closure of East Rim Drive to vehicles.** This proposal is inconsistent with guidance set forth in the park's 2005 general management plan. The majority of park visitors are automobile-based, and total closure of the eastern segment of the road would degrade their experience. This would be too significant an alteration of visitor use patterns and does not meet the purpose and need of this plan.
- **Closing one lane of East Rim Drive for vehicles and converting it into a multiuse trail.** This option would create one-way vehicular traffic. A barrier would need to be constructed for pedestrian safety. In effect, this would create a one-lane road with no shoulder or passing areas, thus increasing auto-congestion during peak periods. Further, a crowded one-lane road would slow emergency response and threaten visitor safety. Alteration of the road would also create adverse impacts to cultural landscape character and historic integrity.
- **Expansion of snowmobiles, mountain bikes, and other mechanized and motorized forms of transit into backcountry zones / trails.** This would be inconsistent with the 2005 general management plan and park zoning and with NPS management policies and recommended wilderness.
- **Development of a second access trail to the lakeshore.** Caldera slope instability severely limits options for a second route. One or two possible locations exist, but trail construction would involve adverse environmental impacts to the lake itself. Any constructed trail would then require intensive maintenance, thus diverting funding and personnel resources from the rest of the trail system.
- **Development of trails on and around Llao Rock.** Trail development on the north rim in the vicinity of Llao Rock would necessitate intrusion into the Llao Rock Research Natural Area and would likely lead to a degradation of the unique flora and fauna found there (including rare plants). This would be inconsistent with the purposes for which the research natural area was established (NPS 2021).
- **Development of trails near Cascade Springs.** Spring habitats are inherently sensitive and prone to disturbance. Bank trampling, erosion, and sedimentation in and near springs could affect the water temperature and chemistry as well as water quantity, adversely impacting aquatic species in the springs as well as streams and wetlands downstream. Once disturbed, spring sites can take a long time to rehabilitate. Because springs form an ecotone between groundwater and surface water habitats, habitat conditions in springs are unique and different from the remainder of the stream network. In general, spring communities often contain rare or unique organisms that are adapted to the relatively constant temperature and water quality conditions found there (J. Hooke, pers. comm.). In addition, aquatic life in the streams, lakes, and wetlands that are fed by springs are highly dependent on the amount, duration, and timing of flow from those springs (Brown 2007 in Adamas et al. 2013), as groundwater flow from springs is generally warmer in winter and cooler in summer than surface water. Furthermore, Cascade Spring is one of the only groundwater spring sources in the eastern part of the park, and so it is a locally important habitat for wildlife (D. Hering,



pers. comm.). On multiple occasions, park resource staff have been to this area and noted an exceptional number of tracks within the spring and heavily used game trails in and around the spring (J. Hooke, pers. comm.). Water is such a limiting factor in this area that the US Forest Service has added guzzlers to provide water to wildlife. Increased visitor use of the creek and springs would reduce habitat quality and cause some wildlife to avoid the area. Several springs in the park are already accessible by trail, such as Boundary Springs, Red Cone Spring, and Lightning Springs. The park has experienced a great amount of resource damage at other spring and waterfall areas with high levels of visitor use such as Lightning Springs, Plaikni Falls, and Vidae Falls—in some cases requiring an area closure. In addition, backcountry rangers must spend staff time cleaning trash out of the area around Lightning Springs (J. Hooke, pers. comm.).

## **COST ESTIMATES**

NPS decision makers and the public must consider the costs and advantages of various alternatives, including the no-action alternative, to make a relevant comparison of the alternatives. The costs shown in table 7 are estimates for comparison purposes only and are not to be used for budgetary purposes or implementing funding requests. If and when the actions are implemented, actual costs would vary. Specific costs would be determined in subsequent, more detailed planning and design efforts. Once the plan is complete, funding will be sought in future years on a project-basis.

The estimates in this section include both one-time net construction costs and annual operations and maintenance (O&M) costs needed to implement the action alternatives. Construction costs for the preferred alternative (alternative 1) are \$8.5 million. Over a 25-year period, the annualized cost of implementation would be \$544K and the annual increase in O&M requirements would be \$166K. There is no guarantee that the actions proposed in this plan would be funded. The park will continue to look for creative and diverse funding opportunities, and implementation of proposed actions are subject to available funding. Budget restrictions, requirements for additional data or regulatory compliance, and competing national park system priorities may prevent implementation of some actions.

Deferred maintenance of the existing Crater Lake trail system, as captured in work orders, was \$3.3M in 2020. It would cost an additional \$208K per year to address all deferred maintenance within a 25-year window, allowing for the escalation of project costs over time. Note that this cost does not include deferred maintenance on the Cleetwood Cove Trail, which will be rehabilitated as part of a separate project (discussed in chapter 3 and appendix B).

**Table 7. Estimated Construction and Annual Operations and Maintenance Costs to Implement the Action Alternatives**

<b>Construction Costs*</b>	<b>Alternative 1</b>	<b>Alternative 2</b>
Backcountry Campsites		\$30,000
Castle Creek Canyon Overlook Trail	\$448,400	
Castle Creek Canyon Trail and Parking	\$233,900	
Chevron Trail	\$25,200	\$25,200
East Bald Crater Loop Trail (Removal)		\$260,900
Falls to Flowers Trail	\$520,600	
Maklaks Crater Loop		\$686,100
Mazama Campground Loop Trail	\$695,500	
Mazama Rock Trail	\$272,400	
Munson Valley Roadside Trail	\$3,534,000	
Munson Valley Spur	\$107,000	
Panhandle Trail and Parking	\$716,200	
Ponderosa Pine Trail	\$90,800	
Pinnacles Trailhead Improvement	\$489,700	
Raven Trail	\$310,800	
Red Cone Trailhead Parking	\$46,300	\$46,300
Rim Trail (East Side)		\$3,192,600
Union Peak to Stuart Falls Connector Trail	\$1,009,000	
Vidae Ridge Trail		\$575,100
<b>Total Construction Cost</b>	<b>\$8.5 M</b>	<b>\$4.2M</b>
<b>Annualized Cost of Implementation</b>	<b>\$544,000</b>	<b>\$272,000</b>
<b>Additional Annual O&amp;M Requirement</b>	<b>\$165,600</b>	<b>\$49,000</b>

\*Costs are escalated to 2021 dollars.

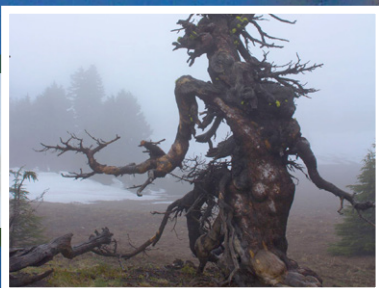
This page intentionally left blank.



# AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

CHAPTER

3







## **CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES**

### **INTRODUCTION AND GENERAL METHODOLOGY**

The “Affected Environment and Environmental Consequences” section describes the resources that could be affected as well as the potential environmental consequences of implementing any one of the alternatives being considered. The section is organized by resource topic and provides a comparison of the alternatives based on issues. Unless stated otherwise, impacts from actions common to all action alternatives are included as part of the impact analyses for alternatives 1 and 2.

The topics presented are those related to the key issues that could inform the NPS decision on how to manage the park’s trail system. The descriptions of the resources provided in this chapter include resource trends and planned actions. They serve as an account of the baseline conditions against which the potential effects of the proposed actions considered in this plan are compared.

### **SOILS**

#### **Affected Environment (Current and Expected Future Conditions of Resources That Would Be Affected)**

The Natural Resources Conservation Service (NRCS) produced a soil survey for the park in 2003. Twelve general soil types organized into six general categories were identified in the survey. The categories include (NPS 2005):

- soils on uplands, formed in air-fall deposited ash and pumice;
- soils on uplands, formed in air-fall deposited ash and pumice over glacial deposits;
- soils in valleys, formed in ash flow deposits consisting of ash, pumice and cinders;
- soils on cinder cones;
- soils on upland meadows with intermingled forests; and
- soils in seeps and on stream terraces.

Generally speaking, soils in the northern and eastern areas of the park consist of thick layers of gravel-sized pumice with an area of finer, sand-sized pumice and ash on the eastern slope of Timber Crater, whereas soils of cobble-sized pumice exist in park valleys and lower elevation lava plains. The caldera rim consists of ash and cinder soils with lesser amounts of pumice soils around the outcrops of hard andesitic or dacitic bedrock. The park’s perennial streams run through deeply incised channels that expose layered ash flows, often with deeper soil development due to persistent moisture presence (USDA NRCS 2003; NPS 2017). Soils on the west side of the Cascade Crest have an udic or moist soil moisture regime, with a drier or xeric soil moisture regime east of the Cascade crest (USDA NRCS 2003; NPS 2017).

The 2003 soil survey by the Natural Resources Conservation Service provides ratings for erodibility and “trafficability” (ability to sustain continuous foot/equestrian traffic) for all soils identified in the park. While the survey acknowledges that most trails should not require notable cutting or filling for development and maintenance, it does identify soil types that are likely unsuitable for trail

development. The ratings are based on soil properties that affect their sustainability for trail, including stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer (USDS NRCS 2003). In general, new trails in areas of unsuitable soils have been removed from consideration in this plan.

Since the establishment of Crater Lake National Park, soils have been impacted by construction of roads and facilities to accommodate park visitors and operations. Most of these projects have occurred within or adjacent to existing developed areas in an approximately 274-acre footprint within the park, as well as along the 95 miles of existing trails in the park. Soils have been damaged by trail construction and high concentrations of people, causing compaction in visitor use areas as well as recurring maintenance of road and utility corridors and fuel breaks. These impacts affect soil resources in many ways, including damaging soil ecosystems; altering the soil profile and removing soil organic matter; affecting soil structure; and affecting nutrient cycling processes.

Trail braiding and widening occurs in spot-locations as trail users avoid rutted, rocky, snow-covered, or muddy areas on trails, trampling adjacent vegetation. Visitor-created trails have proliferated as hikers venture “off-trail” to explore, take photographs, and/or engage in other off-trail activities. Both of these activities result in ongoing compaction and erosion of the park’s twelve soil types. Park managers implement seasonal closures where heavy visitor use and development of social trails threatens sensitive park habitat such as at Llo Rock Research Natural Area.

Proposed development projects within the park, including proposed installation of cellular towers in Rim Village and Mazama Village and improvement of visitor facilities at North Junction Viewpoint, would disturb up to 2.4 acres of native soils, resulting in soil compaction and loss of productivity. Proposed rehabilitation projects will adversely impact soils along 23.5 miles of the East Rim Drive, 1.1 miles of the Cleetwood Cove Trail, and 15 acres of unstable slopes above the trail and at the Annie Spring Entrance Station. These projects will impact up to 12 acres of soils through soil compaction and erosion when both temporary disturbance areas and development footprints are summed. Mitigation measures will be implemented to minimize adverse impacts to soils from these future planned actions, however, these projects will contribute long-term adverse effects to the overall adverse trends in soils in the park.

## **Environmental Consequences**

**No-Action Alternative.** Under the no-action alternative, impacts on soils would remain the same as described in the affected environment. The current resource threats (trail braiding and widening, off-trail travel, etc.) and impacts would continue to occur.

**Alternative 1.** Construction of 20.6 miles of new trails would result in permanent adverse impacts to up to 11.7 acres of undisturbed soils in the park. Initial trail construction would cause soil compaction and loss through erosion. In some areas, up to 6 to 8 inches of topsoil would be removed to create trail benches; this soil would be cast downhill from the trail. Implementation of mitigation measures listed in chapter 2 would reduce impacts from trail construction. Recreational use of the trails would cause continued adverse soil impacts including loss of organic litter and soil compaction, rutting, and erosion. In addition, trail widening or braiding may result in soil compaction and erosion on either side of new trails. However, implementation of management strategies listed in appendix A, such as improving signage, rehabilitating visitor-created trails, and establishing trail borders, would reduce off-trail travel and lessen adverse impacts from hiking on the trail corridors and adjacent areas.

Alternative 1 would permanently reduce soil productivity on up to 0.15 acres through development of two parking areas (Pinnacles Parking Area and Castle Creek Canyon Trail Parking) and associated facilities. Pavement overlays would cause permanent compaction and loss of soil productivity. Construction activities and fill associated with curbs would temporarily impact soils within a 5-foot wide perimeter (approximately 1,200 square feet at Castle Creek Canyon Trail and 1,400 square feet at Pinnacles Parking Area).

With construction of new trails and facilities, there is the potential for informal spur trails to develop as visitors travel off maintained trails to reach a destination. These “visitor-created trails” are of concern to land managers when they become areas of soil erosion and compaction. However, implementation of management strategies listed in appendix A, such as improving signage, rehabilitating visitor-created trails, and establishing trail borders, would reduce off-trail travel and minimize adverse impacts.

The soil compaction and erosion caused by trail construction and recreational use would contribute long-term adverse effects to the overall adverse trends in soils when alternative 1 is added to past, ongoing, and reasonably foreseeable future actions.

**Alternative 2.** Construction of 23.2 miles of new trails and campsites would result in permanent adverse impacts to up to 9.9 acres of undisturbed soils in the park. Initial trail construction would cause soil compaction and loss through erosion. In some areas, up to 6 to 8 inches of topsoil would be removed to create trail benches; this soil would be cast downhill from the trail. Implementation of mitigation measures listed in chapter 2 would reduce impacts from trail construction. Recreational use of the trails and campsites would likely cause continued adverse soil impacts including loss of organic litter and soil compaction, rutting, and erosion. Trail widening or braiding or development of visitor-created trails may result in soil compaction and erosion on either side of new trails.

With construction of new trails and facilities, there is the potential for informal spur trails to develop as visitors travel off maintained trails to reach a destination. These “visitor-created trails” are of concern to land managers when they become areas of soil erosion and compaction. However, use of management strategies listed in appendix A, such as improving signage, rehabilitating visitor-created trails, and establishing trail borders, would reduce off-trail travel and lessen adverse impacts from hiking on the trail corridors and adjacent areas.

The soil compaction and erosion caused by trail construction and recreational use would contribute long-term adverse effects to the overall adverse trends in soils when alternative 2 is added to past, ongoing, and reasonably foreseeable future actions.

**Conclusion.** Under the no-action alternative, impacts on soils would remain the same as described in the affected environment. Alternative 1 would result in greater levels of ground disturbance than alternative 2, with a subsequent increase in the potential for soil compaction, rutting, and erosion both on- and off-trail. On the whole, both action alternatives would have more adverse impacts to soils than the no-action alternative, although adverse impacts would be minimized through the implementation of mitigation measures and best management practices described in chapter 2 as well as management strategies identified in appendix A.

## VEGETATION

### Affected Environment (Current and Expected Future Conditions of Resources That Would Be Affected)

The native plant communities found in Crater Lake National Park are diverse and relatively intact given the protection and management of the park since its establishment more than a hundred years ago. Located in the southern segment of the Cascade Range, the park ranges from roughly 4,000 feet to a little under 9,000 feet in elevation (with Mount Scott being the highest point at 8,929 feet). These conditions are most ideal for montane forest communities, which are the most pervasive plant communities in the park. The primary native plant communities in the park include (NPS 2017; NPS 2005):

- **Lower elevation mixed conifer forest** – Dominant species include ponderosa pine, white fir, Douglas fir, sugar pine, and incense cedar.
- **Middle elevation forests** – Dominant species are either pure Shasta red fir or pure lodgepole pine.
- **Higher elevation mixed conifer forest** – Dominant species include Shasta red fir, western white pine, lodgepole pine, and mountain hemlock.
- **Subalpine forests** – Dominant species include mountain hemlock and whitebark pine at the highest elevations. The park's high elevation forests are either pure mountain hemlock, pure whitebark pine, or a mixture of mountain hemlock, whitebark pine, lodgepole pine, Shasta red fir, and/or subalpine fir. Please refer to the "*Whitebark Pine*" section of chapter 3 for a description of the whitebark pine community and analysis of impacts.
- **Herbaceous and grass communities** – Dominant species include oval-leaved *eriogonum*, Davis' knotweed, Geyer's everlasting, silvery ragwort, and squirreltail. The communities are most commonly found on the Crater Lake caldera rim slopes and in the surrounding pumice flats.
- **Chaparral and shrubland communities** – Dominant species include tobacco brush, green leaf manzanita, Fremont's silktassle, and Greene's goldenweed (in subalpine areas). While generally uncommon in the park, areas of chaparral community primarily exist in the mixed conifer and ponderosa pine communities in the vicinity of Crater Lake.
- **Wetland and riparian communities** – Please refer to the "Wetlands and Riparian Areas" section of chapter 3 for a brief description of riparian and wetland plant communities.

