

ENVIRONMENTAL CONSEQUENCES



INTRODUCTION

The National Environmental Policy Act (NEPA) mandates that environmental impact statements disclose the environmental effects of proposed federal actions. In this case, the proposed federal action would be the adoption of a general management plan for Crater Lake National Park. This “Environmental Consequences” chapter analyzes the potential effects of four management alternatives on cultural resources, natural resources, the visitor experience, park and concession operations, and the socioeconomic environment. By examining the environmental consequences of all alternatives on a relative basis, decision-makers can decide which approach creates the most desirable combination of the greatest beneficial results with the fewest adverse effects on the park.

The alternatives provide broad management directions. Because of the general nature of the alternatives, the potential consequences of the alternatives are analyzed in similarly general terms using qualitative analyses. Thus, this environmental impact statement should be considered a programmatic analysis. Consistent with the National Environmental Policy Act, the National Park Service would conduct additional environmental analyses with appropriate documentation before implementing site-specific actions.

The existing conditions for all of the impact topics analyzed here were identified in the “Affected Environment” chapter. All of the impact topics are

assessed for each alternative. For each impact topic, there is a description of the positive (beneficial) and negative (adverse) effects of the alternative, a discussion of the cumulative effects when this project is considered in conjunction with other actions occurring in the region, and a brief conclusion.

The no-action alternative (continue current management) sets the baseline of existing impacts continued into the future against which to compare impacts of action alternatives. The three action alternatives were then compared to the no-action alternative to identify the relative magnitude and intensity of potential impacts that would occur as a result of changes in park facilities and management. At the end of each alternative there is a brief discussion of unavoidable adverse impacts; irreversible and irretrievable commitments of resources; and the relationship of short-term uses of the environment and the maintenance and enhancement of long-term productivity. A brief summary of the impacts of each alternative was provided in table 6 at the end of the “Alternatives, Including the Preferred Alternative” chapter.



METHODOLOGY FOR ANALYZING IMPACTS

The planning team based the impact analysis and the conclusions in this chapter largely on information provided by experts in the National Park Service, park staff insights and professional judgments, and on the review of existing literature and studies. The team's method of analyzing impacts is further explained below. It is important to remember that it is assumed in the analyses that the mitigation measures described in the "Alternatives, Including the Preferred Alternative" chapter would be applied to minimize or avoid impacts. If these measures were not applied, the potential for resource impacts and the magnitude of those impacts would increase over those described here.

The environmental consequences for each impact topic were defined based on impact type, intensity, context, and duration. Cumulative effects also were identified, but are discussed later in this section.

Effects can be either *adverse* or *beneficial* for the topic being analyzed and are referred to as impact type. The effects also can be *direct* or *indirect*. Direct effects are caused by an action and occur at the same time and place as the action. Indirect effects are caused by the action and occur later or farther away, but are still reasonably foreseeable.

Impact *intensity* refers to the degree or magnitude to which a resource would be positively or negatively affected. Each impact was identified as negligible, minor, moderate, or major in conformance with the criteria for these classifications provided below by impact topic. Because this is a programmatic document, the intensities were expressed qualitatively.

Context refers to the setting or area within which an impact would occur, such as the affected region or locality. In this document most impacts are either localized (site-specific) or parkwide. Cumulative impacts are either parkwide or regional (e.g., biotic community impacts).

Impact *duration* refers to how long an impact would last. The planning horizon for this general management plan is approximately 20 years. Unless otherwise specified, in this document the following terms are used to describe the duration of the impacts:

Short term: The impact would be temporary in nature, lasting a year or less, such as impacts associated with construction

Long term: The impact would last more than one year and could be permanent in nature, such as the loss of soil due to the construction of a new facility

IMPACTS TO CULTURAL RESOURCES AND SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

In this environmental impact statement, impacts to archeological and ethnographic resources, historic structures/buildings, cultural landscapes, and museum collections are described in terms of type, context, duration, and intensity which is consistent with the regulations of the CEQ that implement the provisions of the National Environmental Policy Act. These impact analyses are intended, however, to comply with the requirements of both NEPA and Section 106 of the National Historic Preservation Act (NHPA). In

accordance with the Advisory Council on Historic Preservation's (ACHP) regulations implementing Section 106 of the NHPA (36 CFR Part 800, *Protection of Historic Properties*), impacts were identified and evaluated by (1) determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that are either listed in or determined eligible for listing in the National Register of Historic Places (NRHP); (3) applying the criteria of adverse effect to affected cultural resources either listed in or determined eligible for listing in the national register; and (4) considering ways to avoid, minimize, or mitigate adverse effects.

Under the Advisory Council's regulations a determination of either adverse effect or no adverse effect must also be made for affected national register-listed or determined eligible cultural resources. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the national register, e.g., diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by actions of an alternative that would occur later in time, be farther removed in distance or be cumulative (36 CFR Part 800.5, *Assessment of Adverse Effects*). A determination of no adverse effect means there is an effect, but the effect would not diminish in any way the characteristics of the cultural resource that qualify it for inclusion in the national register.

CEQ regulations and the National Park Service's *Conservation Planning, Environmental Impact Analysis and Decision-making* (Director's Order No. 12) also call for a discussion of the

appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, e.g., reducing the intensity of an impact from major to moderate or minor. Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect as defined by Section 106 is similarly reduced. Although adverse effects under Section 106 may be mitigated, the effect remains adverse.

A Section 106 summary is included in the impact analysis sections for archeological and ethnographic resources, historic structures/ buildings, and cultural landscapes (Section 106 determinations of effect are not provided for museum collections because such resources are generally ineligible for listing in the national register). The Section 106 summary is intended to meet the requirements of Section 106 and is an assessment of the effect of the undertaking (implementation of the alternative) on cultural resources, based on the criterion of effect and criteria of adverse effect found in the Advisory Council's regulations. Future Section 106 compliance would be completed as warranted as individual actions are implemented.

CULTURAL RESOURCES

Archeological Resources

Negligible – Impact is at the lowest levels of detection – Barely measurable with no perceptible consequences, either adverse or beneficial, to archeological resources. For purposes of Section 106, the determination of effect would be no adverse effect.

Minor – Adverse impact: Disturbance of a site(s) results in little, if any, loss of significance or integrity and the national register eligibility of the site(s) is unaffected. For purposes of Section 106, the determination of effect would be no adverse effect. **Beneficial impact:** Maintenance and preservation of a site(s). For purposes of Section 106, the determination of effect would be no adverse effect.

Moderate – Adverse impact: Disturbance of a site(s) does not diminish the significance or integrity of the site(s) to the extent that its national register eligibility is jeopardized. For purposes of Section 106, the determination of effect would be adverse effect. **Beneficial impact:** Stabilization of a site(s). For purposes of Section 106, the determination of effect would be no adverse effect.

Major – Adverse impact: Disturbance of a site(s) diminishes the significance and integrity of the site(s) to the extent that it is no longer eligible to be listed in the national register. For purposes of Section 106, the determination of effect would be adverse effect. **Beneficial impact:** Active intervention to preserve a site(s). For purposes of Section 106, the determination of effect would be no adverse effect.

Historic Structures/Buildings

Negligible – Impact(s) is at the lowest levels of detection, barely perceptible and not measurable. For purposes of Section 106, the determination of effect would be no adverse effect.

Minor – Adverse impact: Impact would not affect the character defining features of a National Register of Historic Places-eligible or listed structure or building. For

purposes of Section 106, the determination of effect would be no adverse effect. **Beneficial impact:** Stabilization/preservation of character defining features in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*. For purposes of Section 106, the determination of effect would be no adverse effect.

Moderate – Adverse impact: Impact would alter a character defining feature(s) of the structure or building but would not diminish the integrity of the resource to the extent that its National Register eligibility is jeopardized. For purposes of Section 106, the determination of effect would be no adverse effect. **Beneficial impact:** Rehabilitation of a structure or building in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*. For purposes of Section 106, the determination of effect would be no adverse effect.

Major – Adverse impact: Impact would alter a character defining feature(s) of the structure or building, diminishing the integrity of the resource to the extent that it is no longer eligible to be listed in the national register. For purposes of Section 106, the determination of effect would be adverse effect. **Beneficial impact:** Restoration of a structure or building in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*. For purposes of Section 106, the determination of effect would be no adverse effect.

Cultural Landscapes

Negligible – Impact(s) is at the lowest levels of detection – barely perceptible and not measurable. For purposes of Section 106, the determination of effect would be no adverse effect.

Minor – Adverse impact: Impact(s) would not affect the character defining patterns and features of a National Register of Historic Places-eligible or listed cultural landscape. For purposes of Section 106, the determination of effect would be no adverse effect. **Beneficial impact:** Preservation of character defining patterns and features in accordance with the *Secretary of the Interior’s Standards for the Treatment of Historic Properties With Guidelines for the Treatment of Cultural Landscapes*. For purposes of Section 106, the determination of effect would be no adverse effect.

Moderate – Adverse impact: Impact(s) would alter a character defining pattern(s) or feature(s) of the cultural landscape but would not diminish the integrity of the landscape to the extent that its national register eligibility is jeopardized. For purposes of Section 106, the determination of effect would be no adverse effect. **Beneficial impact:** Rehabilitation of a landscape or its patterns and features in accordance with the *Secretary of the Interior’s Standards for the Treatment of Historic Properties With Guidelines for the Treatment of Cultural Landscapes*. For purposes of Section 106, the determination of effect would be no adverse effect.

Major – Adverse impact: Impact(s) would alter a character defining pattern(s) or feature(s) of the cultural landscape, diminishing the integrity of the landscape to the extent that it is no longer eligible to

be listed in the national register. For purposes of Section 106, the determination of effect would be adverse effect. **Beneficial impact:** Restoration of a landscape or its patterns and features in accordance with the *Secretary of the Interior’s Standards for the Treatment of Historic Properties With Guidelines for the Treatment of Cultural Landscapes*. For purposes of Section 106, the determination of effect would be no adverse effect.

Ethnographic Resources

Negligible – Impact(s) would be barely perceptible and would neither alter resource conditions, such as traditional access or site preservation, nor alter the relationship between the resource and the affiliated group’s body of practices and beliefs. For purposes of Section 106, the determination of effect on Traditional Cultural Properties or TCPs (ethnographic resources eligible for listing in the national register) would be no adverse effect.

Minor – Adverse impact: Impact(s) would be slight but noticeable but would neither appreciably alter resource conditions, such as traditional access or site preservation, nor alter the relationship between the resource and the affiliated group’s body of practices and beliefs. For purposes of Section 106, the determination of effect on TCPs would be no adverse effect. **Beneficial impact:** Would allow access to and/or accommodate a group’s traditional practices or beliefs. For purposes of Section 106, the determination of effect on TCPs would be no adverse impact.

Moderate – Adverse impact: Impact(s) would be apparent and would alter resource conditions. Something would interfere with traditional access, site

preservation, or the relationship between the resource and the affiliated group's practices and beliefs, even though the group's practices and beliefs would survive. For purposes of Section 106, the determination of effect on TCPs would be adverse effect. **Beneficial impact:** Would facilitate traditional access and/or accommodate a group's practices or beliefs. For purposes of Section 106, the determination of effect on TCPs would be no adverse effect.

Major – Adverse impact: Impact(s) would alter resource conditions. Something would block or greatly affect traditional access, site preservation, or the relationship between the resource and the affiliated group's body of practices and beliefs, to the extent that the survival of a group's practices and/or beliefs would be jeopardized. For purposes of Section 106, the determination of effect on TCPs would be adverse effect. **Beneficial impact:** Would encourage traditional access and/or accommodate a group's practices or beliefs. For purposes of Section 106, the determination of effect on TCPs would be no adverse effect.

Museum Collections

Negligible – Impact(s) is at the lowest levels of detection – barely measurable with no perceptible consequences, either adverse or beneficial, to museum collection.

Minor – Adverse impact: Would affect the integrity of a few items in the museum collection but would not degrade the usefulness of the collection for future research and interpretation. **Beneficial impact:** Would stabilize the current condition of the collection or its constituent components to minimize degradation.

Moderate – Adverse impact: Would affect the integrity of many items in the museum collection and diminish the usefulness of the collection for future research and interpretation. **Beneficial impact:** Would improve the condition of the collection or protect its constituent parts from the threat of degradation.

Major – Adverse impact: Would affect the integrity of most items in the museum collection and destroy the usefulness of the collection for future research and interpretation. **Beneficial impact:** Would secure the condition of the collection as a whole or its constituent components from the threat of further degradation.

NATURAL RESOURCES

The natural resource impact topics that are analyzed in this document include biotic communities, water resources, air quality, and threatened and endangered species. Information on known resources was compiled and compared with the locations of proposed developments and other actions. The impact analysis was based on the knowledge and best professional judgment of planners, resource specialists, data from park records, and studies of similar actions and impacts when applicable. The planning team qualitatively evaluated the impact intensities for all of the natural resource impact topics.

Biotic Communities(vegetation, wildlife, soils)

Negligible – The impact on biological communities, natural processes, soils, or species would be at the lower levels of detection or not measurable.

Minor – The impact would be detectable and could affect the abundance or

distribution of individuals in a localized area, but would not affect the viability of the local population or overall community size, structure, or composition. Changes to natural processes would be limited and affect only a localized area. For soils, the impact would change soil characteristics (e.g., soil profile, productivity) in a relatively small area and would not increase the potential for erosion of additional soil.