In terms of special status species, the park is home to a declining population of whitebark pine (proposed for listing as threatened under the Endangered Species Act). Blister rust (caused by a fungal pathogen), historic fire suppression, climate change, and mountain pine beetle are the primary causes of the population decline. The Crater Lake rockcress, which is the only known plant species that is endemic to the park, is a federal species of concern that is generally found at the higher elevations of the caldera and other peaks. In addition to the effects of climate change on most high elevation species, the rockcress is also threatened by recreational use and ground disturbances from

park facilities and amenities. Lastly, the pumice grape-fern is a high elevation plant that is endemic to the central and southern segments of the Cascade Range. The grape-fern is listed as threatened by the State of Oregon, with the threats primarily being associated with recreational use and related ground disturbances, as well as climate change (NPS 2017).

Past actions in the park have resulted in ground disturbance, removal of native vegetation, and subsequent establishment of invasive exotic plants. Existing facilities in the park cover about 300 acres of land. Construction, maintenance, and use of existing buildings, roads, and trails have created disturbed soil areas where invasive plant populations have become established. These plant populations continue to serve as sources of seed, causing persistent adverse impacts to native plants. Past restoration efforts have mitigated the adverse effects of previous ground-disturbing activities through revegetation with native plants. Historic fire suppression and then later wildland fire management and prescribed fire have also changed natural vegetation succession patterns across the park.

Invasive, nonnative plant infestations are currently the biggest threat to the native plant communities in the park (NPS 2017). Invasive plant infestations often occur on disturbed ground from visitor use and facility development or result from altered environmental conditions brought on by historic wildfire suppression. High levels of visitor use and recreation in the park—including trail use—continue to make the park’s native plant communities prone to the expansion of established invasive plant infestations as well as the colonization of additional invasive species into the park (Parks et. al. 2005). Currently, established infestations include nonnative plants such as cheatgrass, Canada thistle, smooth brome, St. John’s wort, and bull thistle.

Implementation of the park’s invasive plant management plan and fire management plan will result in beneficial impacts to vegetation over the next 10 years across 250 acres and 1,500 acres, respectively, through actions to protect and maintain the health and integrity of native plant communities and the species dependent upon them. Mitigation measures will be implemented to reduce temporary adverse impacts from ground disturbance and mechanical and chemical treatment methods.

Trail braiding and widening occurs in spot-locations as trail users avoid rutted, rocky, snow-covered, or muddy areas on trails, trampling adjacent vegetation. Visitor-created trails have proliferated as hikers venture “off-trail” to explore, take photographs, and/or engage in other off-trail activities. Trampling of vegetation causes reductions in vegetation cover, height, and biomass; changes in species composition; and introduction and spread of nonnative plants along linear trail corridors (Marion et al. 2016). Park managers implement seasonal closures where heavy visitor use and development of social trails threatens sensitive park habitat such as at Llao Rock Research Natural Area.

Future development projects within the park, including proposed installation of cellular towers in Rim Village and Mazama Village and improvement of visitor facilities at North Junction Viewpoint, would result in permanent adverse impacts to vegetation through removal of up to 2.4 acres of native plants. Annual hazard tree mitigation will result in the removal of up to 500 trees over the next ten years in developed areas. Future rehabilitation projects will adversely impact vegetation along 23.5 miles of the East Rim Drive, 1.1 miles of the Cleetwood Cove Trail, and at the Annie Spring Entrance Station. These projects could impact up to 12 acres of vegetation through vegetation removal and introduction of nonnative plants when both temporary disturbance areas and development footprints are summed. Mitigation measures will be implemented to reduce adverse impacts to



vegetation, however, these projects will contribute long-term adverse effects to the overall adverse trends in vegetation at the park.

## **Environmental Consequences**

**No-Action Alternative.** Under the no-action alternative, impacts on vegetation would remain the same as described in the affected environment. The current resource threats (invasive plant species, off-trail travel, etc.) and impacts would continue to occur.

**Alternative 1.** Construction of 20.6 miles of new trails would require permanent vegetation removal in areas. Acreages are approximate pending further design, but it is estimated that the construction of the linear trails would result in the permanent removal of up to 11.7 acres of vegetation. Per trail design standards described in appendix E, trail construction would not remove trees over 6 inches in diameter. Branches extending over the trail corridor would be cut no higher than 10 feet above the trail surface. The maximum width of disturbance would be 8 feet wide, which accounts for the 4- to 6-foot trail widths, potential soil disturbance outside of trail surface (mainly on trail locations on a steep side slope where the cut slope would need to be wider), and the distance of vegetation thinning and trimming beyond the trail. However, trail design and route placement would minimize vegetation removal, and in forests and woodlands best management practices as outlined in appendix E would be implemented to maintain habitat conditions at the stand scale.

No rare endemic plants, including Crater Lake rockcress, pumice grape-fern, and Shasta arnica would be adversely affected by any proposed construction or restoration activities. The National Park Service would implement mitigation measures described in chapter 2, including examining potential rare plant habitat in and near all construction areas that have not been previously surveyed for the presence of rare plants. Known occurrences of rare plants in the vicinity of the proposed parking lot additions and improvements, new trails, and picnic areas would be delineated and protected during construction. If any rare plants were encountered on a proposed trail alignment, the plants would be marked so that individual plants can be avoided by routing the trail away from the plants.

With construction of new trails and facilities, there is the potential for informal spur trails to develop as visitors travel off maintained trails to reach a destination. These “visitor-created trails” are of concern to land managers when they become areas of erosion and vegetation trampling. In addition, trail braiding and widening would continue to occur in spot-locations as trail users avoid rutted, rocky, snow covered, or muddy areas on trails, trampling adjacent vegetation. In particular, five Shasta arnica sites exist on the southeast face of Union Peak in close proximity to where the new connector trail ties to the existing trail. Off-trail activity in this area could damage individual plants, cause soil compaction, and reduce flowering potential. However, park staff would periodically monitor the number of visitor-created trails leaving designated trails as part of visitor use management. If the number of visitor-created trails exceeds the threshold set in appendix A (e.g., in frontcountry areas no more than three visitor-created trails leaving a designated trail per one mile) or if visitor-created trails are impacting sensitive resources, park staff would implement additional management strategies to protect sensitive resources such as rehabilitating visitor-created trails, restricting off-trail travel in sensitive areas, or establishing restoration areas around visitor-created trails. Therefore, the proposed actions under alternative 1 would not threaten the long-term viability of rare plant species within the park.

At the Pinnacles Parking Area, approximately 0.07 acres of lodgepole pine forest would be permanently removed to expand the parking lot and add a vault toilet and picnic area. Constructing a

10-car pullout parking area at the trailhead for Castle Creek Canyon Trail and installing a vault toilet would require permanently removing up to 0.08 acres of Shasta red fir forest. Construction activities and fill associated with curbs would temporarily impact vegetation within a 5-foot-wide perimeter (approximately 1,200 square feet at Castle Creek Canyon Trail and 1,400 square feet at Pinnacles Parking Area). To minimize temporary impacts to vegetation, staging areas would occur in previously developed areas or in the immediate project area, and mitigation measures and best management practices would be implemented as described in chapter 2.

Under this alternative, proposed construction activities that disturb vegetation could lead to increasing populations of nonnative invasive plants by removing established native plants that compete with noxious weeds, exposing mineral soil as a substrate for weed germination and dispersing existing or new weeds seeds or plants carried by construction equipment and trail users. To prevent the spread of invasive and nonnative vegetation, the National Park Service would manage weed infestations in accordance with the park's Invasive Vegetation Management Plan (NPS 2017) and other measures discussed in chapter 2.

In total, actions under alternative 1 would permanently remove up to 11.8 acres of vegetation as a result of constructing new trails, adding or expanding two parking lots in high visitor use areas, and adding a vault toilet and picnic area. Mitigation measures and best management practices listed in chapter 2 would be implemented to reduce adverse impacts to vegetation from these actions. Some rare plant species could be adversely affected through off-trail travel; however, management strategies listed in appendix A would be implemented to limit those occurrences.

Vegetation removal and trampling caused by trail construction and recreational use would contribute long-term adverse effects to the overall adverse trends in vegetation when alternative 1 is added to past, ongoing, and reasonably foreseeable future actions.

**Alternative 2.** Construction of 23 miles of new trails and campsites would result in the permanent removal of vegetation. Acreages are approximate pending further design, but it is estimated that the construction would result in the permanent removal of up to 9.9 acres of vegetation. Per design standards described in appendix E, trail construction would not remove trees over 6 inches in diameter. Branches extending over the trail corridor would be cut no higher than 10 feet above the trail surface. The maximum width of disturbance would be 8 feet wide, which accounts for the 3- to 4-foot trail widths, potential soil disturbance outside of trail surface (mainly on trail locations on a steep side slope where the cut slope would need to be wider), and the distance of vegetation thinning and trimming beyond the trail. However, trail design and route placement would minimize vegetation removal, and in forests and woodlands best management practices as outlined in appendix E would be implemented to maintain habitat conditions at the stand scale.

No rare or endemic plants, including Crater Lake rockcress, pumice grape-fern, and Shasta arnica would be adversely affected by any proposed construction or restoration activities. Under alternative 2, the National Park Service would examine potential rare plant habitat in and near all construction areas that have not been previously surveyed for the presence of rare plants. Known occurrences of rare plants in the vicinity of the proposed parking lot additions and improvements, new trails, and picnic areas would be delineated and protected during construction. If any rare plants were encountered on a proposed trail alignment, the plants would be marked so that individual plants can be avoided by routing the trail away from the plants.

With construction of new trails, there is also the potential for informal spur trails to develop as visitors travel off maintained trails to reach a destination. These "visitor-created trails" are of

concern to land managers when they become areas of erosion and vegetation trampling. In addition, trail braiding and widening would continue to occur in spot-locations as trail users avoid rutted, rocky, snow covered, or muddy areas on trails, trampling adjacent vegetation. Specifically, several Crater Lake rockcress and pumice grape-fern sites exist in very close proximity to the proposed rim trail near Llao Rock and above Grotto Cove and Cloudcap Bay. Llao Rock Research Natural Area is closed to public entry whenever the area is covered by less than one continuous foot of snow in order to protect sensitive resources, including rare plant species. Above Grotto Cove and Cloudcap Bay, off-trail activity could damage individual plants, cause soil compaction, and reduce flowering potential. Above Grotto Cove and Cloudcap Bay, off-trail activity in this area could damage individual plants, cause soil compaction, and reduce flowering potential. However, park staff would continue to periodically monitor the number of visitor-created trails leaving designated trails. If the number of visitor-created trails exceeds the threshold set in appendix A or if visitor-created trails are impacting sensitive resources, park staff would implement additional management strategies to protect sensitive resources such as rehabilitating visitor-created trails, restricting off-trail travel in sensitive resource areas, or establishing restoration areas around visitor-created trails. Therefore, the proposed actions under alternative 2 are not likely to threaten the long-term viability of rare plant species within the park.

Under this alternative, proposed construction activities that disturb vegetation could lead to increasing populations of nonnative invasive plants by removing established native plants that compete with noxious weeds, exposing mineral soil as a substrate for weed germination, and dispersing existing or new weeds seeds or plants carried by construction equipment and trail users. To prevent the spread of invasive and nonnative vegetation, the National Park Service would manage weed infestations in accordance with the park's Invasive Vegetation Management Plan (NPS 2017) and other mitigation measures and best management practices strategies discussed in chapter 2.

Removal of the East Bald Crater Loop Trail from the trail system would reduce adverse impacts to 1.45 acres of vegetation caused by use of the trail corridor, including impacts such as soil compaction, vegetation, and introduction of invasive plant species.

In total, actions under alternative 2 would result in the removal of up to 9.9 acres of vegetation. Mitigation measures and best management practices listed in chapter 2 would be implemented to reduce adverse impacts to vegetation from these actions. Some rare plant species could be adversely affected through off-trail travel; however, management strategies listed in appendix A would be implemented to reduce those impacts.

Vegetation removal and trampling caused by trail construction and recreational use would contribute long-term adverse effects to the overall adverse trends to vegetation when alternative 2 is added to past, ongoing, and reasonably foreseeable future actions.

**Conclusion.** Under the no-action alternative, impacts on vegetation would remain the same as described in the affected environment. Actions proposed under alternative 2 would have greater overall impacts on vegetation than under alternative 1. Alternative 2 would result in greater levels of ground disturbance, as up to 13.8 acres of vegetation would be removed through construction of new trails. In addition, alternative 2 has a greater number of trail segments that are near populations of rare plant species, which could be adversely affected if visitors go off-trail and inadvertently trample individual plants. Some reduction of adverse impacts to native vegetation would occur under alternative 2 with the removal of the East Bald Crater Loop Trail from the trail system. On the whole, both action alternatives would have more adverse impacts to vegetation than the no-action alternative, although mitigation measures and best management practices listed in chapter 2 as well

as management strategies listed in appendix A would be implemented under all action alternatives to reduce adverse impacts to native vegetation, including rare plant species.

## **WETLANDS AND RIPARIAN AREAS**

### **Affected Environment (Current and Expected Future Conditions of Resources That Would Be Affected)**

Wetland and riparian areas in the montane, conifer-dominated landscape of Crater Lake National Park most notably offer unique, moist conditions that support a wide variety of water-loving plants, which in turn provide essential habitat for a great diversity of wildlife species. The value of each wetland and riparian corridor is further elevated by the fact that they make up a very small percentage of landscape area in this higher elevation, heavily forested park. Less than 1% of the park's landscape is estimated to possess wetland conditions (NPS 2017; Adamus and Bartlett 2008). There is a wide variety of wetland and riparian types in the park, which further emphasizes their ecological uniqueness and importance. These include, but are not limited to, stream corridors, ponds and pond fringes, fens and bogs, springs, moist groves of aspen, alder, and cottonwood trees, and wet meadows at various elevations (NPS 2017; Adamus and Bartlett 2008). More specifically, some notable riparian and wetlands areas worth calling out include Sphagnum Bog; Thousand Springs; Poison Meadows; the Whitehorse Ponds complex; Spruce Lake; the riparian corridors of Annie Creek, Sun Creek, and Sand Creek; Red Cone, Lightning, and Annie Springs; and the springs within the caldera and Crater Lake's shoreline.

Vegetation in each of the park's riparian and wetland areas varies depending on the specific type of feature it is. Small groves of aspen appear in wetlands, along riparian zones, and in more mesic montane meadows. Subalpine wet meadows are often dominated by forbs, sedges, and grasses with interspersed water-tolerant trees. At lower elevations in the park, Engelmann spruce is the coniferous tree species that is commonly found in and near wetlands and creek riparian corridors, whereas subalpine fir is more commonly the dominant conifer species in riparian corridors and wetlands at middle to high elevations (NPS 2017).

While a relatively recent analysis of the park's wetland and riparian areas concluded that they are in relatively good condition and only slightly affected by invasive plant species, these moist, nutrient-rich habitats are prone to the threat of nonnative, invasive plant infestations (NPS 2017; Adamus and Bartlett 2008; Zedler and Kercher 2004).

Past actions that have impacted wetlands and riparian areas at Crater Lake National Park over the years include road, facility, and trail construction and maintenance; recreational use; introduction of nonnative fish to park streams, and wildland and prescribed fire and fire management actions. These actions have resulted in adverse impacts to wetlands across the park, including changes in composition and structure of vegetation communities, altered hydrology and water flow patterns; altered nutrient cycling and water filtration processes, and altered temperature regimes from increases or decreases in canopy cover and insolation. Future installation of a new bulkhead and dock system at the Cleetwood Cove marina would result in adverse impacts to up to 0.09 acres of freshwater wetlands from ground disturbance, dredging, and permanent installations.