Moderate – The impact would be clearly detectable and could have appreciable effect on the resource. This would include impacts that effect the abundance or distribution of local populations, but would not affect the viability of the regional population. Changes to community size, structure, or composition and ecological processes could be substantial and occur over a larger area. For soils, the impact would appreciably change soil characteristics (e.g., soil profile, productivity) in specific area and would increase the potential for erosion of additional soil.

Major – The impact would be severely adverse or exceptionally beneficial. Impacts would have a substantial, highly noticeable, or widespread influence, affecting the abundance or distribution of a local or regional population to the extent that the population would not be likely to recover (adverse) or would return to a sustainable level (beneficial). Community size, structure, or composition and ecological processes would be highly altered and landscape level changes could be expected. For soils, the impact would appreciably change soil characteristics (e.g., soil profile, productivity) over an extensive area and would greatly increase the potential for erosion of additional soil.

Crater Lake and Water Resources

Negligible – The impact on water quality or the timing or intensity of flows would be at the lower levels of detection or not measurable.

Minor – The impact would have detectable effects on water quality or the timing or intensity of flows.

Moderate – The impact would have clearly detectable effects on water quality or the timing or intensity of flows and potentially would affect stream species.

Major – The impact would have severely adverse or exceptionally beneficial effects on water quality or the timing or intensity of flows and potentially would affect stream species on a regional or watershed scale.

Air Quality

Negligible – The impact would be at the lower levels of detection or not measurable.

Minor – The impact would have a slight, localized effect on air quality or visibility.

Moderate – The impact would have clearly detectable effects on air quality or visibility over a more widespread area of the park.

Major – The impact would have severely adverse or exceptionally beneficial effects on air quality or visibility and potentially would affect the regional air shed.

Threatened, Endangered, and Sensitive Species

For federally and state-listed species the following impact intensities apply. These

definitions are consistent with the language used to determine effects on threatened and endangered species under the federal Endangered Species Act:

no effect – when the proposed actions would not affect special status species or critical habitat

not likely to adversely affect – when effects on special status species are discountable (i.e., extremely unlikely to occur) and or insignificant (not able to be meaningfully measured, detected, or evaluated) or completely beneficial

likely to adversely affect – when any adverse effect to special status species may occur as a direct or indirect result of proposed actions and the effect is not discountable, insignificant or completely beneficial

VISITOR USE

The discussions of visitor use in this document evaluate four aspects: (1) diversity of activities, (2) interpretation and orientation, (3) facilities and services, and (4) soundscapes and scenic quality. Analysis is conducted in terms of how the visitor experience might vary by applying different management zones in the alternatives. Analysis is qualitative rather than quantitative because of the conceptual nature of the alternatives.

1. Analysis of effects on the diversity on visitor activities is based on whether there was a complete loss, addition, expansion, or a change in the number and range or availability of a recreational opportunity and how the application of management zones would affect group and individual opportunities.

2. Analysis of interpretation and orientation is based on whether there would be a change in the availability of interpretive and educational information and education programs resulting from management zone application or other action.
3. Analysis of visitor facilities and services discusses impacts on access to visitor facilities and services provided by the Park Service and commercial services in relation to management zone application and other actions.
4. Analysis on visitor experience values is associated with visitor experience values based on whether there would be a change in opportunities for solitude, tranquility, challenge, adventure and the freedom to travel throughout the park to experience primary resources and their natural and cultural settings, including scenic quality, natural sounds, views, and night skies.

For impacts to visitor use the following thresholds apply:

Negligible: Visitors would not be affected or there would be no noticeable change in visitor experience or safety. Changes in the natural sound environment would be so slight they would not be of any measurable or perceptible consequence to visitor experiences.

Minor: Changes in visitor experience or safety would be detectable, although the changes would be slight. The changes would affect a relatively small number of visitors, be localized in area, or have barely perceptible consequences to the majority of visitors. A detectable change would occur to the natural sound environment, although the effects would be small, localized and of little consequence to visitor experiences.

Moderate: Changes in visitor experience or safety would be readily apparent and would affect a relatively large number of visitors. A change in the natural sound environment would be readily detectable, affecting the experience of a large number of visitors.

Major: Changes in visitor experience or safety would be severely adverse or exceptionally beneficial, highly noticeable, and would affect relatively large numbers of visitors. A change in the natural sound environment would be obvious, be severely adverse or exceptionally beneficial, and affect the health of visitors, or cause a substantial, highly noticeable effect on the experience of large numbers of visitors.

PARK AND CONCESSION OPERATIONS

The impact evaluation was based on a qualitative evaluation of the effects on park and concession operations from changes in providing visitor and administrative facilities, services, or programs under the alternatives. Impacts were determined by examining the affects of changes on staffing, infrastructure, visitor facilities and services and the role of commercial operators in providing services. The intensity of the impact considers whether the impact would be negligible, minor, moderate, or major. Impact intensities for the park and concession operations impact topic have been defined as follows:

Negligible Park and/or concession operations would not be affected or there would be no measurable or perceptible change in operations.

Minor Changes in park and/or concession operations would be perceptible, although the changes would be slight and localized, and would not be expected to have an overall effect on the ability of the park or concessioner to provide desired services and facilities.

Moderate Changes in park and/or concession operations would be readily apparent, would have appreciable effects on park or concession operations, and could have an effect on the ability of the park to provide some desired services and facilities.

Major Changes in park and/or concession operations would be readily apparent and would highly reduce or increase the ability of the park or concessioner to provide desired services and facilities.

SOCIOECONOMIC ENVIRONMENT

Crater Lake National Park is a part of the socioeconomic environment of Douglas, Jackson, and Klamath Counties. Socioeconomic impacts for the three-county area were determined based on applied logic, professional expertise, and professional judgment. Economic data, historic visitor use data, expected future visitor use, and future developments within the park were all considered in identifying and discussing potential impacts. A mostly qualitative analysis is sufficient to compare the effects of alternatives for decision-making

purposes. However, the estimated costs of various projects do provide basic quantitative measures of the direct economic impacts of each of the alternatives on the region.

Changes in the three-county regional economy would include impacts on the regional socioeconomic base due to changes in park operations and other management or development actions. The socioeconomic base includes such factors as population, income, employment, earnings, etc. Park development and removal projects during the life of the general management plan would benefit the regional construction industry. Programmatic initiatives may require additional funding and/or personnel.

Changes at the park may also affect the socioeconomic conditions of any of the local gateway communities. The size, configuration, and relative isolation of the park has led to only three separate and dispersed entrances being developed to provide automobile access to the park. Several small local communities are associated with each of the travel corridors to these access points. These communities provide some resort opportunities as well as limited range of goods and services for the visiting public. Impacts on concession operations within the park could occur and would probably be considered local impacts.

Each alternative would have different staffing and budget needs, which could affect the adjacent communities and/or the region as a whole. For example, adding new staff positions at a particular location may lead to new hires seeking goods and services including housing in an associated community, these new expenditures provide limited benefits for the local economy.

A recent study of the tourism spending by visitors to Crater Lake National Park provides some measure of the impact such spending has had on the three-county region. In 2001, visitors were found to have spent some \$30.7 million within-in 100 miles of the park.² The multiplier effects resulted in \$34.3 million in direct sales; \$11.5 million in personal income, \$18.3 in value added and supported 863 jobs.³ To put these figures in perspective, visitor spending (\$30.7 million) related to the park visits accounted for about 6% of total tourism spending in the three-county region in 2001.⁴ During the same year, total personal income for the region amounted to over \$8.4 billion, and the three-county work force consisted of 164,225 persons of which 12,387 were unemployed. The economic impacts related to park visitors vary from year to year and are dependent upon the numbers of visitors coming to the park, their participation in various activities, their expenditure patterns, prices of goods and services, and changes in the park and surrounding communities that may affect visitor use of the park.

Context, Intensity, and Duration

Context, intensity, and duration of impacts compare the action alternatives to the no-action alternative. *Context* refers to the relative area within which impacts would occur. For the most part, impacts

² Stynes, Daniel and Ya-Yen Sun. November 2002. Impacts of Visitor Spending on Local Economy: Crater Lake National Park, 2001. Department of Park, Recreation and Tourism Resources, Michigan State University, East Lansing, MI 48824-1222.

³ Stynes, Daniel and Ya-Yen Sun. Multiplier effects are the result of money spent by tourists being re-circulated within the local economy multiplying the effect of the direct expenditures.

⁴ Stynes, Daniel and Ya-Yen Sun. November 2002.

would affect the regional area (Douglas, Jackson, and Klamath Counties) or the local area (e.g., the Fort Klamath gateway community).

Impact *intensity* is the degree to which a topic is positively or negatively affected (see impact thresholds below). Impacts on the socioeconomic environment were qualitatively evaluated and described for this analysis. However, cost estimates for additional development and increased staffing levels do provide a measure of the direct fiscal impact of each alternative.

The *duration* of an impact is described as either short-term or long-term. Short-term impacts would last less than three years. Long-term impacts last more than three years (and some result in a permanent change in conditions).

Socioeconomic Impact Thresholds

The following four levels of description are used to evaluate and describe impacts on the socioeconomic environment.

Negligible — No effects occur or the effects on socioeconomic conditions are below or at the level of detection.

Minor — The effects on socioeconomic conditions are small but detectable, and only affect a small number of firms and/or a small portion of the population. The impact is slight and not detectable outside the affected area.

Moderate — The effects on socioeconomic conditions are readily apparent. Any effects result in changes to socioeconomic conditions on a local scale (e.g., a gateway community or a single county) within the affected area.

Major — The effects on socioeconomic conditions are readily apparent. Measurable changes in social or economic conditions at the county or three-county regional level would occur. The impact is severely adverse or exceptionally beneficial within the affected area.

CUMULATIVE IMPACTS

The Council on Environmental Quality regulations implementing NEPA define a cumulative impact as “...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.” Each cumulative impact analysis is additive, considering the overall impact of the alternative when combined with effects of other actions (inside and outside the park) that have occurred or would occur in the foreseeable future.

These include ongoing and planned actions and projects in the park and surrounding lands: Cumulative impacts were determined by combining the impacts of each alternative with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects at Crater Lake National Park and, if applicable, the surrounding region. The primary projects and actions that could contribute to cumulative effects are summarized below.

- The combination of widespread logging and suppression of natural fires has affected the natural forest stands throughout portions of the park

and surrounding areas. Such changes may also have altered wildlife distribution, frequency, and use of habitat from that which existed prior to the Park's establishment.

- Beneficial effects to late-successional forest species are expected from implementation of the President's NW Forest Plan (NFP). The plan includes development of a network of forest reserves across the Pacific Northwest to protect late-successional forest species where habitat conditions are relatively intact and provide for the regeneration of late-successional forest habitat where habitat is extremely limited and the associated plant and wildlife populations are low.

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- Past introduction of various non-native fish species into Crater Lake and the park's streams has altered the aquatic ecology and adversely affected bull trout, the only known fish species native to the park. Although Crater Lake was originally barren of fish, fish stocking took place between 1888 and 1941. Of the number of species that were stocked, only kokanee salmon and rainbow trout still exist in the lake. Brook trout were introduced in park streams and persist where they have not been eliminated by park management. The park's bull trout restoration program has recently culminated in the elimination of non-native brook trout and reestablishment of bull trout in Sun and Lost Creeks. Some adverse effects to bull trout such as loss of individuals would likely occur. Appropriate mitigation is included as part of the restoration program to minimize the potential for adverse effects

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- Implementation of prescribed fire as part of the park's recently approved

Fire Management Plan would increase landscape and habitat diversity relative to fire and reduce the potential for catastrophic fire. Some adverse effects to wildlife such as loss of individuals or food sources may occur. Appropriate mitigation for sensitive species is included as part of that plan.

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- Ongoing trails rehabilitation and relocation would reduce localized resource impacts such as soil and vegetation loss and trampling and erosion.
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- Planned construction projects include replacement of the waterline from Munson Springs to Garfield, improvement of the lagoon at Munson Valley, rehabilitation of Highway 62 West, and rehabilitation of superintendent's residence.
 - Other planned construction associated with implementation of the 1999 Crater Lake National Park Visitor Services Plan (e.g., rehabilitate cafeteria building, relocate parking and road to area behind cafeteria building, convert existing parking lot to pedestrian open space, construct new visitor contact station for year-round information and interpretation). The 1999 plan identifies the levels and kinds of NPS and concession visitor services and facilities within the developed areas of the park. These projects would have both adverse and beneficial localized effects. For instance, rehabilitation of the cafeteria building and relocation of rim parking would result in some disturbance to soils and vegetation within a previously impacted area, but would also restore historic visitor-use patterns on the rim.
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- Designation of Rim Drive as a Scenic Byway and All American Road and the potential nomination of the Rim Drive as a cultural landscape would likely enhance treatment of Rim Drive.

IMPAIRMENT OF PARK RESOURCES OR VALUES

In addition to determining the environmental consequences of the preferred and other alternatives, NPS policy (NPS 2001: *Management Policies*, section 4.1) requires analysis of potential effects to determine whether or not actions would impair resources of the unit.

The fundamental purpose of the National Park System, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid or minimize to the greatest degree practicable adverse impacts on park resources and values. However, the laws do give the NPS management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the NPS management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the NPS must leave park

resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may constitute an impairment. However, an impact would more likely constitute an impairment to the extent it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- identified as a goal in the Park's General Management Plan or other relevant NPS planning documents.

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessionaires, contractors, and others operating in the park. A determination of impairment is made in the "Environmental Consequences" section in the conclusion section for each resource impact topic.

IMPACTS OF IMPLEMENTING ALTERNATIVE 1 – NO ACTION

CULTURAL RESOURCES

Archeological Resources

Under alternative 1 archeological sites would be surveyed, inventoried, and evaluated under National Register of Historic Places criteria of evaluation to determine their eligibility for listing in the national register as staff and funding permit. All ground-disturbing activities would be preceded by site-specific archeological surveys, and, where appropriate, subsurface testing to determine the existence of archeological resources and how best to preserve them. Known archeological resources would be avoided whenever possible.

Although impacts to archeological sites would be monitored and efforts would be undertaken to minimize or mitigate potential impacts from National Park Service actions, visitor activities, and natural causes, an unknown number of archeological sites would continue to be subject to negligible to minor long-term and permanent adverse impacts from current and ongoing visitor activities, such as unintentional disturbance, vandalism, and looting, erosion as a result of wildfire, wind, heavy snowmelt and runoff, and other climatic conditions

Cumulative Effects. In the past, the relative isolation of the national park and the lack of sufficient monitoring have provided opportunities for looters and vandals to engage in pot-hunting and intentional pilfering, and visitors, as well as natural erosion from fire, wind, heavy snowmelt and runoff, and other climatic conditions, have contributed to inadvertent disturbance of archeological resources. Because much of the park has

not been surveyed and inventoried for archeological resources, decisions about site development have been made that, in hindsight, may not have been best for archeological resources. Such decisions included the placement and location of campgrounds, trails, roads, and other visitor use facilities, which may have been constructed on top of or near archeological resources. Current and ongoing National Park Service activities, such as prescribed burns, trails rehabilitation and relocation, replacement of a waterline from Munson Springs to Garfield Peak, a lagoon project at Munson Valley, and rehabilitation of State Highway 62 West, could potentially result in minor to moderate impacts to archeological resources.

Actions under this alternative, when combined with other past, present, and reasonably foreseeable future undertakings in the park and surrounding region, would contribute to cumulative negligible to moderate, long-term and permanent adverse effects to any overall cumulative impact on archeological resources.

Conclusion. Archeological investigations would be undertaken before development to ensure that archeological resources were understood and that they would not be damaged or lost as a result of National Park Service actions. However, an unknown number of archeological resources would be subject to negligible to minor, long-term and permanent adverse impacts under this alternative as a result of various National Park Service operations and actions, visitor activities, and natural causes.

There would be no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the cultural integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this *General Management Plan* or other relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with archeological resources.

Section 106 Summary. For purposes of Section 106, the determination of effect of actions under this alternative on archeological resources would be no adverse effect.

Historic Structures/Buildings

Historic structures/buildings in the national park would continue to be surveyed, inventoried, and evaluated under National Register of Historic Places criteria of evaluation to determine their eligibility for listing in the national register as National Park Service staff and funding permit. Historic structures/buildings listed in, or determined eligible for listing in, the national register would continue to be managed to preserve their documented values in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* and to support National Park Service activities or visitor use. As a result, actions under alternative 1 would generally have negligible to moderate long-term beneficial impacts on national register eligible structures and buildings.

Rehabilitation of the superintendent's residence, a national historic landmark located in Munson Valley, and its conversion for use as a science and

learning center would result in adverse minor permanent impacts to the structure because some historic fabric (both exterior and interior) would be lost. However, rehabilitation and adaptive use of the structure would ensure its long-term preservation and thus have a moderate beneficial impact on the building.

Cumulative Effects. In the past lack of appropriate preservation treatment, impacts of weathering and other natural phenomena, and adaptive use have resulted in the loss of some historic fabric to historic structures/buildings in the national park. Thus, the documented values of some historic structures/buildings have resulted in cumulative minor to moderate adverse long-term and permanent effects.

Actions under this alternative such as the rehabilitation of the superintendent's residence and comfort station no. 4, when combined with the impacts of implementing the recommendations of the 1999 *Visitor Services Plan, Crater Lake National Park* (including among other things the rehabilitation of the Sinnott Memorial, Community House, Plaza Comfort Station, Kiser Studio, and Promenade at Rim Village) would contribute beneficial minor to moderate long-term effects and an adverse minor permanent impact to any overall cumulative effect on historic structures/buildings.

Conclusion. Actions under alternative 1 would generally have negligible to moderate, long-term beneficial impacts on historic structures/buildings in the park because they would continue to be surveyed, inventoried, and evaluated for their eligibility for listing in the National Register of Historic Places, and listed, as well as determined eligible, structures/buildings would be managed to preserve

their documented values in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Rehabilitation of the superintendent's residence, a national historic landmark located in Munson Valley, and its conversion for use as a science and learning center would result in adverse minor permanent impacts to the structure because some historic fabric (both exterior and interior) would be lost. However, rehabilitation and adaptive use of the structure would ensure its long-term preservation and thus have a moderate beneficial impact on the building.

There would be no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the cultural integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this *General Management Plan* or other relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with historic structures/buildings.

Section 106 Summary. For purposes of Section 106, the determination of effect of actions under this alternative on historic structures/buildings would be no adverse effect.

Cultural Landscapes

Cultural landscapes in the national park would continue to be surveyed, inventoried, and evaluated under National Register of Historic Places criteria of evaluation to determine their eligibility for

listing in the national register as National Park Service staff and funding permit. Multiple property national register nomination forms for cultural landscapes, including (but not exclusively limited to) Munson Valley, Rim Drive, and Rim Village, would be prepared, and the National Park Service would recommend listing of these cultural landscapes in the national register. The National Park Service would implement resource management policies that preserve the natural resource values of these landscapes as well as their culturally significant character defining patterns and features in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties With Guidelines for the Treatment of Cultural Landscapes*. Thus, the overall impacts to cultural landscapes under this alternative would be minor to moderate, long-term, and beneficial.

Cumulative Effects. In the past, lack of concern for the preservation of cultural landscapes in the national park has resulted in decisions about site development and resource management that, in hindsight, may not have been best for cultural landscape values and preservation. Such decisions include the placement and location of campgrounds, trails, parking lots, and other visitor use and administrative facilities (such as those at Rim Village) that have compromised some of the character defining patterns and features of the cultural landscapes in the national park.

Actions under this alternative such as the recommendation that the Rim Village, Rim Drive, and Munson Valley cultural landscapes be listed in the national register and managed to preserve their documented values, when combined with the impacts of implementing the recommendations of the 1999 *Visitor Services Plan, Crater Lake*

National Park (including among other things the rehabilitation of the Sinnott Memorial, Community House, Plaza Comfort Station, Kiser Studio, and Promenade and redesign of the picnic area in Rim Village) would have cumulative beneficial minor to moderate long-term effects on cultural landscapes.

Conclusion. Actions under alternative 1 would generally have minor to moderate, long-term, beneficial impacts on cultural landscapes in the national park because they would continue to be surveyed, inventoried, and evaluated for their eligibility for listing in the National Register of Historic Places and listed, as well as determined eligible, cultural landscapes would be managed to preserve their documented values in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties With Guidelines for the Treatment of Cultural Landscapes*.

There would be no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the cultural integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this *General Management Plan* or other relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with cultural landscapes.

Section 106 Summary. For purposes of Section 106, the determination of effect of actions under this alternative on cultural landscapes would be no adverse effect.

Ethnographic Resources

Native American groups regard Crater Lake and Mount Scott, as well as other sites in the park, as significant sacred sites or landscapes and important traditional use activity areas. National Park Service development and administrative/maintenance operations, as well as increasing visitor use of the national park, have interrupted and are continuing to interrupt access to ceremonial or gathering areas, thus generally having negligible to minor long-term adverse impacts on ethnographic resources in the park. However, the National Park Service is currently undertaking consultation and coordination with the Klamath Tribes and other Native American groups to address these matters of mutual concern on parklands and encourage tribal members to participate in the preparation of programs, exhibits, replica artifacts, and literature to assist the park staff in accurately interpreting the cultural history of the early inhabitants of the park area. The National Park Service would continue to allow access to and/or accommodate the groups' traditional practices and beliefs and facilitate reburial of ancestral remains, both those exposed by natural weathering and those recovered from pot-hunters, under the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA). An ongoing traditional use/ethnographic study would enable the Park Service to carry out consultations more effectively to preserve and protect ethnographic resources in the national park. Therefore, actions under this alternative would generally have negligible to minor, long-term, beneficial impacts on ethnographic resources in the park because of the ongoing consultation and coordination activities between the National Park Service and the Klamath Tribes and other Native American groups.

Cumulative Effects. National Park Service development and administrative/maintenance operations, as well as increasing visitor use of the national park since its establishment, have had and are continuing to have cumulative adverse negligible to minor long-term effects on ethnographic resources. As sacred sites in south-central Oregon have been lost over time, those remaining in the park have become more significant to the Klamath Tribes and other affiliated Native American groups. Actions under this alternative such as ongoing consultations with the Klamath Tribes and other affiliated Native American groups to address matters of mutual concern would contribute negligible to minor, long-term, beneficial effects to any overall cumulative impact on ethnographic resources.

Conclusion. Actions under alternative 1 would generally have negligible to minor, long-term, beneficial impacts on ethnographic resources in the national park because the National Park Service would continue ongoing consultation and coordination with the Klamath Tribes and other Native American groups to address matters of mutual concern in the national park and allow access to and/or accommodate the groups' traditional practices and beliefs.

There would be no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation; (2) key to the cultural integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this *General Management Plan* or other relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with ethnographic resources.

Section 106 Summary. No Traditional Cultural Properties are affected by actions under this alternative. Thus, Section 106 determinations are not necessary.

Museum Collections

Alternative 1 would not provide additional storage and workspace meeting professional and National Park Service museum standards for the preservation and curation of, as well as access to, the park's museum collections. Thus, this alternative would generally have minor long-term adverse impacts on the park's museum collections. Some park-related museum collection materials would continue to be housed and managed by other organizational entities in offsite facilities where their condition is unknown and their ownership obscured.

Cumulative Effects. Since the park was established the combination of limited staffing and lack of storage and workspace meeting professional and National Park Service museum standards have frustrated, and are continuing to hinder, endeavors to improve care of and access to the museum collections and address the ever-increasing cataloging backlog. Thus, the park's museum collections have been subjected to minor to moderate long-term adverse effects. Because existing conditions would not change, actions under this alternative would not contribute to the impacts of the aforementioned actions; thus, there would not be cumulative effects on museum collections under this alternative.

Conclusion. Actions under alternative 1 would generally have negligible to minor long-term adverse impacts on museum collections because of the lack of storage and workspace meeting professional and National Park Service museum standards

and limited staffing to address the ever-increasing cataloging backlog.

There would be no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the cultural integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this *General Management Plan* or other relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with museum collections.

NATURAL RESOURCES

Biotic Communities

Continued maintenance of existing roads, trails, and structures and increasing visitor use could result in additional disturbance to vegetation and soils, such as soil compaction and erosion, trampling and loss of vegetative cover, and introduction and spread of non-native species. Wildlife populations and habitat could also be affected to varying degrees by continuing maintenance activities and visitor use that could affect natural movements of wildlife, habitat, and food sources. Most maintenance and visitor activities would continue to occur along existing trails, roads, and in the developed areas. These areas have been previously disturbed. Visitation is not expected to increase appreciably and would likely have little additional effect on the extent of impacts. The low incidence of collisions between vehicles and wildlife would not likely increase. Also, management actions to avoid or minimize the extent and severity of impacts would continue to be employed, such as localized restoration efforts, confining or directing use through use of signs, trails, and designated parking areas, and continued monitoring and early corrective action to

address invasive non-native plants. Consequently, additional long-term adverse impacts would be minor.

Winter recreational activities occur during the time when wildlife is stressed by cold weather and food shortages. Disturbance or harassment of wildlife during this sensitive time can have negative effects on individual animals, and in some cases populations, particularly when populations are low. Winter recreation such as snowmobiling and skiing can create added energetic stress in winter when most wildlife species are already stressed (NPS 1999d). The effects of winter recreational activities in the park are unknown, although, disturbance would likely be limited because visitor use levels are expected to remain relatively low and would continue to occur within very limited areas within the park. The park service would initiate a long-term data gathering and monitoring program to evaluate winter use and associated impacts to ensure long-term protection of park resources. Management actions, such as restrictions on off-trail use, specific area closures, increased patrols, visitor education, or limits on use or party sizes, would be taken as necessary to address impacts. Consequently, long-term impacts from continuing or increasing winter activities would be offset by increased protection measures that would benefit wildlife, although the extent of potential beneficial effects would likely be localized and minor.

Cumulative Impacts. Cumulative actions would contribute to both beneficial and adverse impacts to biotic communities. Some ongoing and future site-specific restoration work (e.g., trail relocation and rehabilitation and rim restoration following removal of the employee dorm on the

rim) would have long term benefits to resources by restoring vegetation and wildlife habitat. The fire management program may have short-term impacts on animal populations in the vicinity of any fire by eliminating cover, food sources, and habitat. However, in the long term, reintroducing fire would provide for greater habitat diversity and less catastrophic habitat loss. Fisheries management has reestablished the native fishery in Sun Creek. Other cumulative beneficial effects would occur outside the park from implementation of the NFP which is expected to provide for smaller, yet more stable and better distributed populations of late-successional forest species. Overall, these programs would result in major, long-term benefits.