Ground disturbance and related soil erosion associated with trail maintenance and use degrades water quality at times in nearby wetlands and downstream waterways. Trail braiding and widening occurs in spot-locations as trail users avoid rutted or rocky areas on trails, trampling adjacent vegetation and causing soil erosion. Visitor-created trails have proliferated as hikers venture "off-

trail” to explore, take photographs, and/or engage in other off-trail activities. Use of these trails adversely affects wetland and riparian water quality at times from trail and bank erosion and subsequent sedimentation. Ground disturbance corridors associated with trails has also created conditions that are very favorable for invasive plant colonization.

Future implementation of the park’s invasive plant management plan and fire management plan will reduce invasive plant infestations and minimize the fire danger to park resources from hazardous fuel accumulations. Mitigation measures would be implemented to reduce temporary adverse impacts from ground disturbance and mechanical and chemical treatment methods. These projects would add long-term beneficial effects to the overall neutral trends in wetlands and riparian areas.

## **Environmental Consequences**

**No-Action Alternative.** Under the no-action alternative, impacts on vegetation would remain the same as described in the affected environment. The current resource threats (invasive plant species, off-trail travel, etc.) and impacts would continue to occur.

**Alternative 1.** The eastern half of the Ponderosa Pine Trail would intersect black cottonwood riparian forest and montane wet meadow marsh; up to 3,520 square feet (0.08 acres) of riparian vegetation would be permanently removed through trail construction. Additionally, the northern part of the Munson Valley Road Trail would intersect subalpine fire/lodgepole pine-riparian woodland; up to 1,200 square feet (0.03 acres) of riparian vegetation would be permanently removed through trail construction. Use of these trails could adversely affect wetland and riparian water quality from trail and bank erosion and subsequent sedimentation. However, adverse impacts would be minimized with the implementation of best management practices and mitigation measures listed in chapter 2, as well as management strategies identified in appendix A.

Adverse impacts to wetlands and riparian areas from soil erosion and runoff following trail construction would be avoided or minimized by constructing trails when soils are not saturated or susceptible to erosion and runoff. If it is not possible to construct a trail or install a trail bridge with sufficient time for natural revegetation to occur before spring runoff, best management practices and mitigation measures described in chapter 2 incorporating standard erosion control and revegetation methods would be used. Areas adjacent to newly constructed trails where soils are disturbed are typically covered with materials found on-site such as duff and leaf litter or small pieces of vegetation removed by trail construction. Therefore, overall functions of nearby wetlands would not be noticeably altered.

With construction of new trails and opening up existing trails to additional uses, there is the potential for informal spur trails to develop as visitors travel off maintained trails to reach a destination. For example, the Munson Valley Road Trail would make use of an old road corridor where it crosses Goodbye Creek and Munson Creek at the south end of the trail. Use of the Munson Valley Road Trail by hikers could lead to the development and use of spur trails connecting to either creek, increasing the potential for adverse impacts to riparian zones from bank erosion, riparian vegetation trampling, and sedimentation into creeks. However, use of management strategies listed in appendix A such as improving signage, rehabilitating visitor-created trails, and establishing trail borders would reduce off-trail travel and minimize adverse impacts.

Vegetation removal, riparian vegetation trampling, and soil erosion and runoff caused by trail construction and recreational use would contribute long-term adverse effects to the overall neutral



trends in wetlands and riparian vegetation when alternative 1 is added to past, ongoing, and reasonably foreseeable future actions.

**Alternative 2.** Several trail segments proposed under alternative 2 would either cross intermittent creeks or would run along riparian areas. The proposed Maklaks Crater Loop would cross an intermittent creek on its southern side; up to 200 square feet (<0.01 acres) of riparian vegetation would be permanently removed through trail construction. In addition, the proposed southeastern rim trail segment would travel along approximately 3.5 miles of a Sand Creek tributary. Adverse impacts to wetlands and riparian areas from soil erosion and runoff following trail construction would be avoided or minimized by constructing trails when soils are not saturated or susceptible to erosion and runoff. If it is not possible to construct a trail or install a trail bridge with sufficient time for natural revegetation to occur before spring runoff, best management practices incorporating standard erosion control and revegetation methods would be used. Areas adjacent to newly constructed trails where soils are disturbed are typically covered with materials found on-site such as duff and leaf litter or small pieces of vegetation removed by trail construction. Therefore, overall functions of nearby wetlands would not be noticeably altered by trail construction.

Visitor use of constructed trails in this area would adversely affect water quality (from trail erosion, sedimentation, etc.). In addition, where visitor-created trails develop and are used to access creeks, additional soil erosion, riparian vegetation trampling, and sedimentation would occur. However, park staff would continue to periodically monitor the number of visitor-created trails leaving designated trails. If the number of visitor-created trails exceeds the threshold set in Appendix A (e.g., no more than three visitor-created trails leaving a designated trail per 1 mile in frontcountry areas), or if visitor-created trails are impacting sensitive resources, park staff would implement additional management strategies to protect sensitive resources and minimize adverse impacts, such as rehabilitating visitor-created trails, restricting off-trail travel in sensitive resource areas, or establishing restoration areas around visitor-created trails.

Vegetation removal, riparian vegetation trampling, and soil erosion and runoff caused by trail construction and recreational use would contribute long-term adverse effects to the overall neutral trends in wetlands and riparian vegetation when alternative 1 is added to past, ongoing, and reasonably foreseeable future actions.

**Conclusion.** Under the no-action alternative, impacts on wetlands and riparian areas would remain the same as described in the affected environment. On the whole, both action alternatives would have more adverse impacts to wetlands and riparian areas than the no-action alternative, although adverse impacts would be minimized with the implementation of management strategies identified in appendix A that would reduce off-trail travel. Alternative 1 would result in greater impacts to wetlands and riparian areas than alternative 2 through direct removal of riparian vegetation (0.11 acres and 0.01 acres, respectively), although alternative 2 would result in more new trails being constructed near riparian corridors. Park staff would periodically monitor the number of visitor-created trails leaving designated trails. If the number of visitor-created trails exceeds the threshold set in appendix A (e.g., mile in frontcountry areas no more than three visitor-created trails leaving a designated trail per one) or if visitor-created trails are impacting sensitive resources, park staff would implement additional management strategies to minimize adverse impacts.

## NORTHERN SPOTTED OWL

### Affected Environment (Current and Expected Future Conditions of Resources That Would Be Affected)

The northern spotted owl (*Strix occidentalis caurina*) is listed as threatened under the federal Endangered Species Act. This species is dependent on old-growth forests and is at the eastern edge of its range in Crater Lake National Park. A detailed account of the taxonomy, ecology, and reproductive characteristics of the northern spotted owl is found in the 2018 Biological Opinion for activities proposed under the Crater Lake National Park Fire Management Plan (USFWS 2018a). Roughly 32,000 acres of forest habitat suitable for the northern spotted owl has been identified in the park, particularly in the lower elevations (NPS 2005). Northern spotted owls tend to favor mature mixed conifer forests made up of Douglas fir, mountain hemlock, white fir, Shasta red fir, and ponderosa pine (Mohren 2015a). The southern and western areas of the park tend to have the largest and highest density of suitable habitat patches in the park (Mohren 2015a; NPS 2005). While the northern spotted owl has been documented in other areas of the park, virtually all known nest sites occur within identified suitable forest habitat (NPS 2005). The primary threats to the northern spotted owl include habitat competition from the barred owl and the loss of suitable old-growth mixed conifer habitat. Barred owl competition is of particular concern at Crater Lake National Park (Mohren 2015a). In 2015, barred owls were detected at 30% of known spotted owl activity centers (Mohren 2015a).

Past actions that have impacted northern spotted owl include road, facility, and trail construction and maintenance; recreational use; and prescribed fire and fire management activities, including fire suppression. These actions have resulted in adverse impacts to northern spotted owl parkwide, including changes in species abundance and distribution, changes in availability and distribution of preferred habitat and food, and changes in predator-prey relationships and food web dynamics.

Future rehabilitation of the East Rim Drive would cause noise disturbances where road construction was occurring in or near active northern spotted owl habitat. Implementation of the park's fire management plan would have both adverse and beneficial impacts on the northern spotted owl. Thinning and prescribed fire would result in suboptimum habitat for nesting where multilayered understory was eliminated, causing adverse impacts to owls in those areas. However, these projects would increase landscape diversity relative to fire and reduce the potential for stand replacing fires that destroy owl habitat, resulting in long-term beneficial impacts across the landscape. Additionally, annual hazard tree mitigation would result in loss of nesting or roosting habitat. Owls would continue to benefit from implementation of the park's invasive plant management plan, as removal and/or controlling invasive vegetation promotes native plant communities that support prey species for the northern spotted owl.

Verizon Wireless has proposed the installation of two wireless telecommunication facilities. The proposed site at Rim Village is not near owl habitat. The proposed site at Mazama Village is near owl habitat but in an area with high anthropogenic activity; because of this northern spotted owls have not used this area in the past and are unlikely to use it in the future (S. Mohren, pers. comm., 1/21/2021). Therefore, there are no future state, tribal, or private actions reasonably certain to occur in the project area that would contribute to overall trends in northern spotted owl populations.

## Environmental Consequences

**No-Action Alternative.** Under the no-action alternative, impacts on northern spotted owls would remain the same as described in the affected environment.

**Alternative 1.** Impacts to northern spotted owl habitat are analyzed by assessing potential changes in habitat conditions within the proposed parking lot expansions and trail construction footprint. Under alternative 1, approximately 20.6 miles of new trail would be constructed. Tread width would be 4 to 6 feet, with additional vegetation thinning and trimming within 4 feet of the centerline of the trail tread—total width of 8 feet. Thus, the acreage of the Analysis Area related to trail construction is approximately 20.0 acres. In addition, approximately 0.2 acres of land would be disturbed through expansion of parking lots and associated facilities. This means the total area of habitat affected is approximately 20.2 acres.

A total of 20.0 acres of habitat would be impacted as part of the proposed trail construction under alternative 1. Per the trail program's standard operating procedures in appendix E, trail construction would not remove trees over 6 inches in diameter. Branches extending over the trail corridor would be cut no higher than 10 feet above the trail surface. The maximum width of disturbance would be 8 feet wide, which accounts for the 4- to 6-foot trail widths, potential soil disturbance outside of trail surface (mainly on trail locations on a steep side slope where the cut slope would need to be wider), and the distance of vegetation thinning and trimming beyond the trail. However, adverse impacts to habitat would be minimized through the implementation of mitigation measures and best management practices listed in chapter 2. For example, trail design would minimize vegetation removal through route location, and revegetation efforts would reconstruct the natural spacing, abundance, and diversity of native plant species in the trail corridor to the extent feasible. Proposed activities are intended to maintain habitat conditions at the stand scale.

At the Pinnacles Parking Area, approximately 0.07 acres of lodgepole pine forest would be permanently removed to expand the parking lot and add a vault toilet and picnic area. Constructing a 10-car pullout parking area at the trailhead for Castle Creek Canyon Trail and installing a vault toilet would require permanently removing up to 0.08 acres of Shasta red fir forest. Negative impacts at the sites would also include soil compaction and the loss of ground cover and understory species. Construction activities and fill associated with curbs would temporarily impact vegetation within a 5-foot wide perimeter (approximately 1,200 square feet at Castle Creek Canyon Trail and 1,400 square feet at Pinnacles Parking Area). However, both facilities are located next to roads, where spotted owls are less likely to nest (Kerns and Allwardt 1992 as cited in USFS 2017, pg. 77; Perkins 2000 as cited in USFS 2017, pg. 77), and neither are within one mile of any known northern spotted owl nest tree or pair locations.

For the same reasons cited above (minimal alteration of vegetation and small area of habitat affected), effects to northern spotted owl prey species are anticipated to be minimal. Some loss of cover through vegetation trimming and movement of woody debris and rocks may displace prey species. This displacement would be temporary as prey (wood rats, flying squirrels, etc.) are very mobile and would find new cover habitat. Good habitat for prey exists across the landscape, and prey species would not be measurably affected by actions under alternative 1.

Northern spotted owls are susceptible to disturbance from human-caused activity, especially during critical periods in the breeding season (Delaney et al. 1999 in USFWS 2018b). All of the trail and other construction projects proposed have the potential to increase noise above ambient levels. Actions that result in elevated sound levels can result in harassment-level disturbance of owls from

up to 0.25 miles away from the footprint of the project (USFWS 2006). However, adverse impacts to northern spotted owls and their habitat from construction would be minimized through the implementation of mitigation measures and best management practices described in chapter 2. For example, a seasonal restriction to minimize disturbance to nesting northern spotted owls from human-caused activity would be implemented as part of any action alternatives. During the spotted owl breeding season (March 1– August 10), trail or parking lot construction would not be conducted in those portions of treatment units that are within 0.25 miles of an active spotted owl nest site or activity center. Active/inactive nesting status would be determined via standard protocol surveys. In addition, any trail construction project or other project with significant amount of vegetation removal occurring within 1.2 miles of northern spotted owl habitat would require two years of protocol surveys for northern spotted owl if northern spotted owl habitat would be altered. Therefore, trail construction would not have a measurable impact on individual spotted owls through noise or visual disturbance.

Several proposed trails would pass through or near suitable nesting, roosting, and foraging habitat for the northern spotted owl. The National Park Service has identified visitor capacities, i.e., appropriate amount and types of use, for different trails in the park (see appendix B). Use of trails that is below the established visitor capacities would not be expected to cause a significant disruption of behavior because spotted owls do not seem to be startled by human presence on the ground (USFWS 2005 as cited in USFS 2017, pg. 66). If a nest tree, or flight path to the nest itself, is greater than 40 meters from a trail or other source of visual disturbance, there would be no visual disturbance of owls anticipated (USFWS 2006). The National Park Service would implement the management strategies outlined in appendix B to ensure actual use remains within the visitor capacities identified. The National Park Service would also implement mitigation measures and best management practices listed in chapter 2, including assessing potential impacts of visitor use when an active nest is discovered within 0.25 miles of a trail and determining if the trail needs to be temporarily closed. Therefore, trail use would not have a measurable impact on individual northern spotted owls.

The Pumice Flat Trail, an existing trail, would be opened to horseback riding. This trail runs less than 10 feet from the last known location of an observed pair of northern spotted owls; however, no known nests have been observed in this area. No habitat would be removed along the trail, and visitor use of the Pumice Flat Trail is already ongoing. With implementation of mitigation measures and best management practices identified in chapter 2, this change in use would not measurably impact individual northern spotted owls.

The proposed Union Peak to Stuart Falls Connector Trail would come within 3,570 feet (0.66 miles) at its closest distance to a known northern spotted owl nest tree location. This distance is outside the estimated distance at which harassment of northern spotted owls may occur from elevated action-generated sound levels (USFWS 2006). Additionally, adverse impacts to northern spotted owls and their habitat from construction and use of the trail would be minimized through the implementation of mitigation measures and best management practices described in chapter 2, such as protocol surveys occurring for two years prior to trail construction. Therefore, construction, maintenance, and use of the Union Peak to Stuart Falls Connector Trail would not measurably contribute human presence or noise disturbance to the northern spotted owl beyond the current condition.

The Grayback Road would continue to be open to hiking, equestrian, bike, and walking pets on-leash and would officially be repurposed as the Grayback Trail, potentially resulting in an increase in visitor use. However, the Grayback Trail is still 4,129 feet (0.78 miles) at its closest distance to a

known northern spotted owl nest tree location, which is outside the estimated distance at which harassment of northern spotted owls may occur from elevated, action-generated, sound levels (USFWS 2006). Additionally, adverse impacts to northern spotted owls and their habitat from construction and use of the trail would be minimized through the implementation of mitigation measures and best management practices described in chapter 2, such as protocol surveys occurring prior to any trail maintenance activity with potential to cause noise disturbance. Therefore, maintenance and use of the Grayback Trail would not measurably contribute human presence or noise disturbance to the northern spotted owl beyond the current condition.

The habitat loss caused by trail construction and recreational use would add long-term adverse effects to the overall adverse trends in northern spotted owl habitat when alternative 1 is added to past, future, and reasonably foreseeable future actions; however, it would not contribute noticeable or measurable effects to the overall adverse trends in northern spotted owl populations.