Fire suppression and historic timber harvest have adversely impacted lands surrounding the park. Impacts on biotic communities have been long term, major, and adverse primarily because of widespread alteration of forest structure, wildlife habitat, species composition and fragmentation of habitats. Proposed development projects within the park (e.g., replacement of the waterline from Munson Springs to Garfield, rehabilitation of Highway 62 West) would have minor, site-specific, construction-related impacts based on implementation of best management practices such as erosion and sediment controls and revegetation.

Overall the past, present, and reasonably foreseeable actions in combination with the no-action alternative would have both long-term, major adverse and beneficial effects. Adverse impacts would be primarily because of the widespread logging and fire suppression on lands surrounding the park and beneficial impacts would be from restoration and protection programs affecting lands both

action alternative would contribute a minor adverse increment to the overall cumulative impact.

Conclusion. The no-action alternative would have a minor, long-term, adverse impact on biotic communities, primarily in existing areas of concentrated use and development. Increased protection measures could result in minor benefits to wildlife during the winter. The past, present, and reasonably foreseeable actions in combination with the no action alternative would have both long-term, major adverse and beneficial impacts. The no-action alternative would contribute a minor, adverse, and beneficial increment to the overall cumulative impact.

In accordance with the criteria for determining impairment, there would be no major adverse impacts on resources or values, and there would be no impairment of resources or values associated with biotic communities, including vegetation, soils, and wildlife resources.

Threatened, Endangered, and Sensitive Species

Most maintenance and visitor activities would continue to occur along existing trails, roads, and in the developed areas. These areas have been previously disturbed. Visitation is not expected to increase appreciably and there would be no new development under this alternative. Also, NPS actions to manage and protect special status species would continue to be employed, such as monitoring and restoration programs and restrictions on visitor use near nest sites. Consequently, there would be no change in the habitat or disturbance to special status species within the park as a result of the no action alternative.

As discussed under the biotic communities impact topic, the Park Service would initiate a long-term data gathering and monitoring program to evaluate winter use and associated impacts to ensure long-term protection of threatened and endangered species. Because of a number of factors such as limited occurrence, small populations, low densities, and/or low birth rates, these species are more vulnerable to impacts than general wildlife populations. Some species (lynx, wolverine, fisher) could benefit from increased protection measures, although the extent of potential beneficial effects is unknown. Greater beneficial effects would occur if for example, den sites were located and measures were taken to protect them from disturbance.

Cumulative Impacts. Cumulative actions would contribute to both beneficial and adverse impacts to threatened and endangered species. Within the park, the fire management program would perpetuate the natural role of fire in preserving threatened and endangered species habitat and would reduce the threat of catastrophic habitat loss. For instance, prescribed natural fires at Crater Lake tend to be patchy in terms of fire severity. This patchiness historically was associated with habitat improvement for small carnivores, and would likely be associated with habitat maintenance for them in the future. Some species would be negatively influenced by fire management activities in the short term, due the possible loss of individuals or short-term alteration of suitable habitat, such as elimination of a multilayered understory in some locations that may result in suboptimal spotted owl habitat. However, species specific mitigation strategies would be implemented for sensitive species to minimize these effects. Although the park's bull trout restoration program has

had short-term adverse impacts due to the loss of some individual fish, the program has led to the elimination of non-native brook trout and reestablishment of bull trout in Sun Creek. The NFP is expected to provide for smaller, yet more stable and better distributed populations of threatened and endangered late-successional forest species such as the northern spotted owl, which would also contribute beneficial effects. Overall, these programs would adversely affect some individuals or habitat in the short-term, but would not likely adversely affect threatened and endangered species in the long-term because long-term effects would be beneficial.

None of the threatened or endangered animal species are endemic to Crater Lake National Park, and the "threats" to their existence have largely occurred due to land management activities elsewhere, such as old growth forest loss affecting northern spotted owls. Fire suppression and historic timber harvest have adversely affected habitat and threatened and endangered species populations on lands surrounding the park primarily due to widespread alteration and fragmentation of forests. Park construction and rehabilitation proposals would not affect most special status species because there would be no disturbance within known areas of occurrence or suitable habitat. Some inconsequential impacts such as localized disturbance to vegetation within suitable habitat could occur, but would not likely adversely affect any threatened and endangered species. Site-specific surveys would be conducted to determine if special status species were present and the park service would consult with the U.S. Fish and Wildlife Service and Oregon Department of Natural Resources to determine mitigation.

Impacts of the above actions in conjunction with the no-action alternative would result in both long- and short term adverse and beneficial effects. The no-action alternative would not likely contribute to adverse effects on threatened or endangered species and could contribute beneficial long-term effects to the overall cumulative impacts.

Conclusion. The no-action alternative would not adversely affect and could beneficially affect threatened or endangered species. Thus this alternative may affect, but would not likely adversely affect or result in impairment to any threatened or endangered species. Impacts of other actions in conjunction with the no-action alternative would result in both long- and short-term, adverse and beneficial effects. The no-action alternative would not likely contribute to adverse effects on threatened or endangered species and could contribute beneficial long-term effects to the overall cumulative impacts.

Crater Lake

Minimizing development within the caldera and lake drainage would prevent addition of sediments, minerals, or contaminants that could reduce water quality. Current restrictions on access and boating would continue to minimize contaminants that could reduce water quality.

The long-term limnological program would continue to monitor a diverse array of chemical, physical, and biological properties of the lake and springs, including water chemistry, nutrients, secchi clarity, light transmission, temperature, light penetration, lake level, meteorological conditions, chlorophyll concentration, primary productivity,

phytoplankton, zooplankton, and fish. Long-term special studies would include global climate change, nutrient dynamics, and lake mixing. Most of the sample and data collection would continue to occur in the summer months when the lake is easily accessible. Occasional winter studies are also conducted. The program would continue to add devices capable of year-round sample and data collection to gain a better understanding of processes occurring during the winter months. Sample and data processing, along with data analysis and trend monitoring, would occur on a regular basis. Periodic program review by scientists from universities, the NPS, and other state or federal agencies has been incorporated into the long-term program. The latest review of the LTLMP was conducted by a panel of professional aquatic ecologists in 2000. Continued monitoring would result in long-term, negligible, beneficial impacts on water quality.

Cumulative Impacts . Cumulative actions would contribute both adverse and beneficial impacts to water quality.

As called for in the Visitor Services Plan, only essential services would be provided at the rim. Included in this plan is the proposal to relocate the cafeteria parking behind the cafeteria. This would decrease the snow blown into the caldera during snowplowing and thereby decrease possible hydro carbons and vehicle related contaminants. The plan also calls for a reduction in the number of daily concession boat tours.

In 2003 the park's new concessioner replaced the aging tour boat fleet. This resulted in a major technological upgrade with conversion to improved fuel-injected 4-stroke engines, which will operate more efficiently and cleanly. The new boats also incorporated a number of other design

features to prevent accidental fuel leakage or spills into the lake environment. The park is also closely tracking the developments in alternative fuels technology, i.e., fuel cell, to eventually enable a conversion to engines not reliant on fossil fuels. The fuel system servicing the boat dock has recently been upgraded to provide increased protection from fuel leaks and contamination to the lake. Access to the lake would continue to be provided by a single access. Water quality could benefit from these increased protection measures, although the extent of potential beneficial effects is unknown, but would likely be localized and minor.

Conclusion. The no-action alternative would have a negligible, long-term, beneficial effect on water quality within Crater Lake. In accordance with the criteria for determining impairment, there would be no major adverse impacts on water quality, and therefore no impairment of water quality.

Water Resources

Continued maintenance of existing roads, trails, and structures and a slight increase in visitor use would result in little new disturbance to vegetation and soils that could potentially contribute to increased turbidity or sedimentation of park waters. Increased visitation would lead to only a minimal increase in vehicles in the park and associated increase in deposition of petroleum products routed into drainages that could affect water quality. Effects on water quality would be negligible.

A minimal increase in water use could occur from some increased visitation, although overnight accommodations, which utilize more water, would not increase. Water conservation efforts within the park would continue. Impacts

on the quantity of water in Annie Creek would be negligible. Snowmobiles use along the North entrance road would continue. Snowmobiles raise concerns about long-term impacts from high pollution emissions. Emissions from 2-stroke engine exhaust include monoxide, hydrocarbons, nitrous oxides, and particulate matter (NPS 1999e). These concerns include the possibility that accumulations of pollutants in the snowpack and resultant snowpack runoff may be having adverse impacts on water quality and associated aquatic systems, although impacts from snowpack runoff that is contaminated with snowmobile pollutants have not been found. Impacts on water quality are likely short term and localized along travel routes because of the low volume of use and because snowmobiles are restricted to the north entrance road, which does not follow near any streams. Although snowmobile use is not expected to appreciably increase, the Park Service would initiate a long-term data gathering and monitoring program to evaluate use and associated impacts as part of an overall winter recreational use study. Management actions to mitigate nonpoint source pollution would be implemented if necessary. Water quality could benefit from increased protection measures, although the extent of potential beneficial effects is unknown, but would likely be localized and minor.

Cumulative Impacts. The geographical area included in the cumulative analysis for water resources is the park. All streams within the park, including Annie Spring, originate within the park. Effects on water quality and quantity outside the park from actions associated with this alternative would be negligible and likely not measurable.

The park's fire management program may adversely impact water quality (e.g., sedimentation, erosion) due to the effects of fires, particularly high intensity fires. Park construction and rehabilitation proposals would also contribute to adverse impacts from increased surface runoff and erosion. Best management practices such as erosion and sediment controls would be employed to minimize these impacts. Impacts would be localized, short-term, and minor. Minor, localized, beneficial cumulative actions would include ongoing trails rehabilitation and relocation within the park that would reduce localized erosion and runoff.

The replacement of the waterline from Munson Springs to Garfield would likely reduce water loss by the system. Implementation of actions within the *Visitor Services Plan* would also reduce water use within the park. Reductions in water use would have a minor beneficial effect on water quantity in Annie Creek.

Impacts of the above other actions in conjunction with the no-action alternative would result in localized, minor, adverse and beneficial impacts on water quality and minor, beneficial effects on water quantity in Annie Creek. The no-action alternative could contribute a negligible adverse impact on water quality and negligible decrease in Annie Creek water flow to the overall cumulative impact.

Conclusion. The water quality within the park would remain good and the no-action alternative would have a negligible adverse affect on water quality and quantity due to continuing maintenance activities and slight increase in visitation, but would not result in impairment to water resources. The impacts of other actions in conjunction with the no-action alternative would result in localized,

minor, adverse and beneficial impacts on water quality and quantity. The no-action alternative could contribute a negligible adverse impact on water quality and negligible increase in water use within the park to the overall cumulative impact.

Air Quality

Slight increases in visitation would lead to only a small increase in vehicles in the park and associated increase in vehicle emissions. The increase in emissions would be small and would not measurably change the air quality. Snowmobile use along the North entrance road would continue. Snowmobiles raise concerns about long-term impacts from high pollution emissions. Impacts on air quality are believed to be short term and localized along travel routes because of the low volume of use and lack of large congregation sites coupled with winds which tend to disperse particulates and other pollutants. The Park Service would initiate a long-term data gathering and monitoring program to evaluate use and associated impacts. Management practices to mitigate nonpoint source pollution would be implemented as necessary. Air quality could benefit from increased protection measures, although the extent of potential beneficial effects would likely be localized and negligible.

Cumulative Impacts. The park's air quality is good with negligible effects from regional pollution sources outside of the park. Forest fires on surrounding lands could contribute particulates for limited periods of time. Degradation of air quality from the park's Fire Management program could result in moderate short-term impacts, but the program would be in conformance with the Clean Air Act, Oregon State Smoke Management Plan, and the Oregon Visibility Protection Plan.

Park construction and rehabilitation proposals would cause localized increases in dust and emissions from construction vehicles and equipment, resulting in localized, short-term effects on air quality. The cumulative actions in conjunction with the no-action alternative would result in short-term, moderate, adverse impacts on air quality. The no-action alternative would contribute a negligible, adverse and possibly negligible, beneficial increment to the cumulative effect.

Conclusion. The no-action alternative would have a negligible, long-term, adverse effect on air quality from a small increase in vehicle use within the park. In accordance with the criteria for determining impairment, there would be no major adverse impacts on air quality, and therefore no impairment of air quality.

The cumulative actions in conjunction with the no-action alternative would result in short-term, moderate, adverse impacts on air quality. The no-action alternative would contribute a negligible adverse and possibly negligible beneficial increment to the cumulative effect.

VISITOR USE

Diversity of Recreational Opportunity

The existing range of visitor experiences would continue unchanged. Activities identified by visitors as important, such as sightseeing, driving, camping, boat tours, and picnicking would continue to be available. Existing hiking opportunities on front and back country trails would continue during the summer months. Opportunities for winter activities (i.e., cross country skiing, snowshoeing) would continue unchanged at Rim Village and along Rim Drive in the winter months. Snowmobile opportunities would

continue along the North Junction road in the winter. There would be no noticeable change in visitor experience or safety, therefore there would be no or negligible impacts on the diversity of visitor experience.