**Alternative 2.** Impacts to northern spotted owl habitat are analyzed by assessing potential changes in habitat conditions within the proposed parking lot expansions and trail construction footprint. Under alternative 2, approximately 19.1 miles of new trail would be constructed within conifer forest; the rest would be in meadows, shrubland, and rocky areas. Tread width would be 3 to 4 feet, with additional vegetation thinning and trimming within 4 feet of the centerline of the trail tread – total width of 8 feet. Therefore, a total of 18.5 acres would be affected as part of the proposed trail construction under alternative 2. Per the trail program’s standard operating procedures in appendix E, the trail construction would not remove trees over 6 inches in diameter. Branches extending over the trail corridor would be cut no higher than 10 feet above the trail surface. The maximum width of disturbance would be 8 feet wide, which accounts for the 4- to 6-foot trail widths, potential soil disturbance outside of trail surface (mainly on trail locations on a steep side slope where the cut slope would need to be wider), and the distance of vegetation thinning and trimming beyond the trail. Trail design would minimize vegetation removal through route location. Habitat alteration would be minimal and on a very small scale (trail width). Proposed activities are intended to maintain habitat conditions at the stand scale.

Northern spotted owls are susceptible to disturbance from human-caused activity, especially during critical periods in the breeding season (Delaney et al. 1999 in USFWS 2018b). All of the trail and other construction projects proposed have the potential to increase noise above ambient levels. Actions that result in elevated sound levels can result in harassment-level disturbance of owls from up to 0.25 miles away from the footprint of the project (USFWS 2006). However, adverse impacts to northern spotted owls and their habitat from construction would be minimized through the implementation of mitigation measures and best management practices described in chapter 2. For example, a seasonal restriction to minimize disturbance to nesting northern spotted owls from human-caused activity would be implemented as part of any action alternatives. During the spotted owl breeding season (March 1– August 10), trail or parking lot construction would not be conducted in those portions of treatment units that are within 0.25 miles of an active spotted owl nest site or activity center. Active/inactive nesting status would be determined via standard protocol surveys. In addition, any trail construction project or other project with significant amount of vegetation removal occurring within 1.2 miles of northern spotted owl habitat will require two years of protocol surveys for northern spotted owl if northern spotted owl habitat will be altered. Therefore, trail construction is not expected to have a measurable impact on individual spotted owls.

Several proposed trails or trail segments would pass through or near suitable nesting, roosting, and foraging habitat for the northern spotted owl. Use of trails that is below the established visitor



capacities would not be expected to cause a significant disruption of behavior because spotted owls do not seem to be startled by those situations (USFWS 2005, cited in USFS 2017, pg. 66), and good habitat for northern spotted owls exists across the landscape. In addition, the National Park Service would establish visitor capacities for these trails and would implement the management strategies outlined in appendix B if visitor capacities were being approached or exceeded.

The proposed Maklaks Crater Loop trail would come within 1,320 feet (0.25 miles) at its closest distance to a known northern spotted owl nest tree location. Adverse impacts to northern spotted owls and their habitat from construction would be minimized through the implementation of mitigation measures and best management practices described in chapter 2, for example, two years of surveys prior to trail construction as well as seasonal restrictions on construction or maintenance projects occurring within 0.25 miles of active nest sites. Therefore, construction, maintenance, and use of the Maklaks Crater Loop trail would not measurably contribute human presence or noise disturbance to the northern spotted owl beyond the current condition.

The Grayback Road would be repurposed as part the Rim Trail, which may result in additional use by hikers completing the entire or sections of the loop. However, the Grayback Trail is still 4,129 feet at its closest distance to a known nest tree location, which is outside the estimated harassment distance for actions affecting the northern spotted owl (USFWS 2006). Therefore, maintenance and use of the Grayback Trail would not measurably contribute human presence or noise disturbance to the northern spotted owl beyond the current condition.

The closure of the East Bald Crater Loop Trail would result in some beneficial impacts to northern spotted owls through improvement of habitat quality as the trail corridor naturally revegetates. Additionally, the closure would result in fewer disturbances of northern spotted owls from either visitor use or trail maintenance activities.

The habitat loss caused by trail construction and recreational use would add long-term adverse effects to the overall adverse trends in northern spotted owl habitat when alternative 1 is added to past, future, and reasonably foreseeable future actions; however, it would not contribute noticeable or measurable effects to the overall adverse trends in northern spotted owl populations.

**Conclusion.** Under the no-action alternative, impacts on northern spotted owls would remain the same as described in the affected environment. On the whole, both action alternatives would have more adverse impacts to northern spotted owls than the no-action alternative, although mitigation measures and best management practices listed in chapter 2, as well as management strategies identified in appendix A, would be implemented under all action alternatives to reduce adverse impacts to northern spotted owls. Actions proposed under alternative 2 would have greater overall impacts on habitat quality than under alternative 1, as alternative 2 would result in more trail mileage and vegetation removal within northern spotted owl habitat. In addition, one of the trails proposed under alternative 2 would come within 0.25 miles of a known northern spotted owl nest tree location. However, proposed activities are intended to maintain habitat conditions at the stand scale, and trail construction and maintenance would be timed to avoid noise and visual disturbances to northern spotted owls. Therefore, the actions proposed under the no-action alternative, alternative 1, and alternative 2 would not be of any new measurable consequence to northern spotted owls.

Under the US Fish and Wildlife Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service guidance for implementing section 7 consultation under the Endangered Species Act, the no-action alternative, alternative 1, and alternative 2 each *may affect but is not likely to adversely affect* the northern spotted owl.

## WHITEBARK PINE

### Affected Environment (Current and Expected Future Conditions of Resources That Would Be Affected)

The whitebark pine (*Pinus albicaulis*) has been proposed for listing as a threatened species under the federal Endangered Species Act. This conifer species is particularly known for its ability to endure harsh climate conditions of higher elevations, particularly high winds, low temperatures, and deep or persistent snowpack (NPS 2005). US Fish and Wildlife Service (2018b) provides a thorough description of the species' physical environment and distribution; reproductive and other life history traits; and individual-level, population-level, and species-level ecology. At Crater Lake National Park, the whitebark pine stands are most common in the 7,000 to 9,000 foot elevation range, notably around the high rim of the caldera, as well as up the slope and along the ridges of the peaks that surround the park (NPS 2005, USDA NRCS 2003). Unlike the continuous and higher density forests of other dominant tree species in the park at lower elevations, the whitebark pines tend to coexist in more of an open woodland (NPS 2005) but are also found in denser stands with mountain hemlock and lodgepole pine. Recent vegetation mapping determined that there were 298.8 hectares of whitebark pine woodland and 639.1 hectares of mountain hemlock-lodgepole pine-whitebark pine forest (DiPaolo et al. 2018).

Original construction of the Rim Drive required substantial earthwork and vegetation clearing. Ongoing road maintenance, deterioration of the road and associated erosion, and visitor use has continued to affect the condition of vegetation resources near the road. Periodic maintenance activities to repair road damage result in some vegetation disturbance or introduction of invasive plant seeds, adversely affecting regeneration rates of whitebark pine trees. Off-pavement vehicle trespass and pedestrians walking outside of paved areas result in soil compaction, soil erosion, and vegetation trampling, which could also reduce regeneration rates of whitebark pine trees. Previously disturbed sites that have not been reclaimed remain sparsely vegetated and increase the potential for nonnative plant species invasion. Rehabilitation of the East Rim Road would result in removal of some individual trees adjacent to the road, although small trees would be salvaged and transplanted as feasible. There are no known future state, tribal, or private actions reasonably certain to occur in the action area that would impact whitebark pine trees.

This tree species is somewhat fire resistant and can survive moderately intense or slow-moving fires, unlike most other conifers in the region (USDA NRCS 2003). The regeneration of this species generally occurs in open areas that occur naturally and may have been created by past fires. Wildfire suppression over the last century has resulted in whitebark pine stands across its range that have generally become older, denser, and more susceptible to mountain pine beetles (USDA NRCS 2003). Implementation of the park's invasive plant management plan and fire management plan would result in beneficial impacts to parkwide vegetation over the next 10 years through actions to protect and maintain the health and integrity of native plant communities and the species dependent upon them. However, whitebark pines are notably declining in Crater Lake National Park and range-wide mainly due to infection by white pine blister rust, a disease caused by a nonnative fungal pathogen (NPS 2005). Whitebark pine are severely impacted by blister rust because trees infected with the disease either die before they reach a cone-bearing age, have their cone-bearing branches successively killed, or don't produce cones at all (USDA NRCS 2003). Coupled with increasing mortality from mountain pine beetles that are able to wreak more havoc at higher elevations due to warmer temperatures and milder winters, the prognosis for whitebark pine is a steady decline in

population and geographic extent unless the progress of climate change is curtailed and other stressors are mitigated.

## **Environmental Consequences**

**No Action-Alternative.** Under the no-action alternative, impacts on whitebark pine would remain the same as described in the affected environment. The current resource threats (insects, disease, etc.) and impacts would continue to occur.

**Alternative 1.** There would be no specific ground disturbance under alternative 1 with the potential to adversely impact whitebark pine trees. The Munson Valley Road Trail would be constructed within 100 feet of a whitebark pine planting site, and the Panhandle Trail would be constructed within 100 feet of two long-term whitebark pine monitoring plots. Off-trail use by trail users could compromise the success of the plantings and adversely affect regeneration rates of future whitebark pine trees in this area. However, implementation of management strategies listed in appendix A, such as improving signage, rehabilitating visitor-created trails, and establishing trail borders, would reduce off-trail travel and minimize adverse impacts from hiking on the trail corridors and adjacent areas. Therefore, the actions proposed under the alternative 1 would not be of any new measurable consequence to whitebark pine.

Vegetation removal and trampling from trail construction and recreational use would not contribute noticeable or measurable effects to the overall adverse trends in whitebark pine when alternative 1 is added to past, ongoing, and reasonably foreseeable future actions.

**Alternative 2.** Under alternative 2, 2.7 miles of the proposed Rim Trail would be routed through mapped whitebark pine stands, and an additional 1.0 miles would be located within 100 feet of mapped whitebark pine stands. Construction of the proposed Rim Trail would result in the permanent removal of approximately 1.4 acres of vegetation from within whitebark pine stands.

In addition, all trees and brush more than 12 inches above ground would be cut to a 2- to 4- inch stump from within 4 feet of the center line of the trail tread. This would include the removal of trees 6 inches or less in diameter. However, trail design would minimize vegetation removal through route location, and in forests and woodlands, proposed activities are intended to maintain habitat conditions at the stand scale.

With construction of new trails and facilities, there is the potential for informal spur trails to develop as visitors travel off maintained trails to reach a destination. These “visitor-created trails” are of concern for whitebark pines when they become areas of erosion and vegetation trampling, which could compromise the success of whitebark pine seedlings and adversely affect regeneration rates of future whitebark pine trees in this area. The use of management strategies listed in Appendix A, such as improving signage, rehabilitating visitor-created trails, and establishing trail borders, would reduce off-trail travel and lessen adverse impacts from hiking on the trail corridors and adjacent areas. However, where off-trail travel occurs, impacts would be difficult to reverse as pumice soil turns to dust under heavy visitor use, and it is difficult to get plants to reestablish once the plant community cover is low or nonexistent. Regeneration of whitebark pine trees could be inhibited in those areas for decades.

Less than 2 acres of whitebark pine habitat would be impacted by trail construction, and up to 2 acres of habitat could be impacted through off-trail travel as described above. As the total potential acres impacted is less than 4 acres out of 298 acres of whitebark pine woodland and 639 acres of

mountain hemlock/lodgepole pine/whitebark pine forest the long-term viability of the whitebark pine population in the park would not be adversely impacted by actions under alternative 2.

Vegetation removal and trampling from trail construction and recreational use would contribute long-term adverse effects to the overall adverse trends in whitebark pine when alternative 1 is added to past, ongoing, and reasonably foreseeable future actions.

**Conclusion.** Under the no-action alternative, impacts on vegetation would remain the same as described in the affected environment. The current resource threats and impacts would continue to occur. Actions proposed under alternative 2 would have greater overall impacts on whitebark pine than under alternative 1 and the no-action alternative. Alternative 2 would result in greater levels of ground disturbance than alternative 1; up to 1.4 acres of vegetation within whitebark pine stands would be removed through construction of new trails. Still, trail design would prevent seedling or tree removal through route location, and habitat conditions would be maintained at the stand scale. In comparison, there is no specific ground disturbance under alternative 1 with the potential to adversely impact whitebark pine trees. Some beneficial impacts to whitebark pine trees would occur under both action alternatives through implementation of management strategies to reduce the development of visitor-created trails.

Under the US Fish and Wildlife Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service guidance for implementing section 7 consultation under the Endangered Species Act, the actions proposed under the no-action alternative, alternative 1, and alternative 2 would not be expected to impact whitebark pine at a stand or population level and would not jeopardize the existence of the species. Furthermore, alternative 1 *may affect but is not likely to adversely affect* the whitebark pine.

## **WILDERNESS CHARACTER**

### **Affected Environment (Current and Expected Future Conditions of Resources That Would Be Affected)**

**Recommended Wilderness in Crater Lake National Park.** After four years of analysis and public input in the early 1970s, the Department of the Interior recommended to President Nixon that 122,400 acres in Crater Lake National Park met the definition set forth in the Wilderness Act and should be designated as wilderness. President Nixon sent this recommendation to Congress on June 13, 1974. However, Congress did not act on the recommendation. Although Congress has not yet acted on this formal departmental recommendation, these recommended wilderness areas have been managed per the terms of the Wilderness Act and NPS wilderness management policies. Various trails in the Crater Lake trail network traverse recommended wilderness areas.

In general terms, the recommended wilderness includes five general areas of the park, as follows (Unrau and Mark 2013):

1. **Northeast roadless areas** – Generally extending from the north entrance to the northeast corner of the park, then southward past the eastern slopes of Mt. Scott to the Pinnacles area. Its western boundary extends from the Pinnacles area along the Pinnacles Road, the Rim Drive, and the North Entrance Road. This area is quite dry, and the predominant visitor uses in this area are hiking and limited wilderness camping.

2. **Southeast roadless areas** – Generally extending from the Pinnacles Road at the eastern boundary, southward to the southeast corner of the park, and then along the south boundary westward to the Highway 62 (at park’s southern panhandle). Its western and northern boundaries are the South Entrance Road, Rim Drive, and the Pinnacles and Grayback Roads. This area includes most of the Annie Creek drainage basin, which includes biologically diverse riparian corridors along the canyon bottoms, as well as unique geologic formations. Sun Creek, and its valued fishery, bisect this area.

3. **Southwest roadless areas** – Generally extending from the South Entrance Road along the south and west boundary, the West and South Entrance Roads, and the Union Peak Motor Nature Road. The Union Peak shield volcano, Red Blanket Canyon, several cones, and other volcanic features lie within this area. Plant cover represents three life zones and varies from a pumice desert to mature forest.

4. **Northwest roadless area** – Lying on the west slope of the Crater Lake caldera, this area is generally bound on the south and east by the West Entrance Road, West Rim Drive, the North Entrance Road, and roughly the northern and western park boundaries. This area includes upper headwaters of the Rogue River and several of its spring-fed tributary streams. The unique Sphagnum Bog complex lies in this area near the park’s western boundary. It also includes forests of whitebark pine, mountain hemlock, as well as lodgepole, ponderosa and western white pines.

5. **Crater Lake and southern rim** – Generally consisting of the entire Crater Lake surface and the rim area on the southern side of the lake within the Rim Drive and the caldera walls, except for the Cleetwood Cove access and service corridor and a few acres at Wizard Island where boat docking and storage occur. Although Crater Lake was not part of the initial wilderness recommendation in the early 1970s, the National Park Service later concluded that the existence and use of tour boats and lake research boats should not preclude the lake surface from wilderness designation.

**Qualities of Wilderness Character.** Wilderness character is not specifically defined in the 1964 Wilderness Act, nor is its meaning discussed in the act’s legislative history. However, the Wilderness Act identifies the following qualities that unify wilderness areas regardless of their size, location, or any other feature. The five qualities of wilderness character are:

- **Undeveloped** – “*an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation. . .*” This refers to areas that are essentially without permanent structures, enhancements, or modern human occupation. To retain its primitive character, a wilderness ideally is managed without the use of motorized equipment or mechanical transport. Scientific instrumentation, research installations, and other administrative structures diminish the *undeveloped quality* of recommended wilderness.
- **Natural** – “*protected and managed so as to preserve its natural conditions. . .*” This means areas that are largely free from the effects of modern civilization. It also refers to maintenance of natural ecological relationships and processes, continued existence of native wildlife and plants in largely natural conditions, and absence of distractions (e.g., large groups of people; mechanization; and evidence of human manipulation, unnatural noises, signs, and other

modern artifacts). Spread of nonnative species and noise have degraded the *natural quality* in portions of recommended wilderness within the park.

- **Untrammeled** – “*an area where the earth and its community of life are untrammeled by man*” and “*generally appears to have been affected primarily by the forces of nature...*” This refers to ecosystems that are unhindered and free from human control or manipulation. In other words, this wilderness quality can be degraded by human actions that control or manipulate components or processes of ecological systems within the wilderness area. Fire management and invasive species management have degraded the *untrammeled quality* when they are implemented in recommended wilderness areas. There would be no measurable difference in impacts to the *untrammeled wilderness quality* between alternatives; as a result, this wilderness character was dismissed from further analysis.
- **Solitude or Primitive and Unconfined Recreation** – the area “*has outstanding opportunities for solitude or a primitive and unconfined type of recreation...*” Solitude means encountering few, if any, people, and experiencing privacy and isolation. Primitive and unconfined recreation refers to freedom to explore with few restrictions, and the ability to be spontaneous. It means self-sufficiency without support facilities or motorized transportation, and experiencing weather, terrain, and other aspects of the natural world with minimal shelter or assistance from devices of modern civilization. The national park provides a variety of opportunities for visitors to find solitude. The noise and presence of other visitors, noise from overflights, vehicle traffic noise, and mechanized tools for research and maintenance activities degrade the character of this recommended wilderness quality.
- **Other Features of Value** – This quality applies to those values and features that are not fully covered in the other four qualities, including features of scientific or cultural value. In many cases, these values are often cultural resources that can teach us about the history and special significance of people's relationship to the land. Proposed actions and visitor use within recommended wilderness areas would avoid and protect other features of value. As a result, the *other features of value* quality of wilderness character was dismissed from further analysis.

Past actions that impacted wilderness character include road, facility, and trail construction and maintenance; prescribed fire and fire management activities, including fire suppression; invasive plant management activities; and placement of research installations. These actions have resulted in ongoing adverse impacts to the *natural quality* from the establishment of invasive plants and changes to the natural fire regime (see “Vegetation” section above). These actions have also resulted in ongoing adverse impacts to the *opportunities for solitude or primitive and unconfined recreation quality* from the existence of recreational facilities and management restrictions in wilderness as well as from noise and visual disturbances.

Ongoing implementation of the park's invasive plant management plan and fire management plan results in temporary adverse impacts to the *untrammeled quality* but also results in long-term beneficial impacts to the *natural quality* through actions to protect and maintain the health and integrity of native plant communities. The use of motorized equipment during implementation of either of these plans temporarily causes adverse impacts to the *undeveloped quality* and *opportunities for solitude or primitive and unconfined recreation quality* as well as the *natural quality* through disturbance of wildlife.



Construction-related noise and visual disturbances from proposed development projects and rehabilitation projects within the park, including proposed installation of cellular towers in Rim Village and Mazama Village, improvement of visitor facilities at North Junction Viewpoint, rehabilitation of the East Rim Drive, and rehabilitation of the Annie Spring Entrance Station, would impact nearby recommended wilderness areas. Although not occurring in wilderness, construction-noise would be audible from recommended wilderness areas and is likely to adversely affect the *solitude or primitive and unconfined recreation quality*, as well as the *natural quality* through disturbance of wildlife. However, mitigation measures would be implemented to reduce adverse impacts from construction-related noise and visual disturbances and to prevent the introduction of invasive plants.

Use of the area's authorized trails and off-trail travel causes reductions in vegetation cover, height, and biomass, changes in species composition, and introduction and spread of nonnative plants along linear trail corridors, resulting in adverse impacts to the *natural quality* of wilderness character. Maintenance of the trail system causes temporary adverse impacts to the *solitude or primitive and unconfined recreation quality*, while the continuing presence of trails in wilderness adversely impacts the *solitude or primitive and unconfined recreation quality*.

## Environmental Consequences

**No-Action Alternative.** Under the no-action alternative, impacts on wilderness character would remain the same as described in the affected environment.

**Alternative 1.** During the construction period, construction of the Raven Trail, Union Peak to Stuart Falls Connector Trail, Mazama Rock Trail, and Falls to Flowers Trail would degrade the wilderness character of opportunities for solitude or primitive and unconfined recreation due to the continued presence of work crews and new ground and human disturbance. Adding approximately 6.6 miles of new trails in recommended wilderness would increase the total wilderness trail miles by 6% in the park, resulting in a permanent adverse impact to opportunities for primitive and unconfined recreation. The presence of trails in wilderness detracts from the opportunity for unconfined recreation by potentially limiting self-exploration, self-determination, and reliance on personal skills.

Because most trail work in wilderness would be conducted with hand tools, construction noise would be limited, and disturbance would mostly be contained to the narrow trail corridor. Exceptions include use of mechanized equipment such as small hand tools, chainsaws, rock drills, generators, possible rock blasting, and use of helicopters for material delivery. Use of this equipment would result in adverse impacts to the *undeveloped quality* of wilderness character for the duration of the use of those tools. However, use of this equipment would be subject to minimum requirements analysis and is expected to be infrequent, limited to short durations, and used in compliance with the park's wilderness requirements. In addition, the noise from these actions would be heard and seen by visitors in nearby wilderness, resulting in occasional adverse impacts to the *solitude or primitive and unconfined recreation quality* during the construction season.

In addition, construction of these new trails would also have the potential to degrade the *natural quality* of wilderness by introducing nonnative plants, introducing noise, and displacing wildlife; however, mitigation measures and management strategies described in chapter 2, as well as management strategies described in appendixes A and B would be implemented to minimize this potential. The area affected by the sights and sounds of construction would vary depending on topography, vegetation, and other site conditions. The effects would diminish as one moves away

from the construction site. Sound from using mechanized equipment may be noticeable several miles or more from the site. These adverse effects on wilderness qualities would typically occur during a three- to four-month construction season occurring over several years.

Establishing visitor capacities and implementing them with appropriate management strategies would result in both long-term beneficial and adverse impacts to the *solitude or primitive and unconfined recreation quality* of wilderness character, as park staff may need to enforce additional management restrictions in order to protect opportunities for solitude.

Other actions under alternative 1 would involve constructing trails, expanding parking areas, and installing a vault toilet and picnic area. Although outside recommended wilderness, these actions would generate noise and visual intrusions from construction activities that may carry into wilderness and degrade the *natural quality* and opportunities for solitude during the few weeks involved for each location's short construction period. In particular, the combustion noise and other related equipment noise associated with construction activities for parking expansion at the Castle Creek Canyon Trail would have noticeable temporary adverse effects on wilderness character of the recommended wilderness lands immediately to the north.

Improving or adding trails in heavily used areas would have beneficial effects on recommended wilderness by limiting off-trail use and helping to reduce the footprint of informal trails. These beneficial effects would promote recovery of native vegetation on disturbed areas and eventually improve the *natural quality* of wilderness (see vegetation section above).

Under alternative 1, impacts to each of the wilderness qualities would continue to be greatest along trails and in highly developed areas since access to other parts of recommended wilderness is more difficult and time consuming. The impacts would continue to be localized and therefore would be minimal when compared to the overall amount of recommended wilderness in the national park.

The disruption caused by the noise and visual disruption of trail construction and other projects under alternative 1 would add temporary or short-term adverse impacts to overall adverse trends in wilderness character, while the addition of new trails in wilderness would contribute long-term adverse impacts to overall trends. However, establishing visitor capacities and implementing them with appropriate management strategies would also contribute beneficial impacts to the overall trends, specifically to solitude aspects of wilderness character.

**Alternative 2.** During the construction period, construction of the Rim Trail and Maklaks Crater Loop would degrade opportunities for solitude due to the continued presence of work crews and new ground and human disturbance. Adding approximately 12 miles of new trails in recommended wilderness would increase the total wilderness trail miles by 11 % in the park, resulting in a permanent adverse impact to opportunities for primitive and unconfined recreation. The presence of trails in wilderness detracts from the opportunity for unconfined recreation by potentially limiting self-exploration, self-determination, and reliance on personal skills.

Construction of new trails would also have the potential to degrade the *natural quality* of wilderness by introducing nonnative plants, introducing noise, and displacing wildlife; best management practices and mitigation measures described in chapter 2 would be implemented to minimize this potential. Because most trail work in wilderness would be conducted with hand tools, construction noise would be limited, and disturbance would mostly be contained to the narrow trail corridor. Exceptions include use of mechanized equipment such as small hand tools, chainsaws, rock drills, generators, possible rock blasting, and use of helicopters for material delivery, which would also

result in adverse impacts to the *undeveloped quality* of wilderness for the duration of the construction. However, use of this equipment would be subject to minimum requirements analysis and is expected to be infrequent, limited to short durations, and used in compliance with the park's wilderness requirements. The noise from these actions would be heard and seen by visitors in adjacent wilderness areas, which diminishes opportunities for solitude or primitive and unconfined recreation. The area affected by the sights and sounds of construction would vary depending on topography, vegetation, and other site conditions. The effects would diminish as one moves away from the construction site. Sound from using mechanized equipment may be noticeable several miles or more from the site. These adverse effects on wilderness qualities would typically occur during a three- to four-month construction season occurring over several years.

Establishing visitor capacities and implementing them with appropriate management strategies would result in both long-term beneficial and adverse impacts to the *solitude or primitive and unconfined recreation quality* of wilderness character, as park staff may need to enforce additional management restrictions in order to protect opportunities for solitude.

Other actions under alternative 2 also involve trail construction outside wilderness that would generate noise and visual intrusions that may carry into wilderness and degrade the *solitude or primitive and unconfined recreation* and *natural qualities* during the few weeks involved for each location's short construction period.

Improving or adding trails in heavily used areas would have beneficial effects on recommended wilderness by limiting off-trail use and helping to reduce the footprint of informal trails. These beneficial effects would promote recovery of native vegetation on disturbed areas and eventually improve the *natural quality* of wilderness (see vegetation section above).

Under alternative 2, impacts to each of the wilderness qualities would continue to be greatest along trails and in highly developed areas since access to other parts of recommended wilderness is more difficult and time consuming. The impacts would continue to be localized and would be minimal when compared to the overall amount of recommended wilderness in the national park.

The disruption caused by the noise and visual disruption of trail construction and other projects under alternative 2 would add temporary or short-term adverse impacts to overall adverse trends in wilderness character, while the addition of new trails in wilderness would contribute long-term adverse impacts to overall trends. However, establishing visitor capacities and implementing them with appropriate management strategies would also contribute beneficial impacts to the overall trends, specifically to solitude aspects of wilderness character.

**Conclusion.** Under the no-action alternative, impacts on wilderness character would remain the same as described in the affected environment. The current threats and impacts would continue to occur. In comparison, actions proposed under alternative 2 would have greater overall impacts on wilderness character than under alternative 1 and the no-action alternative. Alternative 2 would result in 12 miles of new trails being constructed in wilderness, while under alternative 1 there would be 6.6 miles of new trails constructed in wilderness. Both of these would result in permanent adverse impacts to the *solitude or primitive and unconfined recreation quality*. The combustion noise and other related equipment noise associated with construction activities for parking expansion under alternative 1 would have adverse effects on wilderness character of the recommended wilderness lands within earshot, in particular the *natural quality* and *solitude or primitive and unconfined recreation quality*; however, these impacts would only last for the duration of the construction project. Noise and visual disturbances from trail maintenance and visitor use of new wilderness trails

would also adversely impact the *natural quality* and *solitude or primitive and unconfined recreation quality* under both action alternatives. Under both action alternatives, mitigation measures and management strategies would be implemented to reduce adverse impacts from construction and use of new trails and facilities. With more than 122,400 acres within the park's recommended wilderness, the actions proposed under alternative 1 and alternative 2 would impact a very small fraction of the park's recommended wilderness.

## **HISTORIC STRUCTURES AND CULTURAL LANDSCAPES**

### **Affected Environment (Current and Expected Future Conditions of Resources That Would Be Affected)**

Historic structures and cultural landscapes in the affected environment consist of six documented historic roadways and trails and two bridges that are described below. Since several of these linear resources have been documented as both historic structures and cultural landscapes, these two resource types are combined for the purpose of this analysis.

- **Rim Drive Historic District.** Listed on the National Register of Historic Places, Rim Drive is a narrow, linear designed landscape centered on the 31.6-mile Rim Drive roadway that encircles the rim of the Crater Lake caldera. The district includes the road base, shoulders, surfacing, pavement, retaining walls, masonry guardrail, culverts and headwalls, spillways, drop inlets, paved ditches, bankslopes, devices to protect trees, planting beds, walkways, overlooks, cuts, and fills. Although not all of these design features contribute to the significance of the district, those that are original and retain integrity are included as features of the NRHP-listed road segments. The district also includes the Cloudcap spur road and the Vidae Falls service road and trails originally designed to encourage pedestrian circulation from Rim Drive. Overall, the Rim Drive Historic District possesses exceptional integrity. (CLI 2011, p. 42; CLR 2009; NR Nomination 2007).
- **Army Corps of Engineers Road System (ACERS) Historic District.** Between 1913 and 1918, the Army Corps of Engineers constructed the first engineered road circuit around the Crater Lake caldera. Crater Lake Rim Road, along with the Pinnacles Road approach route and Sentinel Road, represent the earliest period of highway engineering in Oregon as well as the starting point for vehicular circulation systems within Crater Lake National Park. The National Park Service later constructed portions of the wider, paved Rim Drive over the road, but segments of this earlier Rim Road remain intact and are currently used as vehicular roads and trails; the segments that predate the expansion of Rim Drive are distinct from the Rim Drive Historic District today even though the two historic districts overlap (NPS 2011). The ACERS Historic District, which was listed in the National Register of Historic Places in 2019, includes 11.8 miles of trail composed of 12 segments of the Rim Road, Pinnacles Road, and Sentinel Road as well as archeological sites associated with Army Corps construction activities and the remains of construction equipment used during road construction (NPS 2019).
- **Grayback Road.** Grayback Road (also called Grayback Drive) is an old road segment that was part of the Army Corps of Engineers road system (1913–1918). The road is a 4.77-mile two-track graded road in the southeast vicinity of the park between Dutton and Grayback ridges. It is currently used for administrative purposes only (FHWA 2000, NPS 2011).

- **Munson Valley (Bridle) Trail.** This trail is a remaining linear segment of a larger bridle complex of paths built during the 1930s and connected to Rim Village in 1940. It is located within the Munson Valley Historic District, which was listed on the National Register of Historic Places in 1988. The historic district includes the park headquarters area that was built between 1926 and 1949 (NPS 2005).
- **Munson Valley Road.** The Munson Valley Road runs from Highway 62 to Rim Village past Park Headquarters. There are two historic Mission 66-era bridges along this section of the roadway crossing Annie Creek and Goodbye Creek.
- **Fort Klamath to Rogue River Wagon Road.** This 22-mile military wagon road parallels State Highway 62 in places, but some segments veer some distance away from the highway, especially the spurs to Rim Village and Thousand Springs. Segments of the historic road are observable in or near various developed areas of the park, including Rim Village, Munson Valley, the abandoned Annie Spring campground, and Mazama Village. Potential character-defining features include roadbed segments, retaining or embankment walls, blazed trees, campsites, and artifacts associated with use of the road between 1865 and 1915 (NPS 2005).
- **Garfield Peak Trail.** The Garfield Peak Trail is a 3.4-mile trail documented as a component of the Rim Village cultural landscape that has been determined eligible for the National Register of Historic Places. The original trail of 1917 was shortened and reconstructed by the National Park Service in 1931 and begins east of the Crater Lake Lodge along the promenade. (NPS 2017).