Visitor Access and Circulation

Access to and within the park would be unchanged. There would be no change in management practices to control or manage visitor access. The operation or the location of visitor entrances to the park or the road system used by visitors within the park would not change. Visitors would continue to enter the park from the north and south on Highways 62 and 138. Two-way traffic would continue on Rim Drive and on the Pinnacles Road. The Grayback Drive would remain open to motorized traffic. Scenic driving on the park's road system, particularly year-round private vehicle access to caldera views of Crater Lake at Rim Village, would continue. Visitors would be able to drive from one area in the park to another during the late spring and early fall and would usually be able to be accommodated in existing parking areas. Munson Valley Road to Rim Village would continue to be cleared of snow in the winter. The amount of parking within the park would remain approximately the same as current availability. The number of visitors at peak periods currently causes parking congestion at popular Rim Drive overlooks, particularly Cleetwood Cove, the Watchman, and Phantom Ship. Traffic and parking congestion is also apparent at Rim Village and Mazama Village during the summer months. During congested periods, some visitors are deterred from stopping due to the inconvenient parking and choose to pass by rim pullouts and parking areas, particularly at Cleetwood Cove and the Watchman. Any increase in

congestion would detract from the visitor experience. Perceptions of full parking lots, many vehicles traveling park roads, and traffic noise are important factors in determining the quality of visitor experiences. Access to trailheads and opportunities for day hikes on front country trails along the rim, at Munson Valley, and at Mazama Village would not change. Front country hiking experiences could become crowded during the peak use summer months and change the character of this activity. Visitor surveys indicate that short trails are extremely important to a majority of visitors. Any increase in the use of frontcountry trails during peak periods, particularly along Cleetwood Cove would contribute to congestion and detract from visitor experience. Boat tours would continue at the same levels on the lake and some visitors may not be accommodated due to sold-out tours. Due to anticipated increases in visitor numbers, the change in visitor experience and safety in the way visitors access the park's resources would be readily apparent, and would affect a relatively large number of visitors resulting in moderate long-term adverse impacts to visitor access.

Education and Orientation

Current opportunities for information, interpretation, and education would continue at existing levels and locations. Visitor information would continue to be available throughout the year via personal contact, printed material, and the park's web site. During the summer, visitors would continue to receive information about the park at two visitor centers. Visitor opportunities to learn about park resources would also continue through NPS interpretive programs on the concessioner-operated Crater Lake boat tours. Interpretive outreach programs

including internet information would continue to be upgraded. A science and learning center would be developed at Munson Valley. Learning center opportunities would expand the range of interpretive opportunities but would likely affect a relatively small number of visitors, resulting in a minor, beneficial impact to the diversity of visitor experiences. During the winter, information and orientation to the park would continue at the visitor information building at Munson Valley. Access to interpretative and educational opportunities is important. Sixty-four percent of visitors to Crater Lake use the visitor centers, and 75% of visitors indicated that the availability of information and orientation at the visitor centers was very important to their park experience (Visitor Survey 2001). Over the long term, increased visitation to the park is anticipated during peak periods. Increased visitation could make it more difficult for some visitors to readily obtain park information or to participate in interpretive programs. Changes in visitor experience would be detectable, although the changes would be slight or have barely perceptible consequences to the majority of visitors, resulting in long-term, minor, adverse impacts to visitor interpretive and educational opportunities.

Visitor Facilities and Services

Visitor facilities and services would continue unchanged. Visitors would continue to camp at Mazama Campground and at Lost Creek Campground. Park roads and their associated pullouts and overlooks would be maintained and traffic circulation would be unchanged. Visitors would continue to receive park orientation and information at visitor contact centers at Munson Valley and at Rim Village and would continue to hike both front and back country trails. There would be no

loss, addition, expansion, or change in the number of park facilities. If visitor facilities were not reconfigured or expanded, some crowding along frontcountry trails or in developed areas might occur. Changes in use would be detectable, although the changes would be slight and localized, resulting in minor, long-term, adverse impacts to the visitor's experience of park facilities.

Soundscapes and Scenic Quality

With anticipated increases in visitation the contribution of vehicle noise levels along park roads and at areas of concentrated visitor use, such as Rim Village, Mazama Village, and Cleetwood, would be expected to increase. Any increase in visitation and traffic along Rim Drive would further degrade the opportunity to experience solitude and tranquility while viewing the lake.

A change in the natural sound environment would be readily detectable along transportation corridors and at popular overlooks, viewpoints and trailheads. The changes would affect a relatively large number of visitors but would be localized, resulting in minor long-term adverse impact on soundscapes along park roads. There would be no change in outstanding opportunities for visitors to experience the park's primary resources in their natural and cultural settings. As crowding along Rim Drive escalates, there would be a change in the way many visitors perceive lake views. Because there would be readily apparent changes in viewing the lake under crowded conditions and the change would affect a relatively large number of visitors, a moderate long term adverse impact to the experience of enjoying scenic vistas at the caldera rim is expected under this alternative.

Cumulative Impacts. Past and ongoing projects, including development of front-country trails, reconfiguration of Rim Village, and adaptive reuse of historic structures in Munson Valley and Rim Village, have had long-term, major, beneficial impacts on visitor experience. Reconfiguration of Rim Village would change the way visitors access views of the lake. A walk along the promenade would be possible without having to compete with vehicular traffic. A year-round visitor contact station at the rim would enable winter views of the lake for people of all abilities. Overall these projects have the potential to increase the diversity, of visitor experience, enhance the range of interpretative programs, expand access to park facilities, and to improve the quality of visitor experience values such as sounds of nature and scenic views. The major long-term beneficial impacts of the above other actions, when combined with the impacts of the no-action alternative would result in an overall major, long-term, beneficial impacts. The no-action alternative would contribute a minor to moderate adverse increment as well as a minor beneficial increment to the cumulative impacts to visitor experience.

Conclusion. Overall, under alternative 1 there would be minor to moderate long-term, adverse impacts to the visitor experience. There would also be minor, long-term, beneficial impacts to visitors' educational opportunities. The cumulative actions in conjunction with the no-action alternative would result in major beneficial impacts on visitor experience. The no-action alternative would contribute a minor to moderate adverse and minor beneficial increment to the cumulative effect.

OPERATIONS

Park Operations

Under the no action alternative, no staffing increase is anticipated. Park infrastructure, visitor facilities and services would remain unchanged. Park functions currently stationed in the park would remain in existing park facilities. Some office functions currently conducted in surrounding communities would continue. The relative distribution of disciplines across divisions would remain the same.

The level of effort to protect park resources, maintain park facilities, and to provide for visitor enjoyment is anticipated to slightly increase. Park structures and infrastructure would continue to be supported from the central maintenance facility located at Munson Valley. Munson Valley Road to Rim Village would continue to be cleared of snow during the winter months and Rim Drive would continue to be plowed to allow summer season access as early in the spring as weather dictates. The park would continue to maintain year-round employee residences at Steel Circle and summer season residences at Sleepy Hollow at Munson Valley. Over the long term, the level of resource protection, visitor protection and safety, and the level of education and interpretive effort are expected to slightly increase. The level of staffing as well as the use of facilities and infrastructure would remain unchanged, resulting in a perceptible change in the ability of the park to provide desired services. These changes would be slight but detectable, resulting in minor, long-term, adverse impacts in park operations.

Cumulative Impacts. Past and ongoing projects, including reconfiguration of Rim

Village, adaptive reuse of historic structures in Munson Valley and Rim Village, upgrading the infrastructure at Cleetwood Cove, and highway road improvement projects on Highway 62, have had long-term moderate beneficial impacts on park operations. Overall these projects have the potential to have an appreciable effect on park operations and improve the ability of the park to provide desired services and facilities. Impacts of the above other actions in conjunction with the no-action alternative would result in moderate long-term beneficial cumulative impacts. The no-action alternative would contribute a minor adverse increment to cumulative impacts to park operations.

Conclusion. Overall, under alternative 1 there would be minor long term adverse impacts to park operations. The cumulative actions in conjunction with the no-action alternative would result in moderate, long-term beneficial cumulative impacts. The no-action alternative would contribute a minor adverse increment to cumulative impacts to park operations.

Concession Operations

Under the no-action alternative, existing commercial activities would continue unchanged, although the primary area of commercial activity would shift from Rim Village to Mazama Village. Necessary and appropriate commercial services to meet the needs of visitors and to enhance their enjoyment of the park would continue to be provided at Rim Village, Mazama Village and at Cleetwood Cove. There would be no change in the number or frequency of boat tours on the lake. Because commercial activities would not be affected and there would be no measurable change in operations under

alternative 1, there would be new impacts on concession operations.

Cumulative Impacts. Past actions including restoration of the Crater Lake Lodge, reconfiguration of facilities at Rim Village, Mazama Village, and Cleetwood Cove have had moderate, long-term beneficial impacts on concessioner operations. The no-action alternative would not contribute to cumulative impacts on concession operations.

Conclusion. Overall, under alternative 1 there would be negligible long term adverse impacts to concession operations. The no-action alternative would not contribute to cumulative impacts on concession operations.

SOCIOECONOMIC ENVIRONMENT

Park staffing remains relatively constant at 75 full-time equivalent positions (FTEs). The park's annual budget also remains the same (\$4,027,000 in 2003) except for small increases due to inflation and the rising costs of goods and services utilized by the park. Facilities, park operations, and recreational uses are maintained. Current conditions and trends continue. Most facilities and services within the park would remain essentially the same as now. Without a long-term, comprehensive management plan, park managers would accommodate changing visitor use patterns, uses, and volumes, and changes in resource conditions, as they occurred or in response to pressure from various interest groups. The current upward trend in visitation continues. While visitation can and does fluctuate from year to year, the historic growth rate of approximately 1.4% is assumed to continue for the life of this plan.

Additional funding for specific currently authorized projects would amount to \$7,906,900 (\$6,402,900 federal dollars + \$1,504,000 private dollars, see appendix C). These projects do not occur all at the same time but are phased in over a number of years. The impacts (e.g., increase in income, creation of jobs, etc.) on individual firms and employees could be short term, moderate to major, and beneficial for individuals and affected firms. However, impacts on the regional economy (with nearly \$5.0 billion in earnings and about 187,000 jobs in 2001) as measured by economic indicators (e.g., a substantial increase in income or a decrease in unemployment or poverty, etc.) would be negligible.

Crater Lake National Park would continue to be a substantial contributor to the regional economy and some local gateway communities' economies as a result of jobs provided, and wages and operational expenditures by the National Park Service. In addition, the park serves as a key attraction for the local and regional tourism industry. The visiting public would continue to generate tourism related spending within the regional and local economies, which benefits businesses by generating income and providing employment opportunities.

However, the three-county region would not be affected due to the size and diversity of the regional economy. Individual gateway communities may be affected by specific projects occurring in the park. However, the number and types of businesses located in the local gateway travel corridors are small. Since there are few local businesses that can be affected by the continuing operations of the park, and the park would continue to operate and be open to the public, and this alternative continues current policies and programs,

no changes in the types or amounts of impacts would occur as the result of this alternative.

Cumulative Impacts. Additional changes or shocks (either positive or negative) to the local and regional socioeconomic environment within which the park exists are not expected. No other actions that could have cumulative effects when combined with the impacts of the no-action Alternative have been identified during this planning process, which has included public participation and input. The park continues to be an important visitor attraction bringing visitors to the region resulting in tourism related expenditures in the area. Expenditures by the Park Service to operate and maintain the park continue to contribute positive direct benefits to the local and regional economies. In conjunction with other past, present, and reasonably foreseeable actions, no additional cumulative impacts are expected.

Conclusion. The park's staff levels and base budget would not change under the no-action alternative other than as a result of adjustments for inflation and rising labor and materials costs. Approved projects over and above regular operations of the park, which would be funded under the no-action alternative, would amount to about \$7,906,900 in direct expenditures. These projects would be phased-in over a number of years, so impacts on individual firms and employees could be moderate to major, short term, and beneficial, but impacts on the regional economy would be negligible. The current range and level of impacts (tourism spending and park spending) on adjacent communities would continue to be beneficial providing income, employment, and business

opportunities to the local and regional economy.

The no-action alternative would continue to have a minor to moderate short-term beneficial impact on the socioeconomic climate of the gateway communities and regional area, primarily because of ongoing maintenance of facilities and programs and some limited development projects. The overall current level and types of impacts would remain the same. In the long-term, the park would continue to be an important visitor attraction and contributor to the tourism industry in the three-county region.

UNAVOIDABLE ADVERSE EFFECTS

There would be no unavoidable adverse impacts of major intensity that would result from implementing alternative 1. Alternative 1 would result in moderate adverse impacts to visitor access along Rim Drive and Mazama Village. The negligible and minor impacts are described in the foregoing analysis.

RELATIONSHIP OF SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The vast majority of the park would be protected in a natural state and would maintain its long-term productivity. Adverse impacts on the park's soils, water quality, and wildlife from continuing visitor activities could reduce the productivity of the park's natural resources in localized areas over time.

**IRREVERSIBLE OR IRRETRIEVABLE
COMMITMENTS OF RESOURCES**

Construction materials and energy used would be irretrievably lost. There would also be an irretrievable and irreversible

commitment of resources in terms of funds expended on both labor and construction materials. Because it takes so long for soils to form, the loss of soils due to visitor use in localized areas would be an irreversible commitment of resources.

IMPACTS OF IMPLEMENTING ALTERNATIVE 2 – PREFERRED ALTERNATIVE

CULTURAL RESOURCES

Archeological Resources

Implementation of this alternative would generally have the same impacts on archeological resources as those listed under alternative 1, although provision of more diversified visitor experiences along the Rim Drive corridor, including development of new trails, picnic areas, and improved pullouts, parking areas, and overlooks, could have additional minor, long-term and permanent adverse impacts on archeological sites. Development of the new science learning center in the superintendent's residence would also result in additional minor, long-term, and permanent adverse impacts on archeological sites.

Cumulative Effects. Implementation of this alternative would generally have the same cumulative effects on archeological resources as those listed under alternative 1, although development projects and improvements along the Rim Drive corridor, as well as development of the new science learning center in the superintendent's residence, would contribute minor, long-term, and permanent adverse effects to any overall cumulative impact on archeological resources.