The park manages its trail development and maintenance activities in accordance with the 2005 Crater Lake General Management Plan, NPS *Management Policies 2006*, and existing laws and policies including the National Historic Preservation Act. As part of the National Park Service's NHPA obligations related to cultural resources, resource managers assess how proposed park actions affect or impact resources eligible for listing in the National Register of Historic Places. All construction projects—including building new trails—are evaluated on a case-by-case basis to identify the potential for the actions to disturb historic resources and contributing cultural landscape features. Impacts can then be avoided or mitigated through further planning and consultation.

Past park actions including cultural resource surveys, baseline documentation, condition assessments, and monitoring programs have provided beneficial impacts in the form of information related to location, historic context and studies, and treatment recommendations for the historic structures and cultural landscapes identified in the park. While any groundbreaking activity—including new construction or trail development—may result in isolated damage to situ archeological resources, components of historic roads or trails and/or features associated with cultural landscapes, best practices included in the NPS *Management Policies 2006*, and compliance with the National Historic Preservation Act has limited the effects of past park undertakings. Emerging visitation trends have the potential to impact historic roads and associated cultural landscapes. Increasing park visitation and congestion contribute to informal parking along roads and the creation of undesigned social trails that diminish the integrity of historic trails and have the potential to disturb archeological and other cultural resources in proximity to the trail and road system. Continuation of current trail management would result in minimal potential for impacts to

significant historic properties, including historic structures, archeological resources, and cultural landscapes due to ongoing maintenance and the high level of visitation on the existing trail system.

## **Environmental Consequences**

**No-Action Alternative.** Under the no-action alternative, impacts on historic structures and cultural landscapes would remain the same as described in the affected environment. The current resource threats and impacts related to increased visitation and trail congestion would continue to occur.

**Alternative 1.** Under alternative 1, approximately 20 miles of new summer-use trails would be developed primarily in the southern and western portions of the park to better disperse visitors and provide them opportunities to experience more areas and features of interest. All proposed trail routes and areas of associated ground disturbance would be surveyed for archeological and other cultural resources to ensure avoidance of sites. Cultural resources adjacent to the trails would be protected by thoughtfully locating new formal trails away from visible and sensitive cultural resources as well as managing visitor-created trails and rehabilitating disturbed areas consistent with established indicators and thresholds. New formalized trails would direct users away from fragile cultural resources. Surveys would be phased and coordinated with the development of project designs prior to any ground disturbance.

The two NPS Mission 66-era bridges on Munson Valley Road would be retained and protected, and the trail that parallels the road would use the existing vehicular bridge at Annie Spring to avoid and minimize impacts. Other areas of potential ground disturbance would be surveyed and assessed to avoid cultural resources, including the proposed expansion of the Pinnacles parking area and construction of a vault toilet and picnic area. Grayback Road would be retained for administrative purposes, and its character-defining features would be protected. Equestrian use along the Pumice Flat Trail and in the Lodgepole Picnic Area could trample soils and damage in situ archeological artifacts found along the Fort Klamath to Rogue River Wagon Road, but any effects would be localized and could be mitigated through visitor education, collection of surface artifacts, or site monitoring. While all impacts to archeological resources are permanent, adherence to the mitigation measures and best management practices identified in chapter 2 of this environmental assessment and best practices included in *NPS Management Policies 2006* would be expected to avoid or minimize loss or disturbance of significant cultural resources and character-defining features, resulting in minimal localized impacts to archeological resources, cultural landscapes, and other cultural resources as a result of actions included in alternative 1.

The creation of new trails under alternative 1 would be expected to decrease the current trend of increased visitation, social trailing and the erosion and compaction associated with off-trail visitor use. Reduced social trailing and trail congestion would contribute beneficial impacts to historic trails and structures, although it is difficult to predict if these changes would result in a measurable impact to cultural resources or affect future visitor's actions.

**Alternative 2.** The impacts to cultural resources under alternative 2 are essentially the same as under alternative 1, with the establishment of approximately 23 miles of new summer-use trails primarily in the eastern portion of the park. In addition to a new loop trail, the Maklaks Crater Loop, 18 miles of new trails would be developed on the south, east, and north side of Crater Lake to connect with existing portions of Rim Trail on the western side and create a continuous 30-mile network. A new overnight camp would be developed at Palisades, and existing camps at Grouse Hill, Lightning Springs, and Lost Creek would be expanded to accommodate additional users. The east side of the proposed Rim Trail would follow the historic Rim Road segments; any changes in alignment,



materials, or setting would negatively affect the character-defining features of the National Register-listed ACERS district. Construction activities and ground disturbances on or along Rim Road would also endanger adjacent contributing sites and any in situ archeological artifacts. In common with alternative 1, all proposed trail routes and areas of associated ground disturbance would be surveyed for archeological and other cultural resources to ensure avoidance of significant sites, and additional consultation would occur related to the location, design, and construction of individual projects included in this alternative. Cultural resources adjacent to the trails would be protected by replacing user-created trails with formalized trails that would direct users away from fragile cultural resources. Surveys would be phased and coordinated with the development of project designs. These actions and adherence to mitigation measures described in chapter 2 and best management practices under *NPS Management Policies 2006* would be expected to minimize loss or disturbance of significant cultural resources. While all impacts to archeological resources are permanent, actions in this alternative would have minimal localized impacts to archeological resources, cultural landscapes, and other cultural resources.

Similar to alternative 1, the creation of new trails under alternative 2 would be expected to decrease the current trend of social trailing and the erosion and compaction associated with off-trail visitor use. Reduced social trailing and trail congestion would contribute beneficial impacts to historic trails and structures, although it is difficult to predict if these changes would result in a measurable impact to cultural resources in the project area or affect future visitor's actions.

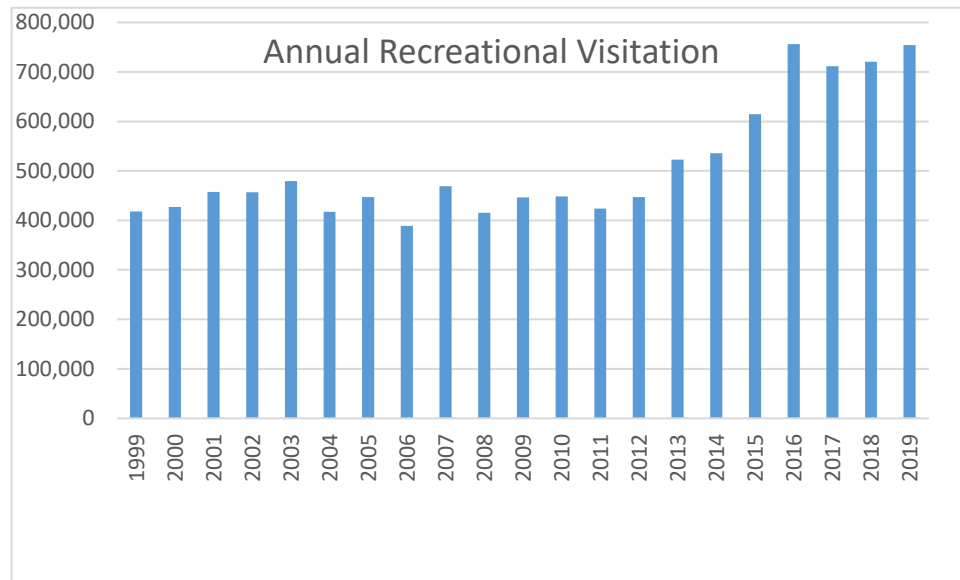
**Conclusion.** Alternatives 1 and 2 would result in minimal / limited adverse impacts to historic trail segments and other previously identified significant cultural resources. Under existing laws and policies, National Park Service staff would survey and assess project areas and monitor and protect archeological resources, historic structures, cultural landscape features and other cultural resources. Should sites and isolates be identified, they would be noted in an official memo to the decision file and avoided by project redesign. Other best management practices would be implemented to further minimize or avoid project impacts to cultural resources.

## **VISITOR USE AND EXPERIENCE**

### **Affected Environment (Current and Expected Future Conditions of Resources That Would Be Affected)**

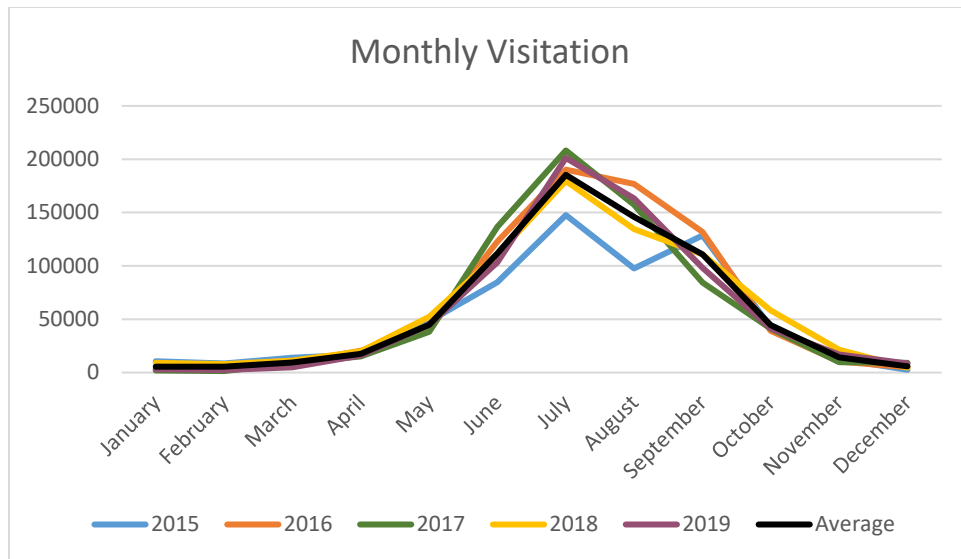
The Crater Lake trail system provides visitors with a variety of opportunities to explore the park. The trail system allows visitors to experience the unique environment inside the caldera and on the lake; enjoy scenic vistas along the caldera rim and on surrounding summits; access forested backcountry areas secluded from development; and amble amongst creeks, wildflowers, and waterfalls. The trail system provides recreational opportunities that range from solitude and self-reliance, to immersion in a mountainous landscape with small or medium-sized groups, to highly social trail experiences in a relatively secure environment. Visitors' motivations for using the trail system similarly range from those desiring challenge or exercise to those simply desiring a chance to stretch their legs and get away from the car for a while.

**Visitation Trends.** Visitation to Crater Lake has steadily increased over time. Trends over the last 20 years best illustrate this pattern. In 1999, there were 417,992 recreational visits to Crater Lake. By 2009, this number had risen to 446,516. In 2019, this number had risen sharply to 754,112, nearly double the visitation from 20 years before (figure 5). NPS staff have collected annual trail count data since 2014, and comparison of this data with parkwide visitation data indicates that overall trail use levels tend to mimic parkwide visitation trends. It is therefore reasonable to assume that trail use has experienced a similar increase over the last 20 years.



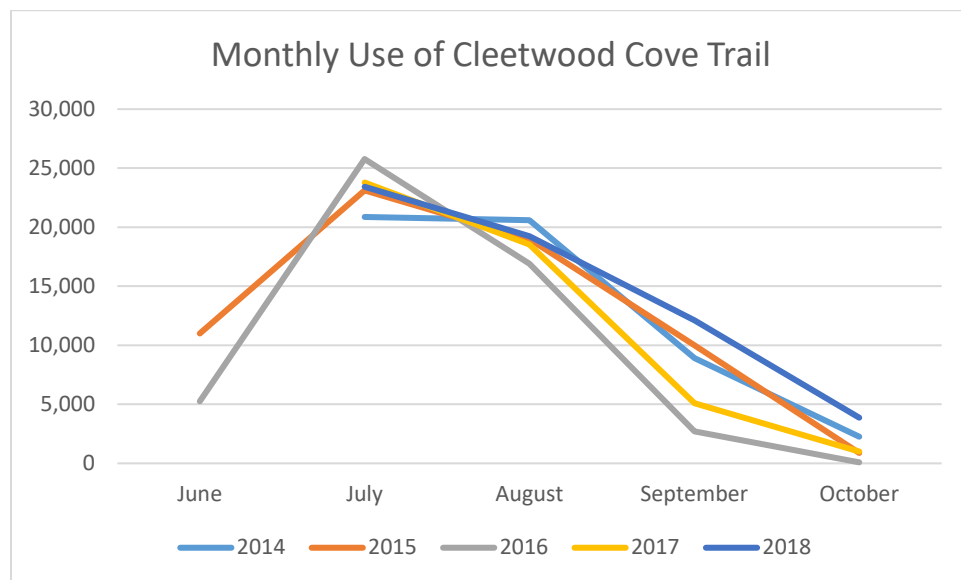
**FIGURE 5. ANNUAL RECREATIONAL VISITATION TO CRATER LAKE NATIONAL PARK (1999–2019)**

Visitation to Crater Lake is highly seasonal in nature, with summer easily being the busiest season. Over the past five years, monthly visitation during the summer months of June through September has averaged over 100,000, while monthly visitation during the winter months of December through March has averaged under 10,000. Monthly visitation during the shoulder season months of April and November has averaged around 15,000, while May and October have averaged around 45,000 (figure 6). While overall use in the shoulder season remains a fraction of summer use, it should be noted that the months of April, May, October, and November have seen respective increases of 112%, 75%, 35%, and 91% over the past 10 years, representing a dramatic shift to more shoulder season use.



**Figure 6. Monthly Recreational Visitation to Crater Lake National Park (2015–2019)**

Use of the park’s trails follows a similar pattern, though use of the trails is somewhat delayed as the snow melts in May and June. Once the snow melts, trail use typically increases quickly in June, peaks in July, tapers slightly in August, and then tapers more dramatically in September and October. A good example of this trend is the Cleetwood Cove Trail, where NPS staff have collected trail use information through infrared trail counters since 2014. Because of snow, park staff are usually not able to deploy the Cleetwood Cove trail counters until late June or early July (figure 7).



**Figure 7. Monthly Use of the Cleetwood Cove Trail (2014–2018)**

Use of the Crater Lake trail system is typically greater on weekends than on weekdays. Again, the Cleetwood Cove Trail is a good example of this. During the 2018 summer trail use season at Cleetwood Cove, the typical weekend day saw 22% more users than the average of the five weekdays preceding it.

Use of the trail system is also generally concentrated near the caldera rim of Crater Lake and near developed areas. As a general rule, the further a trail is from Crater Lake and from developed areas, the fewer users it receives. This distinction can be quite dramatic, with some trails that are near development and on the caldera rim receiving around 1,000 visits per day (while others receive between 200 and 300), trails near development and away from the caldera rim receiving around 100 visits per day, and trails that are near neither developed areas nor the caldera rim receiving only a handful or a few dozen visits per day. (For a detailed discussion of the varying trail use levels across the different areas of Crater Lake, see the visitor capacity analysis in appendix B.)

**Visitor Access and Circulation.** The primary way visitors access the Crater Lake trail system is by personal vehicle. Trailheads can be accessed by vehicle from three directions: from the north via the North Entrance Road, from the west (Medford, OR) via Oregon Route 62/Interstate 5, and from the south (Klamath Falls, OR) via Oregon Route 62/US Route 97.

Thirty-three miles of the Pacific Crest Trail pass through Crater Lake. Through-hikers on the Pacific Crest Trail can choose to follow an alternate route that brings them along the caldera rim and passes through the Rim Village, which can serve as an important restocking point.

**Visitor Opportunities.** The Crater Lake trail system is extensive, with roughly 95 miles of designated trails maintained by park staff. There are also user-created trails in the park, particularly along the caldera rim and in developed areas. These trails are not part of the designated trail system and they are not maintained by park staff.

Visitors can hike on all park trails, and this is easily the most popular trail activity. According to a 2001 visitor survey, more than one-third (37%) of visitors to Crater Lake hiked during their visit. Mountain biking, horseback riding, and dog walking (on-leash) are allowed on some park trails. Backpacking is also popular with some visitors. The trail system includes five designated backcountry campsites for backpackers and overnight stock users, though dispersed camping away from roads and water sources is allowed. In the winter, skiing, snowshoeing, and limited snowmobile use are all allowed.