Conclusion. Implementation of this alternative would generally have the same impacts on archeological resources as those listed under alternative 1.

There would be no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the

cultural integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this *General Management Plan* or other relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with archeological resources.

Section 106 Summary. For purposes of Section 106, the determination of effect of actions under this alternative on archeological resources would be no adverse effect.

Historic Structures/Buildings

Although implementation of alternative 2 would generally have the same impacts on historic structures/buildings as those listed under alternative 1, rehabilitation and adaptive use of some historic structures/buildings for new functions would have moderate, long-term, beneficial impacts on those structures/buildings.

Cumulative Effects. Implementation of this alternative would have the same cumulative effects on historic structures/buildings as those listed under alternative 1, although rehabilitation and adaptive use of some historic structures/buildings for new functions would contribute moderate, long-term, beneficial effects to any overall cumulative impact on historic structures/buildings.

Conclusion. Implementation of this alternative would have the same impacts on historic structures/buildings as those listed under alternative 1, although rehabilitation and adaptive use of some historic structures/buildings for new functions would have moderate, long-

term, beneficial impacts on those structures/ buildings.

There would be no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the cultural integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this General Management Plan or other relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with historic structures/ buildings.

Section 106 Summary. For purposes of Section 106, the determination of effect of actions under this alternative on historic structures/buildings would be no adverse effect.

Cultural Landscapes

Implementation of this alternative would generally have the same impacts on cultural landscapes as those listed under alternative 1. Although development of new trails, picnic areas, and improved pullouts, parking areas, and overlooks in the Rim Drive corridor would have some additional minor, long-term, adverse impacts on the Rim Drive cultural landscape. However, management of parking and road congestion along the road by defining and formalizing existing pullouts, parking areas, and overlooks would be expected to have minor, long-term, beneficial impacts on the Rim Drive cultural landscape because the historic character and general design features of the road corridor would be preserved.

Cumulative Effects. Implementation of this alternative would generally have the

same effects on cultural landscapes as those listed under alternative 1. Development projects and improvements along the Rim Drive corridor would contribute minor, long-term, adverse effects to any overall cumulative impact on the Rim Drive cultural landscape. However, improvements along the road to manage parking and road congestion would be expected to contribute minor, long-term, beneficial impacts to preservation of the historic character and general design features of the road corridor.

Conclusion. Implementation of alternative 2 would generally have the same impacts on cultural landscapes as those listed under alternative 1. Although development projects and improvements along the Rim Drive corridor would contribute additional minor, long-term, adverse effects on the Rim Drive cultural landscape, improvement along the road to manage parking and road congestion would be expected to have minor, long-term, beneficial impacts on preservation of the historic character and general design features of the road corridor.

There would be no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the cultural integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this *General Management Plan* or other relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with cultural landscapes.

Section 106 Summary. For purposes of Section 106, the determination of effect of actions under this alternative on cultural landscapes would be no adverse effect.

Ethnographic Resources

Implementation of this alternative would generally have the same impacts on ethnographic resources as those listed under alternative 1, although emphasis on expanded and diverse recreational and educational opportunities in the national park for visitors would have minor, long-term, adverse impacts on such resources. Although expanded visitor activities could result in intrusion on significant sacred sites or landscapes, important traditional use activity areas, and ceremonial practices, these impacts would be generally slight but noticeable. However, educational opportunities would be provided to park visitors to heighten their awareness of the importance of ethnographic resources and the need to respect tribal access to such sites as well as a group's ceremonial practices.

Cumulative Effects. Implementation of alternative 2 would have the same cumulative effects on ethnographic resources as those listed under alternative 1. Emphasis on expanded and diverse recreational and educational opportunities for visitors, however, would contribute minor, long-term, adverse effects to any overall cumulative impacts on ethnographic resources.

Conclusion. Implementation of this alternative would generally have the same impacts on ethnographic resources as those listed under alternative 1, although emphasis on expanded recreational opportunities would have minor, long-term, adverse impacts on such resources.

There would no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the cultural

integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this General Management Plan or other relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with ethnographic resources.

Section 106 Summary. No Traditional Cultural Properties are affected by actions under this alternative. Thus, Section 106 determinations are unnecessary.

Museum Collections

Implementation of this alternative would have beneficial, minor to moderate, long-term impacts on the park's museum collections because the increased volume of the collections that would result from expanded park research activities, as well as acquisition of pertinent park-related collection materials not currently owned or managed by the National Park Service, would be stored in both onsite and offsite facilities that meet professional and National Park Service museum standards. Thus, provision for adequate storage and workspace would be provided to improve curation, protection, and access to the collections, and staffing would be upgraded to reduce the cataloging backlog.

Cumulative Effects. Since the national park was established the combination of limited staffing and lack of storage and workspace meeting professional and National Park Service museum standards have hindered endeavors to improve care of and access to the park's museum collections and address the ever-increasing cataloging backlog, thus having minor to moderate, long-term, adverse impacts on such resources. Actions under this alternative, such as expansion of the collections and their storage in both onsite

and offsite facilities, would contribute beneficial, minor to moderate, long-term effects to any overall cumulative impacts on the park's museum collections.

Conclusion. Implementation of alternative 2 would have beneficial minor to moderate long-term impacts on the park's museum collections.

There would be no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the cultural integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this *General Management Plan* or other relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with museum collections.

NATURAL RESOURCES

Biotic Communities

The greater emphasis on research, partnering, and visitor education would greatly enhance the opportunities for positive effects on resources within the park. The following actions would potentially have localized minor to more widespread moderate, long-term, beneficial effects on biotic communities. The intensity of the effects would likely be greater over time as more knowledge of the resources is accumulated, partnerships expanded, and resource management actions were implemented that further preserved and restored native species, communities, and processes.

Expanded opportunities for research and greater collaboration and communication between park resource staff and members

of the scientific community would provide valuable information and working relationships relevant to managing and preserving the park's resources. The quality and quantity of information would be enhanced, as would integration of research and data collection with resources management, which would contribute to more informed and better management decisions. Park management could become more proactive in determining desired resource conditions and identifying and addressing potential impacts or threats. Research and the information gained would allow for not only better management of resources within the context of the park, but within a broader regional and global ecological context as well. All these actions would indirectly contribute to improved resource conditions by enhancing the park service's knowledge and capabilities for restoring and maintaining native species, communities, and processes. Some adverse impacts to resources from research activities such as vegetation and soil trampling could occur but would be localized and negligible.

Increased partnerships with the scientific community and others would provide a wider base of expertise to draw upon in making management decisions. Increased monitoring and restoration programs would also be possible through partnerships.

Enhanced visitor education opportunities could also indirectly benefit native species, communities, and processes. Improved education and interpretation would increase the public's appreciation, understanding, and stewardship for these resources, which may reduce the potential for visitor-related impacts. This broader base of public support and advocacy would also aid in accomplishing the park's

resource protection and preservation programs and initiatives.

Conversion of the Grayback Trail to non-motorized use would have localized long-term benefits because of reduced noise along the trail corridor that may reduce disturbance of nearby wildlife species. Beneficial effects would likely be minor because of the relatively low levels of motorized use that would be eliminated and the continued presence of hikers and bikers along the corridor. Seasonal closure of a section of the Rim Drive to motorized use would have similar effects.

Possible future implementation of alternative transportation systems would reduce or eliminate localized effects on vegetation, soils, and wildlife habitat such as trampling and erosion that were described under the no action alternative. This would result in long-term, negligible to minor benefits.

Adaptive use of existing buildings is expected to result in negligible new resource impacts. These buildings are located in existing, previously disturbed developed areas. Construction and use of new facilities (i.e., picnic areas, short trails) and minor improvements of existing pullouts, parking areas, and overlooks in frontcountry zones along the Rim Drive and other park roads would result in site-specific loss of soils, vegetation, and wildlife habitat. There would also be increased human disturbance to wildlife. Individuals, populations, and species vary in their sensitivity to disturbance and visitor use might disturb or displace some individual animals, particularly those species more sensitive to human disturbance. Certain wildlife may also become habituated to human presence or attracted to the increased food source visitors provide. Specific locations for new

facilities have not been identified; however, siting them primarily in or adjacent to previously developed or disturbed sites within the park and avoiding sensitive resources such as wetlands or whitebark pine stands, would minimize additional loss of vegetation, soils, and habitat and disruption to wildlife. Long-term adverse impacts would be localized and minor. Mitigation measures such as topsoil salvage, erosion control, and revegetation would minimize construction impacts.

Administrative and office functions relocated from the park to nearby communities would be housed in existing structures if possible. However, if new buildings were necessary, construction activities would have short-term effects on soils and vegetation. Depending on whether or not facilities were built on previously disturbed sites, the long-term adverse effects with mitigation would be negligible to minor.

Winter recreational activities occur during the time when wildlife are stressed by cold weather and food shortages. Disturbance or harassment of wildlife during this sensitive time could have negative effects on individual animals, and in some cases populations, particularly when populations are low. Winter recreation, such as snowmobiling and skiing, could create added energetic stress in winter when most wildlife species are already stressed (NPS 1999d). The effects of winter recreational activities in the park are unknown, although, disturbance would likely be limited because visitor use levels are expected to remain relatively low and would continue to occur within limited areas within the park. Snowmobiling would also be restricted to current levels. The park service would initiate a long-term data gathering and monitoring

program to evaluate winter use and associated impacts to ensure long-term protection of park resources. Management actions, such as restrictions on offtrail use, specific area closures, increased patrols, visitor education, or limits on use or party sizes, would be taken as necessary to address impacts. Wildlife could benefit from increased protection measures, although the extent of potential beneficial would likely be localized and minor.

Cumulative Impacts. Cumulative impacts on biotic communities from land uses and activities in the park and surrounding lands would be similar to those described for alternative 1 (no-action alternative). Overall cumulative impacts would be long-term, and both major adverse and beneficial. Adverse impacts would be primarily because of the widespread logging and fire suppression on lands surrounding the park and beneficial impacts would be from restoration and protection programs affecting lands both within and outside of the park. The preferred alternative’s contribution to adverse cumulative impacts would be minor. However, actions under alternative 2, particularly increased research, partnering, and visitor education, would promote the further protection, maintenance, and restoration of native communities. Therefore, alternative 2 would also contribute a minor to moderate, beneficial effect to the overall cumulative impacts.

Conclusion. The greater emphasis on research, partnering, and visitor education under this alternative would indirectly contribute to improved resource conditions within the park, potentially having localized minor to more widespread moderate, long-term, beneficial effects on biotic communities. Long-term adverse impacts from construction and use of new facilities would be localized

and minor. Biotic communities would not be impaired by the actions proposed under this alternative.

Cumulative impacts would be long term and both major, adverse, and beneficial. Adverse impacts would be primarily because of the widespread logging and fire suppression on lands surrounding the park, and beneficial impacts would be from restoration and protection programs affecting lands both within and outside the park. Alternative 2’s contribution to adverse impacts would be minor and its contribution to beneficial effects minor to moderate.

Threatened, Endangered, and Sensitive Species

Similar to impacts discussed under biotic communities, greater emphasis on research, partnering, and visitor education under this alternative would also enhance the opportunities for positive effects on threatened and endangered species and their habitat within the park through increased knowledge and better informed management. Any research proposals would be reviewed on a case-by-case basis so that potential adverse effects to these species or their habitats could be avoided.

Some inconsequential changes to habitat or loss of individual sensitive plant species might occur from new development or use as described below. New facilities would be limited and small in scale. They would primarily be placed within currently developed or previously impacted areas or corridors, or where human use is already occurring, thus minimizing the potential for adverse effects. Site-specific surveys would be conducted before implementing specific actions to determine if special status species existed in any proposed

project area. If any were located or if an action occurred within suitable habitat, the National Park Service would consult with the U.S. Fish and Wildlife Service and Oregon Department of Natural Resources to determine mitigation measures to avoid or minimize adverse impacts on the species.

As discussed under the biotic communities impact topic, the Park Service would initiate a long-term data gathering and monitoring program to evaluate winter use and associated impacts to ensure long-term protection of threatened and endangered species. Because of a number of factors, such as limited occurrence, small populations, low densities, and/or low birth rates, these species are more vulnerable to impacts than general wildlife populations. Some species (lynx, wolverine, fisher) could benefit from increased protection measures, although the extent of potential beneficial effects is unknown. Greater beneficial effects would occur if for example, den sites were located and measures were taken to protect them from disturbance.

Based on the nature of the actions being proposed along with a commitment to conduct surveys, consultation with the U.S. Fish and Wildlife Service and Oregon Department of Natural Resources, and implementation of appropriate mitigation measures, this alternative would avoid or minimize adverse effects on threatened and endangered species. However, alternative 2 could result in some adverse effects on some threatened or endangered species. (Further rationale is provided below by individual species.)

Canada lynx, California Wolverine, and Pacific Fisher. Although the park has conducted extensive surveys for Canada lynx and wolverine in the park, none have been detected. All these species require

large expanses of land relatively free from human use. Because of the extent of suitable habitat within the park, new development and associated visitor use would likely occur within or near suitable habitat, which would incrementally contribute to habitat loss and fragmentation. Increased human noise and activity could disturb and displace these species. However, development would be located primarily in nonwilderness areas in or adjacent to existing developed areas and roadways. Because of the existing development and use in these areas, adjacent habitat would not be readily used and would probably be avoided by these species. Some new backcountry trail links would be established to connect into the park's backcountry network of trails. These new trails would be zoned for low levels of use, would require only minimal clearing of vegetation and, would impact a relatively small area, potentially affecting only a small fraction of these species' territory or the extent of suitable habitat.

Bald Eagle. There would be little if any adverse impact on the primary food sources (fish and carrion) of the bald eagle. No new development or use would occur near the existing nest site along the Crater Lake shoreline. Tour boats would continue to be restricted from areas on the lake that are near the nest site. The primary area for potential nest sites for this species would likely be within the caldera. Potential new development along the rim, such as trails and picnic areas, could affect potential nest site habitat. However, new development would affect little of the overall amount of suitable habitat along the rim or within the caldera. Prior to new development, surveys would be completed to identify suitable habitat and locate nest sites. New development would be sited and designed to avoid impacts to nesting eagles.

Northern Spotted Owl. Current management practices that would continue under alternative 2 include protecting identified nest sites from human activities. Although new development and associated use could be located within patches of old growth stands identified as suitable habitat, no development would occur near known nest sites or within associated protective buffer zones. Most development would be in or adjacent to existing developed areas and roadways, thus minimizing the likelihood of disturbance. Conversion of the Grayback Trail to non-motorized use could reduce disturbance to a known owl nest site because of reduced noise along the trail corridor, although the nest is located over 1.2 miles away from the road.

Northern Goshawk. Development of frontcountry facilities along roadways (e.g., picnic and parking areas, trails) could result in the loss of goshawk habitat, primarily where facilities were located in forested habitats. These developments would impact a relatively small area and would potentially affect only a small fraction of any nesting pair's much larger territory or the extent of suitable habitat. Surveys to locate nest sites would be completed prior to facility construction and those sites avoided.

Peregrine Falcon. Peregrines are known to be sensitive to disturbances such as human presence above their nest site. No new development would be located in or above the area of the one known nest site within the caldera. Tour boats would also continue to be restricted from areas on the lake that are near the nest site. New development such as trails or picnic areas along the rim could result in visitor use above some caldera cliff faces that could provide potential nest sites. However, new development would affect very little of the

overall amount of suitable habitat along the rim or within the caldera. Prior to new development, surveys would be completed to identify suitable habitat and locate nest sites. New development would be sited and designed to avoid impacts to nesting falcons.

Bull Trout. Some frontcountry development could occur within the Sun and Lost Creek drainage basins near the Grayback and Rim Drive Road intersection and the Lost Creek campground. Runoff from areas disturbed by construction could lead to increased sedimentation that could affect bull trout habitat in Sun Creek. Design and location of facilities would take into consideration such parameters as soil types, slopes, and vegetative cover in order to minimize disturbance and potential runoff. A vegetative buffer would be maintained between facilities and creek headwaters. Best management practices such as erosion and sediment controls and revegetation would be implemented to eliminate or reduce both short- and long-term impacts.

Conversion of the Grayback Trail to nonmotorized use could have localized long-term benefits because the elimination of vehicles would reduce erosion that could affect bull trout habitat in Sun Creek. Beneficial effects would likely be negligible because of the relatively low levels of motorized use and associated impacts that would be eliminated. The park would continue to take actions to stabilize and minimize areas of erosion along this trail.

Pumice Grapefern, Shasta Arnica, and Crater Lake Rockcress. The location of these plants would continue to be protected and the populations monitored. Because of the limited new development and use along the rim that would occur,

disturbance to populations of these plants would be negligible. For example, some small loss of habitat or individual plants might occur where new picnic areas or trails along the rim were developed. However, locations for any new development or trails would be surveyed for the presence of these species, and measures to avoid or minimize adverse impacts would be implemented.

Cumulative Impacts. Cumulative impacts on threatened and endangered species from land uses and activities in the park and surrounding lands would be similar to those described for alternative 1 (no-action alternative). Overall cumulative impacts would be both adverse and beneficial. Adverse impacts would be primarily due to land management activities in the region. Park programs would adversely affect some individuals or habitat in the short term, but would not likely adversely affect threatened and endangered species in the long term because long-term effects would be beneficial. Alternative 2 could contribute some adverse effects on threatened or endangered species but could also contribute beneficial long-term effects to the overall cumulative impacts.

Conclusion. Greater emphasis on research, partnering, and visitor education under this alternative would enhance the opportunities for positive effects on threatened and endangered species and their habitat within the park. New development could result in small, localized reductions in habitat. The survey, avoidance, mitigation, and consultation actions that the Park Service would take would help ensure that this alternative would avoid or minimize adverse effects on threatened and endangered species. Alternative 2 could result in some adverse effects on threatened or endangered

species but would not result in impairment to these species. Alternative 2 could contribute some adverse effects on threatened or endangered species but could also contribute beneficial long-term effects to the overall cumulative impacts.

Crater Lake

Impacts to Crater Lake, as in alternative 1, would be minimized by proactive management actions to prevent contamination to the lake. Development within the caldera and lake drainage would be minimal, preventing the addition of sediments, minerals or contaminants that could reduce water quality. Park operations such as snowplowing would continue to be managed to minimize addition of contaminants to the lake ecosystem. Current restrictions on access and boating would continue.

The Crater Lake Long-Term Limnological Program would continue its interdisciplinary monitoring and research program. The program would continue to inform management of the lake's status, variability, and trends. And contributes to the scientific understanding of Crater Lake and other large-lake and ocean ecosystems. This alternative expands the research and monitoring programs of the park through expanded partnerships and the establishment of the new science and learning center. Expanded research efforts would include

- modeling ecosystem components and interactions among biological, physical, and chemical processes, including food web interactions and the impacts of introduced fish
- optical studies of the lake to include the effects of abiotic and biotic particles lake clarity
- paleo-limnological studies

- studies of benthic and nearshore communities

Expanded research and monitoring would result in long-term beneficial impacts to the water quality of Crater Lake.

Cumulative Impacts. Cumulative actions would contribute both adverse and beneficial impacts to water quality.

As called for in the Visitor Services Plan, only essential services would be provided at the rim. Included in this plan is the proposal to relocate the cafeteria parking behind the cafeteria. This would decrease the snow blown into the caldera during snowplowing and thereby decrease possible hydro carbons and vehicle related contaminants.

Improvements in boating technology by conversion of research and tourboats to 4-stroke motor or direct fuel injection would also prevent contaminants that could reduce water quality. Personal watercraft would continue to not be allowed on the lake, and access to the lake would continue to be provided by a single access. Water quality could benefit from these increased protection measures, although the extent of potential beneficial effects is unknown, but would likely be localized and minor.

Conclusion. The no-action alternative would have a negligible, long-term, beneficial effect on water quality within Crater Lake. In accordance with the criteria for determining impairment, there would be no major adverse impacts on water quality, and therefore no impairment of water quality.

Water Resources

The construction or rehabilitation of facilities would have the potential to impact water quality through ground disturbance, which would result in increased surface runoff and erosion. However, due to the limited extent of proposed developments and implementation of mitigation measures, such as silt fences, erosion control blankets, mulch, and revegetation to control impacts, increased sedimentation and turbidity would be temporary and negligible.

Relocation of some park administration functions outside the park would likely have little effect on water use in the park because the existing building would be used for other functions. Adaptive use of existing buildings is expected to have a negligible effect on water use within the park. New overnight use by a small number of visiting researchers, scientists, and artists would be accommodated in existing facilities. This is expected to result in a negligible, if any, increase in overall water demand. Incorporation of water saving features into facilities would be expected to offset most of the increased use.

Under this alternative, snowmobile use would be restricted to existing use levels. Similar to alternative 1 (no-action alternative), because snowmobiles raise concerns about long-term impacts from high pollution emissions, the Park Service would initiate a long-term data gathering and monitoring program to evaluate use and associated impacts as part of an overall winter recreational use study. Management actions to mitigate nonpoint source pollution would be implemented if necessary. Water quality could benefit from increased protection measures, although the extent of potential beneficial

effects would likely be localized and minor.

Cumulative Impacts. Cumulative impacts on water resources from land uses and activities in the park and surrounding lands would be similar to those described for alternative 1 (no-action alternative). The park's fire management program might adversely impact water quality (e.g., sedimentation, erosion) due to the effects of fires, particularly high intensity fires. Park construction and rehabilitation proposals would also contribute to adverse impacts from increased surface runoff and erosion. Best management practices such as erosion and sediment controls would be employed to minimize these impacts. Impacts would be localized, short-term, and minor. Minor beneficial cumulative actions would include ongoing trails rehabilitation and relocation within the park that would reduce localized erosion and runoff.

The replacement of the waterline from Munson Springs to Garfield would likely reduce water loss by the system. Implementation of actions within the *Visitor Services Plan* would also reduce water use within the park. Reductions in water use would have a minor beneficial effect on water quantity in Annie Creek.

The impacts of other actions described above in conjunction with the impacts of alternative 2 would result in localized, minor, adverse, and beneficial impacts on water quality and minor beneficial effects on water quantity in Annie Creek. Alternative 2 would contribute a negligible adverse impact on water quality and negligible decrease in water quantity in Annie Creek to the overall cumulative impact.

Conclusion. Alternative 2 would have a negligible adverse effect on water quality due to construction activities and a negligible effect on Annie Creek water quantity. Water quality could benefit from increased protection measures, although the extent of potential beneficial would likely be localized and minor. Water resources would not be impaired by the actions proposed under this alternative. The cumulative actions in conjunction with alternative 2 would result in short- and long-term negligible to localized, minor adverse and beneficial impacts on water quality and quantity. Alternative 2 would contribute a negligible, adverse impact on water quality and negligible, decrease in water quantity in Annie Creek to the overall cumulative impact.

Air Quality

Seasonal closure of a portion of the Rim Drive and closure of the Grayback Trail to motorized use would benefit air quality because of reduced vehicular emissions in these areas. Beneficial effects would be localized and negligible because of the relatively low levels of motorized use that would be eliminated.

There would be some short-term, localized impacts on air quality resulting from particulates or machinery fumes generated during construction, removal, or rehabilitation of facilities under some alternatives. Mitigation measures such as watering and revegetation of disturbed areas, requiring machinery to meet emission standards, would be employed. Effects would be short term and negligible, lasting only during the construction period.

Under this alternative, snowmobile use would be restricted to existing use levels. Similar to alternative 1 (no-action

alternative), because snowmobiles raise concerns about long-term impacts from high pollution emissions, the Park Service would initiate a long-term data gathering and monitoring program to evaluate use and associated impacts as part of an overall winter recreational use study. Management practices to mitigate nonpoint source pollution would be implemented as necessary. Air quality could benefit from increased protection measures, although the extent of potential beneficial would likely be localized and negligible.

Cumulative Impacts. Cumulative impacts on air quality from actions in the park and surrounding lands would be similar to those described for the no-action alternative. The park's air quality is very good with negligible effects from regional pollution sources outside of the park. Forest fires on surrounding lands could contribute particulates for limited periods of time. Degradation of air quality from the park's fire management program could result in moderate short-term impacts, but the program would be in conformance with the Clean Air Act, Oregon State Smoke Management Plan, and the Oregon Visibility Protection Plan. Park construction and rehabilitation proposals would cause localized increases in dust and emissions from construction vehicles and equipment, resulting in localized short-term effects on air quality. The cumulative actions in conjunction with the no-action alternative would result in short-term, negligible to moderate, adverse impacts on air quality. Alternative 2 would contribute a negligible, short-term adverse and negligible, long-term, beneficial increment to the cumulative effect.

Conclusion. Long-term, beneficial impacts to air quality within the park would be minor. Short-term construction

related impacts would be negligible. Air quality would not be impaired by the actions proposed under this alternative. The cumulative actions in conjunction with alternative 2 would result in short-term moderate adverse impacts on air quality. Alternative 2 would contribute a negligible, short-term, adverse, and negligible, long-term, beneficial increment to the cumulative effect.

VISITOR USE

Diversity of Recreational Opportunity

Under alternative 2 there would be a focused range of visitor experiences emphasizing research, learning, and more in-depth experience of park resources. Visitors would have opportunities to participate in guided field trips, seminars, and workshops. This focused learning environment would enable park interpreters and partnering researchers to convey a broader range of information and involve park visitors in hands-on learning experiences about both natural and cultural park resources. In frontcountry areas at Munson Valley, Rim Village, and along Rim Drive, there would be expanded opportunities to experience the rustic designed architecture of park buildings and roads in their cultural settings.

Existing recreational opportunities would remain, including scenic driving, front country and back country hiking, picnicking, and nature viewing. Winter activities, including snow-camping, cross-country skiing, and snowshoeing would continue as would snowmobile access along the north entrance road to North Junction. Use of snow coach access would be encouraged on the North Entrance road. Greater diversity of visitor use along Rim Drive would be provided by

seasonal closures of sections of East Rim Drive during the autumn shoulder season, allowing visitors an opportunity to experience the primary resource of the park in ways other than driving, as new (nonmotorized) uses would be encouraged in areas that have space to accommodate them. Nonmotorized recreational opportunities would be available along Grayback Drive.

Because there would be an addition in recreational opportunities (seasonal non-motorized use along Rim Drive) and an expansion of existing educational / interpretive programs (in-depth, focused educational field trips and seminars), the change in the diversity of visitor experience would be highly noticeable, exceptionally beneficial, and would affect relatively large numbers of visitors, resulting in a major beneficial impact on the diversity of visitor opportunity.