While a variety of trail experiences are possible in the park in terms of scenery, frequency of encounters with other visitors, length, and difficulty, the trail system does not provide as great a diversity of opportunities as possible. Options generally include shorter out-and-back hikes near the caldera rim and longer backcountry excursions. There are few options for longer loop hikes, stock trips, biking, and hikes away from the caldera rim. This lack of diversity in available trail experiences contributes to the crowding and congestion seen on some trails, particularly popular trails near the caldera rim and near developed areas.

Examples of existing trail opportunities include:

- The Cleetwood Cove trail is the only trail that offers access to the lake and boat tours. Visitors can expect to encounter many other hikers, especially at peak times, along this strenuous 2.2-mile out-and-back trail.
- The Sun Notch trail provides opportunities to view the lake from the caldera rim. Visitors can expect to encounter some other hikers along this moderate half-mile trail.
- The Pinnacles trail allows visitors to experience eerie spires of volcanic ash sculpted by erosion. They can expect to encounter some other hikers along this easy one-mile roundtrip trail.

- The Bald Crater Loop trail offers visitors an opportunity to explore the forested areas of the park and spend a night or two in the backcountry. Visitors can expect to encounter very few other people along this strenuous 13.6-mile trail.

**Planned Actions that Will Affect Visitor Use and Experience.** The Steel Visitor Center is expected to be closed for two or more years beginning in 2021. This closure will temporarily change visitor use patterns so that Munson Valley will see lighter visitation than normal and Mazama Village will see greater visitation than normal. The disruption to visitor use patterns in this area is noteworthy as the trails around here are some of the busiest in the park.

The temporary closure of the Cleetwood Cove Trail for one or more summer seasons over the next few years to accommodate rock scaling, trail reconstruction, new dock installation and other work will displace visitors from one of the most popular trails in the park and remove any opportunity for visitors to experience the lakeshore and the lake itself.

**Expected Future Conditions.** Generally, the visitor use and experience on Crater Lake's trail system is expected to deteriorate if visitation trends continue and management continues unchanged. In the near-term, the existing trail system would continue to be accessible to the public and visitors use and enjoyment of the trails would be unchanged. However, park visitation and trail use is expected to continue rising. This would lead to increased crowding and congestion on the trails as well as associated infrastructure like trailheads, parking lots, and access roads, thus limiting visitors' opportunities for connection with nature and solitude.

Crowding and congestion may also reduce visitors' ability to access the trail system. As trailhead parking lots begin to fill earlier, more frequently, and potentially become overwhelmed, visitors could face the uncertainty or inability to find parking, thus preventing them from visiting certain portions of the trail system. It may also lead to increased informal parking, which causes safety and resource concerns. Increasingly heavy use of the trails would also cause more erosion and potentially increase the frequency of trail closures related to resource and safety concerns. These reactive closures would reduce visitors' access as they would have fewer areas to visit, and fewer locations would offer a particular type of use or experience that may be of interest.

## **Environmental Consequences**

**No-Action Alternative.** Under the no-action alternative, impacts on visitor use and experience would remain the same as described in the affected environment. The current visitor use and experience trends and trail system management would continue unchanged. The continued unmanaged increases in visitation would likely result in substantial long-term adverse impacts to visitor use and experience as increased crowding and congestion would increasingly cause the visitor experience to decline and could threaten visitor access to some areas as facilities become overwhelmed.

**Common to All Action Alternatives.** The addition of a few new trails and the establishment of others for winter use would generally result in beneficial impacts to visitor use and experience, as they would provide year-round recreational opportunities for a variety of user types. Though some trails or portions of trails may be closed while improvements are being made, these closures would only result in minor, short-term adverse impacts while the construction occurs. The impacts would be minor, as the vast majority of trails would remain open at any one time and the park would provide timely and accurate communication regarding closures to minimize impact, as well as noise

abatement and visual screening as described in the “Mitigation Measures and Best Practices Common to All Action Alternatives.”

The temporary closures may also lead to some increased competition for trails and campsites, particularly at popular trails near the caldera rim where visitors can view the lake from a distance, but this would be a minor impact as most trails would remain open at any one time. The impacts of temporary closure of some trails or portions of trails while improvements are being made could be compounded by the concentration of visitors in the Mazama Village area during the temporary Steel Visitor Center closure. The trails in this area are already some of the busiest in the park and altering the visitation pattern so more visitors use trails in the Mazama Village area would be a noticeable impact. The scale of this impact could be mitigated through careful timing and sequencing of the temporary trail closures to avoid further displacing visitors onto trails in the Mazama Village area while the Steel Visitor Center is under construction.

*Lady of the Woods Trail* — Marking this existing trail for winter use would improve the diversity and quality of visitor experience. The trail would provide visitors with a short, easy snowshoeing/hiking opportunity in winter. The winter trail would primarily benefit snowshoers but would also be available for use by skiers.

*North Entrance Road* — Added clarity and increased information about the winter recreational opportunities available on the North Entrance Road would beneficially impact visitor use and experience. Existing uses including snowmobiling, skiing, and hiking would be more well-known to the public. Additionally, visitors would have clarity and be aware that pets, dog-sledding, skijoring, and snow bikes are allowed. The information about the availability of these opportunities, some of which are unique in the park, would be especially beneficial as the long, gradual grade is friendly to recreationists at the beginner and intermediate levels. However, allowing multiple user types on a trail and publicizing the opportunities creates a higher potential for user conflicts, as different user groups have varying expectations for quiet and are traveling at various speeds. The potential for the presence of human waste and trash would increase as more visitors would be using the road with limited facilities that are available.

*Red Cone Trailhead* — The proposed additional parking at the Red Cone Trailhead could result in some adverse impacts to the visitor experience, as it may encourage more use of the nearby Grouse Hill Campsite by those looking for a free and easy-to-access alternative to paid campgrounds, therefore increasing competition for camping with PCT through-hikers. However, the addition of up to four oversize vehicle parking spaces would provide additional opportunities for equestrian users to access this portion of the park from park roads, rather than from neighboring lands. The added parking would also provide opportunities for RVs and other large size vehicle users to more easily park and hike or sightsee.

*Accessibility* — The use of ABA Accessibility Standards to improve accessibility of trails as practicable would benefit visitors of differing abilities. Improved information about the condition and difficulty of trails would allow visitors of all abilities to make informed decisions about which trails to use, thereby improving the overall quality of their experience at the park as it generally aligns with their expectations.

*Management Strategies Associated with Indicators and Thresholds* — The Indicators and Thresholds (See appendix A) contain a number of management strategies which would impact visitor use and experience.



Management strategies designed to improve the delineation and demarcation of trails would beneficially impact visitor use and experience. Improved trail identification and signage would mean visitors could more easily find their way and reconcile on-the-ground trails with mapped trails. Likewise, the evaluation and potential rehabilitation or designation of visitor created trails would prevent confusion and disorientation for visitors, who often mistake them for official trails. Rails and borders along trails would also make it easy to stay on trails in areas where they can become confusing. The restriction of off-trail travel and creation of restoration areas in some locations could adversely impact visitor use, though the wayfinding improvements and overall expansion of opportunities would largely mitigate these impacts, as would improve education about the importance of these measures.

The suite of management strategies designed to reduce the presence of human waste, pet waste, and litter would generally be beneficial to visitor experience. The actions include installation of more dog waste stations and restroom facilities, education about appropriate waste disposal and Leave No Trace ethics, expectation-setting about closed restrooms in winter, and other measures. These actions would all decrease the waste visitors find along park trails, making for a more pleasant experience. These strategies would also provide visitors with the information and equipment they need to avoid unpleasant surprises related to restroom needs and improve their comfort while visiting the park.

The temporary closures of the North Entrance Road to snowmobile use when the off-road use threshold is exceeded would adversely affect visitors who desire snowmobiling on the road when it is closed. However, this management strategy is designed to leverage this potential for an adverse impact to improve compliance with staying on the legal route, and ultimately prevent the temporary closures from occurring.

*Management Strategies Associated with Visitor Capacity* — The Visitor Capacity analysis includes management strategies designed to implement the visitor capacity. These management strategies would generally have a beneficial impact to visitor experience, though in some cases they may adversely affect visitor use.

The continued management of roadside parking at Cleetwood Cove would adversely impact visitor access as the trailhead parking lot frequently fills. As visitors face the uncertainty or inability to find parking, they may have to adjust their plans to arrive at a different time, or they may not be able to visit this highly desirable destination, which is unique within the park, at all.

Increased education and expectation setting encouraging visitors to visit Cleetwood Cove early or late in the day would beneficially impact visitor experience. As visitors are made more aware of the crowded conditions they are likely to find in the middle of the day and the possibility they may not be able to find parking, more visitors would choose to arrive early or late in the day. This would decrease crowding and congestion during the middle of the day and improve the quality of the experience for all visitors. Even if visitors do not alter their plans based on this information, they would know in advance to expect crowded conditions. As expectations more nearly match the actual experience, the perceived quality of the experience would improve.

The implementation of temporary trail closures during the summer or September visitation season to accommodate improved maintenance would adversely impact more visitors' ability to visit Cleetwood Cove.

Encouraging visitors to use newly constructed trails and lesser used trails would beneficially impact visitor use and experience as visitors become more aware of the opportunities available on trails throughout the park. This action would better distribute visitors across the park's trail system and reduce crowding and congestion to a limited degree on some of the park's most well-used trails, having a beneficial impact on visitor experience on all of the trails. This action could have an adverse impact on the experience of visitors that prefer to use some of the lesser-used trails for the solitude they provide. Encouraging more use on these trails would adversely impact their ability to have that experience. Setting appropriate expectations for visitors to some of the more popular trails in the park would also beneficially impact the experience as the crowding and congestion they encounter would not be a surprise, and therefore less detrimental to their experience.

Improved education regarding the lack of onsite restroom facilities at some trailheads would beneficially impact visitor experience, as visitors would be less likely to be surprised by this fact when they arrive at a trailhead. This education would likely mean fewer instances of human waste along the trail caused by visitors' lack of awareness about the absence of restrooms. This would increase visitor comfort while using the trails and reduce the unpleasantness associated with finding human waste along the trails.

Managing backcountry permits within identified capacities for designated sites in the Pacific Crest, Dutton Creek, and Lightning Spring backcountry trail loop would have beneficial and adverse effects to visitor use and experience. Some beneficial impacts would occur as visitors who plan ahead are able to ensure they would be able to experience this backcountry loop, removing the adverse impact that can come with uncertainty. Once visitors are on the trail, they would be able to experience conditions that are consistent with the desired conditions for the area, thus benefitting the visitor experience. Those who are not aware of the permit requirement could be adversely affected if they arrived without knowledge of the changed management system. Depending on implementation of the permit system, if day-of or walk-up permits are not available, it could reduce visitor spontaneity before and during their visit to the park. There would also be potential for adverse impacts to those unable to obtain a permit. Lastly, implementation of a permit system could lead to visitor perceptions that the park is less accessible.

*Adaptive Management Strategies Associated with Visitor Capacity* — The Visitor Capacity analysis also includes adaptive management strategies that would be implemented if and when they are necessary. These actions would typically be taken when visitor capacities are being approached or exceeded. These adaptive management strategies would generally have a beneficial impact to visitor experience, and they may adversely affect visitor access and use.

The strategy of actively managing the pace and flow of trail use on peak usage days on the Cleetwood Cove Trail would have beneficial and adverse effects on visitor access and experience. The most notable beneficial effect is that hikers would continue to have opportunities to have a high-quality experience within the caldera rim at all times of the day and throughout the visitation season. When visitors are able to get on the trail, they would be able to experience conditions that are consistent with the desired conditions for the area, thus benefitting the visitor experience. Visitors would no longer be subjected to the crowding and congestion that is inconsistent with desired conditions, and at times unsafe, during peak visitation times.

Visitors who arrive at the Cleetwood Cove Trailhead when it is being actively managed may be adversely affected as they will have to wait until the trail is less busy, return later in the day, or return another day to hike the Cleetwood Cove Trail. Some of these visitors would be displaced to other trails they find equally enjoyable, but for many visitors there would be no substitute for the

experience of walking down inside the caldera rim and to the lakeshore. While some visitors may be merely inconvenienced by the added wait time or need to return later, others that are on a short visit to the park may not be able to have this singular primary experience at all. The redistribution to times earlier and later in the day may also be undesirable for visitors wishing to be at the lakeshore at a certain time of day due to water temperature, weather conditions, and the boat tour schedule. This is particularly relevant for anglers, swimmers, and those planning to take a boat tour.

Managing the pace and flow of trail use at the Cleetwood Cove Trail, when taken together with the planned temporary closures for rock scaling, trail reconstruction, new dock installation, and other work at Cleetwood Cove, could have a combined adverse effect on visitor access and lead to visitor perceptions that this primary park experience is less accessible. However, the full temporary closures associated with the rehabilitation would be much more responsible for this adverse impact than the marginal increased impact caused by the more active management of pace and flow.

The addition of restrooms to some of the higher use trailheads would beneficially impact visitor experience as visitors have more opportunities to begin their hike at a location with a restroom. This would also reduce some of the human-waste related concerns along the trail, making for a more pleasant trail experience.

The designation of additional backcountry campsites in the backcountry and the possible phasing-out of dispersed camping in some areas would have beneficial and adverse impacts on visitor use and experience. The designated sites would provide a higher level of development, meaning campsites would be more comfortable and easily found, which could beneficially impact some visitors' experience. On the other hand, the designation of official sites would mean the loss of the sense of adventure and discovery that comes with finding a favorable dispersed site.

*Trends Analysis* —The addition of some trail-based opportunities, improved accessibility throughout the system, and improved management of visitation included in the actions common to all action alternatives would counteract the short-term adverse effects over the next few years associated with temporary closures of the Steel Visitor Center and Cleetwood Cove Trail. The actions common to all action alternatives would also help ameliorate the long-term adverse effects associated with crowding and congestion expected in the future.

**Alternative 1.** The additional trail mileage proposed in alternative 1 would result in long-term beneficial impacts to visitor access and experience. The new trails would vary in length and seasonal usability and would offer access to important features and key experiences that are not currently available in the southern and western portions of the park, as well as increased interconnectivity between park sites and with external trail networks. The additional trail miles would also improve the visitor experience by helping to disperse use, decreasing crowding and congestion on some of the more popular trails near the caldera rim. The additional trail miles would be particularly beneficial for visitors seeking solitude, as some of the new trails away from the crowding along the rim would provide more opportunity to have the trail to oneself.

Improved accessibility and the opening of some trails to new user types would increase the diversity of recreational opportunities within the park. In addition, the new trails would improve safety and allow for realistic alternatives to motorized transportation by separating pedestrians and cyclists from the main roads by motor vehicles in the busy Mazama Village-Munson Valley-Rim Village corridor. The addition of trails in some of the lower elevation areas with less snowfall in the southern and western portions of the park would improve the access to trail-based experiences during the early and late parts of the visitation season.

Though some trails or portions of trails may be closed while improvements are being made, these closures would only result in minor, short-term adverse impacts which would be largely mitigated by timely and accurate communication regarding closures, timing to minimize impact, as well as noise abatement and visual screening. Overall, Alternative 1 would result in long-term, beneficial impacts to visitor use and experience, as recreational opportunities within the park are added to, improved, and diversified.

*Castle Creek Canyon Trail and Overlook* — These new trails would provide beneficial impacts to access and the diversity and quality of visitor experience, as they would offer short, easy hikes at a lower elevation, thus giving visitors more hiking opportunities during the shoulder season when higher elevations are still under snow. The trail and overlook would be the first opportunity visitors have to stretch their legs, experience the park from outside their vehicle, and enjoy a trail after they enter the park from the west. They would be attractive to visitors as they access a unique point of interest in the park and are located away from the dense visitor use along the caldera rim. However, it is noted that spring shoulder season hiking may be made less enjoyable by the presence of ample mosquitos and relative lack of botanical diversity.

*Falls to Flowers Trail* — The Falls to Flowers Trail would connect the Munson Valley area with the Grayback Trail, providing visitors with the opportunity to access a longer out-and back hike totaling roughly 15 miles. This access to a longer hike beginning in the busy developed area of the park and extending roughly parallel to the caldera rim would be attractive to visitors looking for a longer, moderate, easy-to-access day-hike, and would beneficially impact their experience. The pedestrian access it would provide to Vidae Falls from the central visitor use corridor would also be beneficial in dispersing use and providing alternatives to a vehicle-based visit.

*Grayback Trail* — This existing administrative road would be reclassified as a trail and would continue to be open to hiking, equestrian use, dogs, and mountain biking. The reclassification would result in beneficial impacts to visitor experience by increasing the awareness of the diverse recreational opportunities available on this trail. However, adverse user-conflicts may become more likely as more user groups become aware of the trail and begin to use it in greater numbers. Additional beneficial impacts to the visitor experience would occur, as the trail offers recreation options away from the rim and would thus help to disperse visitors during peak periods. However, a lack of points of interest along the trail may limit its popularity and hence, its function in dispersing use.

*Mazama Campground Loop Trail* — This new, ABA accessible trail would provide additional opportunities for campground guests who wish to go on a short hike directly from the campground. Beneficial impacts to access, the visitor experience, and the diversity of recreational opportunities would be seen, as the trail would be open to multiple user groups. This type of access could create the possibility of user conflicts, though the risk would be mitigated by the width of the trail. There would also be beneficial impacts to visitor safety, as campground guests would no longer need to ride bikes on the roads through the campground. This trail would also expand opportunities for skiers in winter where they would be free of potential conflicts with snowshoers and pets.

*Mazama Rock Trail* — The addition of this new trail would beneficially impact visitor use and experience by providing an impressive view of Crater Lake accessed by a short—though difficult—hike. In this way, the experience would be similar to that at Watchman Overlook, and though somewhat redundant, may help to disperse use away from Rim Village providing a less crowded experience at both sites.

*Munson Valley Roadside Trail* — The new, paved, multi-use trail would have beneficial impacts to visitor access, as it would improve connectivity between Mazama Village area and the Park Headquarters-Steel Visitor Center area, as well as Rim Village (via the Munson Valley Spur). Mazama campground guests will particularly benefit from this additional trail opportunity that facilitates access to the lake. However, given the total elevation gain, many visitors would not see it as a viable alternative for parking at the rim. The trail would be especially attractive to cyclists, and would disperse some cycling use away from the rim. Separating vehicles and bicycles would have beneficial impacts on visitor safety. However, sustained grades would allow downhill cyclists to ride at high speeds, which could discourage other user groups from using it and potentially have an adverse impact on the visitor experience for non-cyclists. The trail would also provide new, easier recreational opportunities in the winter months for those seeking an experience not far from development.

*Munson Valley Spur* — This new trail, when combined with the Raven Trail, would be part of a loop-hike near the rim and would beneficially impact visitor access to the rim, especially when parking is scarce or full at Rim Village.

*Panhandle Trail* — This new trail would provide beneficial impacts to the diversity and quality of visitor experience, as it would offer an opportunity for a short hike within a forested portion of the park. The hike would be particularly attractive during times when higher elevation trails are snow packed. However, while this type of experience is somewhat unique within the park, this type of experience is already available to visitors on other public lands in the area and does not provide a rare or unique experience on a regional scale. Therefore, this trail is likely to appeal to non-local visitors who may only be aware of hiking opportunities within the national park and may be unaware of regional opportunities.

*Ponderosa Pine Trail* — This new trail would result in beneficial impacts to visitor access and experience, as it would provide an additional opportunity for visitors seeking a short hike to a feature of interest (a rare stand of old-growth trees), particularly when higher elevations are covered in snow. Like the adjacent Panhandle Trail, this trail would be particularly attractive during times when higher elevation trails are snow packed.

*Pumice Flat Trail* — Adding equestrian use to this existing trail would have beneficial impacts on the diversity and quality of visitor experience for equestrians, as they would have more opportunities for recreation, as well as improved connectivity to adjacent lands that have equestrian trails. Adverse impacts to the experience of non-equestrian users may result, as the new designation would increase the potential for user conflicts. However, the potential for conflict is only slight because use-levels would likely continue to be low-to-moderate and mountain bikes are not allowed.

*Raven Trail* — This new trail, when combined with the Munson Valley Spur Trail, would become part of a loop-hike near the rim. Beneficial impacts to the visitor experience would be seen, as this trail would help visitors access the rim when parking is scarce or full at Rim Village. The trail would also facilitate alternatives to a vehicle-based visit.

*Union Peak Trail to Stuart Falls Trail Connector* — This new trail would have beneficial impacts on the diversity and quality of visitor experience for hikers and equestrians. It would provide opportunities to complete a longer and more challenging backcountry loop of roughly 13 miles and provide more opportunities for recreation for those seeking overnight backpacking trips or equestrian rides in the park. It would also improve opportunities to experience the park's recommended wilderness and offer a high degree of solitude. Solitude and opportunities to access

key points of interest like Union Peak, Bald Top, and Stuart Falls would appeal to many backcountry users and would be a beneficial impact.

*Pinnacles Parking Area* — The expansion of this existing parking area would beneficially impact visitor use and experience as more parking will be available to accommodate visits to the area. The vault toilet and picnic area would also be beneficial. The expansion is unlikely to be large enough to incur any adverse impacts associated with crowding on the area's trails.

*Trends Analysis* — The additional trail miles in alternative 1 that would disperse use, decreasing crowding and congestion on some of the more popular trails near the caldera rim, and improve trail connectivity would ameliorate the short-term adverse effects over the next few years associated with temporary closures of the Steel Visitor Center and Cleetwood Cove Trail. Alternative 1 would also counteract and help to reduce the long-term adverse effects associated with crowding and congestion expected in the future.

**Alternative 2.** The additional trail mileage proposed in alternative 2 would result in long-term beneficial impacts to visitor use and experience similar to those described in alternative 1. While the total mileage of trail added in the two alternatives would be roughly the same, alternative 2 differs substantially in that these trail miles are concentrated in one medium-length, day hike trail and one long loop trail that would circumnavigate the lake. This is distinct from alternative 1, where the many more shorter trails are proposed that would create a network in the developed Rim Village-Munson Valley-Mazama Village corridor and add a few other shorter opportunities in lower elevation locations away from the caldera rim.

The new trails included in alternative 2 would result in beneficial impacts to visitor use and experience, as their addition would provide new options for recreation, primarily in the form of medium-length day-hikes and long, multi-day backpacking trips. The closure of one trail would result in a long-term adverse impact by removing access to an area of the park, but the effect of this impact would be lessened by the addition of other new trails and by the increased availability of park resources to improve conditions on the remaining trails.

As in alternative 1, some trails or portions of trails may be closed while improvements are being made. These closures would only result in minor, short-term adverse impacts which would be largely mitigated by timely and accurate communication regarding closures, timing to minimize impact, as well as noise abatement and visual screening. Overall, alternative 2 would result in long-term, beneficial impacts to visitor use and experience, as recreational opportunities within the park are added to, improved, and diversified. Alternative 2 would also be likely to result in some adverse impacts to safety and the quality of visitor experience due to the potential for an increase in unauthorized visitor activities, such as the creation of social trails leading to undeveloped viewpoints.

*Maklaks Crater Loop* — Beneficial impacts to access and the diversity and quality of visitor experience would result from the addition of this new hiking and equestrian trail. Though the trail contains no specific feature of interest or unique experience, it would be attractive as a loop trail of moderate difficulty and would further beneficially impact the visitor experience as it would encourage dispersal of use to a less-visited area of the park.

*Rim Trail (East Side) and Vidae Ridge Trail* — The chief feature of alternative 2 is the completion of a 30-mile Rim Trail that would circumnavigate Crater Lake. This trail would result in beneficial impacts to access and the quality of visitor experience as it would improve opportunities to engage in

the key experience at the park: viewing Crater Lake. This trail-based opportunity is not currently available along substantial portions of the southern, eastern, and northern parts of the caldera rim, and this trail would provide multiple viewpoints of the lake in a manner that is currently only available by vehicles in the summer season.

While this trail would provide outstanding access to the key park experience of viewing the lake, visitors would not be able to view the lake along the entire length of the trail. This condition has the potential to negatively impact the visitor experience, as visitors may be disappointed by the lack of views on some stretches of trail and may attempt to create their own trails in order to attain their desired lake-viewing experience. Visitor-created trails could create additional safety risks, as visitors may unknowingly enter hazardous areas of the park. Additionally, the proximity of the trail to the Rim Drive along much of its length would be likely to encourage informal roadside parking, which would present a danger to both pedestrians and motorists.

As overnight use would be allowed by permit along the Rim Trail (East Side), the opportunity to complete a three- or four-night backpacking trip in close proximity to the rim would be a new opportunity not currently available in the park. However, camping in unauthorized locations (i.e. along the rim) may increase as visitors cannot reach their reserved campsite, seek a less crowded campsite type, or prefer a campsite with views of the lake. Given the multiple points where this trail comes near the Rim Drive and front country facilities, it would offer a long-distance hiking opportunity especially appealing to beginner and intermediate-level hikers.

Given the proximity of the trail to the Rim Drive, the option of traveling only a segment of the trail would create opportunities for short, easy hikes with lake views that could help disperse some crowds away from Rim Village. However, the characteristics that draw beginner and intermediate-level hikers, such as the opportunity to do long-distance hiking near developed areas, may also attract inexperienced hikers and provide a false sense of safety. Visitor-created social trails could lead to unstable slopes or surfaces as visitors look for undesignated viewing areas that could result in adverse impacts to visitor safety.

*East Bald Crater Loop* — The closure of this loop trail would result in adverse impacts on the diversity and quality of visitor experience, as the number of hiking and riding opportunities in the backcountry would be reduced. However, the closure of this maintenance-intensive trail would free up a marginal amount of time and resources for the park trail crew, thus leading to a marginal improvement to conditions on other trails-- a beneficial impact to the users of those trails.

*Trends Analysis* — The three trail additions in alternative 2 would help to disperse use and would counteract the short-term adverse effects over the next few years associated with temporary closures of the Steel Visitor Center and Cleetwood Cove Trail. Alternative 2 would also counteract and reduce the long-term adverse effects associated with crowding and congestion expected in the future.

**Conclusion.** On the whole, both action alternatives would be beneficial to visitor use and experience and would be superior to the no-action alternative. Alternative 2 would have more potential for adverse impacts to visitors than alternative 1. In addition, the benefits of alternative 2 would be more concentrated in a few distinct types of recreation (medium to longer distance hiking) and areas (the eastern and northern sides of the lake). Alternative 1 would provide a much wider spectrum of recreational opportunities in more diverse settings. While both alternatives would have the potential to disperse visitors away from crowded areas along the caldera rim, alternative 1 would likely be



more effective at doing so since its new recreational opportunities appeal to more types of users and are located closer to major nodes of visitation. The impacts from actions common to all action alternatives would be both beneficial and adverse, though they would generally be more beneficial than the impacts from the no-action alternative.

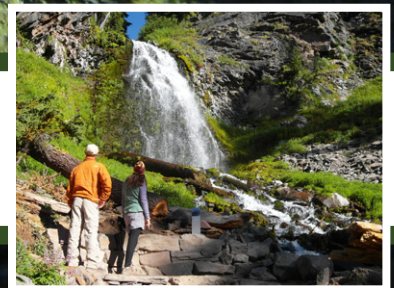
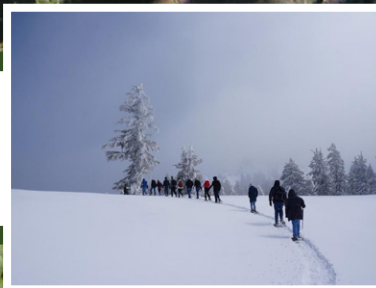
This page intentionally left blank.



# CONSULTATION AND COORDINATION

CHAPTER

4







## **CHAPTER 4: CONSULTATION AND COORDINATION**

### **AGENCY CONSULTATION**

During preparation of this trail management plan, members of the planning team met and/or consulted with various entities.

#### **US Fish and Wildlife Service**

Via the Information for Planning and Consultation website for the US Fish and Wildlife Service, the National Park Service requested the most recent list of species and their designated critical habitat protected under the federal Endangered Species Act that may be impacted by projects in Crater Lake National Park. This action served as a record that the National Park Service had initiated informal consultation with the US Fish and Wildlife Service pursuant to the requirements of the Endangered Species Act and NPS management policies.

#### **National Historic Preservation Act Section 106 Compliance**

On January 27, 2017, the park superintendent notified the Oregon State Historic Preservation Officer by letter that the park was beginning work on a trail management plan and had initiated the Section 106 process of the National Historic Preservation Act and consultation under 36 CFR 800. Plan goals, objectives, and the planning effort's progress were discussed during biannual meetings held between the Oregon State Historic Preservation Officer and park cultural resource management staff throughout the planning process. The Oregon State Historic Preservation Officer was also invited to attend open house scoping sessions. The park noted that further consultation with the Oregon State Historic Preservation Officer would occur as proposed undertakings and areas of potential effect were better defined with the development of project designs.

On January 27, 2017, the park superintendent notified the Klamath Tribes and the Cow Creek Band of the Umpqua Tribe of Indians by letter that the park was beginning work on a trail management plan. The superintendent informed the tribes of the National Park Service's intent to conduct government-to-government consultation with tribes pursuant to section 106 of the National Historic Preservation Act as proposed undertakings and areas of potential effect were better defined with the development of project designs.

The proposed actions described in this plan are conceptual and appropriate for a high-level comprehensive trail planning effort; exact locations, construction materials, and implementation strategies for trail segments included in the action alternatives have not been finalized.

Once individual actions from the selected alternative are considered for implementation, additional consultation will be conducted with the Oregon State Historic Preservation Officer, traditionally associated tribes and other consulting parties in accordance with the 2008 Programmatic Agreement among the National Park Service, the Advisory Council on Historic Preservation, and the National Conference or State Historic Preservation Officers for Compliance with Section 106 of the National Historic Preservation Act and ACHP regulations (36 CFR Part 800).

## CONTRIBUTORS

The National Park Service followed an interdisciplinary approach to prepare this plan. The following NPS staff, among others, contributed to its development.

### CRATER LAKE NATIONAL PARK INTERDISCIPLINARY TEAM

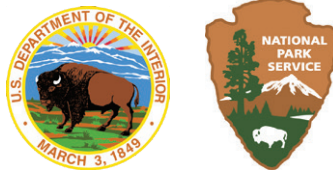
Craig Ackerman – Superintendent  
Heidi Barker – Backcountry Permits Manager  
Sean Denniston – Management Assistant  
Jennifer Gifford – Trails Program Supervisor (former)  
Jennifer Gibson – Chief, Resource Management and Fire  
Kirsten Hardin – Chief, Facility Management  
John Harwood – Fire Operations Supervisor  
David Hering – Fisheries Biologist  
Andrew Hoeg – Trail Crew Supervisor  
Jennifer Hooke – Botanist

Chad Hunter – Operations Supervisor  
Steve Mark – Historian and Section 106 Coordinator  
Marsha McCabe – Chief, Interpretation and Cultural Resources  
Kean Mihata – Chief Ranger  
Sean Mohren – Terrestrial Ecologist  
Ed Waldron – Fire Management Officer  
Wendy Wayne – Compliance Specialist and Accessibility Specialist  
Ian Willis – Trails Foreman

### DENVER SERVICE CENTER

Mindy Burke – Contract Editor  
Laurie Domler – Community Planner  
Tom Gibney – Project Manager  
John Paul Jones – Visual Information Specialist  
Marc Kochheiser – Landscape Architect  
Danielle Lehle – Natural Resource Specialist  
Raymond McPadden – Project Manager (former)  
Carrie Miller – Cultural Resource Specialist (former)

Charles Notzon – Economist  
Hilary Retseck – Cultural Resource Specialist  
Steve Whissen – Cultural Resource Specialist (former)  
Andrew White – Visitor Use Management Specialist  
Don Wojcik – Natural Resource Specialist (former)  
Zak Wood – GIS Specialist



As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

CRLA 106-177216  
September 2021





CRATER LAKE NATIONAL PARK | TRAIL MANAGEMENT PLAN / ENVIRONMENTAL ASSESSMENT | SEPTEMBER 2021