Visitor Access and Circulation

Under alternative 2 the road system would continue to be accessible during peak visitor use times in the summer months. Traffic congestion, especially along Rim Drive during the summer season, would be managed by improving existing pullouts, parking areas, and overlooks. If warranted by future crowding, shuttles and other alternative transportation systems would be used to alleviate congestion along Rim Drive between Cleetwood Cove and Rim Village. A feasibility analysis would determine whether the shuttle would be a concession, Park Service operated, or a service contract. There would be some change to motor vehicle accessibility to portions of east Rim Drive during the shoulder autumn season when portions of East Rim Drive would be closed to motorized traffic on an experimental basis resulting in reduced motorized access.

Grayback Drive would be closed to motorized traffic throughout the year. Private vehicle access to the rim in the winter would continue. Snowmobile access and permits for snow coach tours would continue on the North Entrance Road to North Junction. Because there would be no noticeable change in the way visitors experience the park in the winter, there would be negligible impacts to visitor accessibility to park resources during the winter season. Overall, changes in motorized accessibility in the park would be detectable, localized in area, and of short duration affecting a relatively small number of visitors resulting in minor, long-term, adverse impacts to motorized accessibility.

New trails would be developed in localized frontcountry areas along the park's road system. There would be new hiking and biking opportunities along East Rim Drive during the autumn. Improvements to existing front country hiking trails and development of new front country trails would result in greater trail accessibility. Visitor surveys indicate that short trails are extremely important to a majority of visitors. Expansion of frontcountry trails, the addition of seasonal nonmotorized hiking and biking opportunities along East Rim Drive, and the addition of year-round hiking and/or skiing, snowshoeing, and biking opportunities along Grayback Drive would be readily apparent. Ninety-three percent of visitors responding to the 2001 Visitor Survey indicated that short, frontcountry trails were either very important or extremely important. Because front country trail access would be expanded and new front country non-motorized trail opportunities would be added an exceptionally beneficial impact on trail accessibility would normally be expected, however because visitation to the park during the fall shoulder season is

considerably reduced from peak use these additions and expansions of nonmotorized trail opportunities would affect a relatively small number of visitors resulting in minor to moderate, long-term, beneficial impacts on trail accessibility.

Education and Orientation

Under alternative 2 existing passive interpretive opportunities would continue and interpretive programs and educational services would increase in number and in depth of information. Opportunities to participate in educational programs would increase with the development of a science and learning center at Munson Valley. Partnerships with universities, museums, other agencies, and researchers would expand the breadth and depth of knowledge of park resources and enrich interpretive programs. Visitors would have the opportunity to participate in a wide variety of educational programs such as focused guided field trips, workshops, and seminars. Interpretation of park resources would be provided by researchers guiding special in-depth tours, participatory field trips, and seminars. Park interpreters would provide research-based programs. Guided hikes and interpretation on concession-operated boat tours would focus on participatory, learning experiences for visitors. New and expanding sources of information about park resources would be available to park visitors and would be conveyed in a broader context as technology advanced and new educational venues developed. Because the variety and range of interpretive programs would increase and expand, the change to visitor opportunities to participate in educational and interpretive programs would be highly noticeable. These changes in the interpretive program would affect relatively large numbers of visitors, resulting in a major, long-term,

beneficial impact on visitors' opportunities to participate in interpretive programs.

Visitor Facilities and Services

Opportunities for visitors to access and use park facilities and services would increase. New and expanded uses of park facilities would open some park buildings and structures for visitor use and enjoyment. Visitors would gain new opportunities to experience east Rim Drive and its associated pullouts and overlooks without vehicular traffic during the fall. Grayback Drive would provide non-motorized opportunities year-round. Participation in workshops and seminars conducted in park buildings and other structures would expand and change visitor use of park facilities. These changes would be highly noticeable, a relatively large numbers of visitors would be affected, and the changes would be exceptionally beneficial. Therefore alternative 2 would have a major, beneficial, long-term impact on the visitor's experience of park facilities and services.

Soundscapes and Scenic Quality

Development of frontcountry trails would occur in localized areas along the park's transportation corridor resulting in detectable, localized, but small changes to the natural sound environment in these areas. This would result in negligible long-term, adverse impacts to soundscapes at park trailheads. Closing portions of East Rim Drive to vehicular traffic in the autumn shoulder season would enhance the natural soundscape along this portion of the lake caldera. This change would be detectable, although the change would affect a relatively small number of visitors and would be localized in area resulting in minor beneficial long-term

impacts to soundscapes along east Rim Drive.

With the seasonal closure of East Rim Drive in the fall, visitor opportunities to sightsee in the park would experience a change during that season. Scenic views of the lake without the intrusion of vehicular traffic would be possible. During peak use periods in the summer opportunities for visitors to sightsee in the park, including motorized sightseeing along Rim Drive, would remain unchanged. There would be a noticeable change in visitor experience in viewing the lake in the autumn. This change would be highly noticeable, but would affect a relatively small number of visitors and be localized in area, resulting in a minor, beneficial impact on visitor opportunities to sightsee and enjoy the park's scenic views.

Cumulative Impacts. Past and ongoing projects, including development of front-country trails, reconfiguration of Rim Village, and adaptive reuse of historic structures in Munson Valley and Rim Village, have had long-term, major, beneficial impacts on the visitor experience. Reconfiguration of Rim Village would change the way visitors access views of the lake at Rim Village. A walk along the promenade would be possible without having to compete with vehicular traffic. A year-round visitor contact station at the rim would enable winter views of the lake for people of all abilities. Overall these projects have the potential to increase the diversity, of visitor experience, enhance the range of interpretative programs, expand access to park facilities, and to improve the quality of visitor experience values such as sounds of nature and scenic views. The impacts of

the above other actions, when combined with the impacts of the no-action alternative would result in a major, long-term, beneficial impact. Alternative 2 would contribute a minor to major, beneficial increment to cumulative impacts to the visitor experience, because alternative 2 would add new and expanding existing visitor opportunities. Alternative 2 would also contribute minor, long-term adverse increment to cumulative impacts due to the seasonal closure of East Rim Drive.

Conclusion. Alternative 2 would have a major beneficial impact on the diversity of visitor experience. Under this alternative visitors would experience minor, long-term, adverse impacts on vehicular access with the seasonal closure of East Rim Drive but would gain minor to moderate, long-term, beneficial impacts on frontcountry trails accessibility. There would be major beneficial impacts to visitor enjoyment of educational and interpretive programs and access to park facilities and services. Opportunities for visitors to enjoy scenic views would be expanded along the caldera rim resulting in minor beneficial impacts to scenic viewing opportunities. The cumulative actions in conjunction with the no-action alternative would result in an overall major, long-term, beneficial impact. Alternative 2 would contribute a minor to major beneficial increment to cumulative impacts to the visitor experience, because this alternative would add new and expanding existing visitor opportunities. Alternative 2 would also contribute a minor, long-term, adverse increment to cumulative impacts due to the seasonal closure of East Rim Drive.

OPERATIONS

Park Operations

Under alternative 2 existing buildings and facilities would be adaptively used for new functions and uses. Researchers and scientists would stay in the park year-round increasing all season use of park buildings. Use of park facilities is expected to be constant but short term with frequent turnover, necessitating increased maintenance responsibilities in preparing and maintaining park buildings for and in use. Maintenance of year-round residences at Steel Circle and summer season residences at Sleepy Hollow in Munson Valley would continue. Park maintenance staff would continue to support park operations from the central maintenance facility located at Munson Valley. Munson Valley Road to Rim Village would continue to be cleared of snow during the winter months and Rim Drive would continue to be plowed to allow summer season access as early in the spring as weather dictates. Because changes in the ability of the park to provide desired services and facilities would be small but perceptible, minor, long-term, adverse impacts to park operations would be expected under alternative 2.

To accommodate new and expanded visitor use, some park functions that are not, of necessity, park resource-based, would be relocated outside the park in surrounding communities. Fewer employees would reside in the park and more staff functions would be accomplished outside the park boundary. This action would disperse the staff and associated inconveniences in communication and coordination among employees would be expected to occur. This would be offset by increased telecommunication

efficiency and reliability. Locating staff in surrounding communities would also contribute to increased efficiencies in developing partnerships and would contribute a moderate beneficial impact on park operations. Different options for accommodating operations outside the park would be studied before implementing any actions. Actions that propose purchasing additional property outside the boundary would require additional authorization. Staff functions would shift to a greater emphasis on research, education, and interpretation. There would also be an increased need for maintenance operations to maintain year-round use of park facilities and to manage frequent turnover of park residential spaces. Because changes in park operations would be readily apparent and would have an appreciable effect on the ability of the park to provide new services and facilities, there would be moderate, beneficial impacts on park operations.

Cumulative Impacts. Past and ongoing projects including reconfiguration of Rim Village, adaptive reuse of historic structures in Munson Valley and Rim Village, upgrading infrastructure at Cleetwood Cove, and highway road improvement projects on Highway 62, have had long-term moderate beneficial impacts on park operations. Overall these projects have the potential to have an appreciable effect on park operations and improve the ability of the park to provide desired services and facilities. Impacts of the above other actions in conjunction with the no-action alternative would result in moderate, long-term, beneficial cumulative impacts. The no action alternative would contribute a moderate, beneficial, and minor adverse increment to cumulative impacts to park operations.

Conclusion. Alternative 2 would result in moderate, beneficial impacts on park operations. Cumulative actions in conjunction with the no-action alternative would result in a moderate, long-term, beneficial cumulative impact. Alternative 2 would contribute a moderate, beneficial and minor, adverse increment to cumulative impacts to park operations.

Concession Operations

Under alternative 2 impacts on concession activities would be similar to alternative 1. Relative to the no-action alternative, there would be no measurable or perceptible change to concession operations under alternative 2, resulting in no new impacts on concession operations.

Cumulative Impacts. Past actions, including restoration of the Crater Lake Lodge, and ongoing actions, such as reconfiguration of park facilities at the rim and at Mazama Village, have had a beneficial impact on concessioner activity. Consolidation of concession activity at Mazama and the closeness of Mazama Village to Oregon State Highway 62 facilitate concession operations and inventory staging. These actions would result in moderate, long-term, beneficial impacts. Alternative 2 would not contribute to cumulative impacts on concession operations.

Conclusion. Alternative 2 would have negligible, long-term adverse impacts and would not contribute to cumulative impacts on concession operations.

SOCIOECONOMIC ENVIRONMENT

The emphasis of this alternative is to manage the park and its resources to provide greater opportunities for visitors

to experience diverse recreational, educational, and research opportunities. Some additional staff persons (5.5 FTE) would be hired. Changes to the park's infrastructure are called for to support this shift in park emphasis. The park's base budget would be increased by \$700,380. Development projects (such as building new trails and backcountry camping sites, improving roadways, pullouts, parking areas, etc.) require the expenditure of additional funds for development in the amount of \$4,743,000 – which is \$943,000 more than the no -action alternative. These monies spent over the life of the plan for various projects would provide some impacts (e.g., increase in income, creation of jobs, etc.) to individual firms and workers which would be moderate to major, short term, and beneficial. Impacts on the economic indicators within the affected area described in the “Affected Environment” chapter would be negligible because of the relative size of the regional economy (approximately \$5.0 billion in earnings and about 187,000 jobs in 2001) and the phasing of the projects over the next 15 to 20 years.

The pattern of increasing visitation is expected to continue. Concession services may be expanded to cover additional tours or research partnerships. Providing additional facilities and programs would encourage more visitor use at the parks. The amount of additional use is indeterminate at this time. However, this increased use could result in some additional spending within the gateway communities or region, which would benefit some retail establishments, restaurants, or motels in the travel corridors.

Moving some administrative or operational functions to areas outside the park as the need for space increased would

result in the purchase or long-term lease of land and building(s) and/or the construction of new buildings in gateway areas. New facility construction would result in a short-term, positive impact on the regional economy, mostly affecting the construction sector of the economy. The purchase of privately owned land on a willing-buyer/willing-seller basis would benefit both the private landowner and the Park Service. Land or real estate acquisition by the federal government would result in some long-term loss of local real-estate tax revenue. However, the amount of property tax revenue lost to the three counties would be minor compared to the tax revenues collected by Douglas County (tax revenues \$ 58.2 million in 2002/03), Jackson County (tax revenues \$148.1 million in 2002), and Klamath County (tax revenues of about \$37 million, 2002). Acquisition of other federally owned land for these purposes would not result in any change in real estate taxes.

Improving facilities within the parks would further contribute positive economic benefits – in the form of direct spending – to the growing regional economy. More visitors might result in additional tourism-related spending within the region and gateway towns, increasing business opportunities, income, and employment. The need for housing for additional park staff combined with the increasing desirability of living in the gateway communities might add to the demand for local housing and other locally provided goods. Hiring additional staff would result in a small increase in the local population that would contribute to the overall growth in the gateway communities. As described above, in conjunction with other past, present, and reasonably foreseeable actions, the preferred alternative would have minor to moderate,

long-term, beneficial impacts on the socioeconomic climate of the local gateway communities, but these benefits would be negligible at the three-county regional level.

Cumulative Impacts. Additional changes or shocks (either positive or negative) to the local and regional socioeconomic environment are not expected. No other actions that could have cumulative effects when combined with the impacts of alternative 2 have been identified during this planning process. In conjunction with other past, present, and reasonably foreseeable actions, no additional cumulative impacts are expected.

Conclusion. An increase in park staffing levels by 5.5 full-time FTE's, along with a budget increase to \$4,727,380 (current + leasing + staffing) would have a moderate impact on the local gateway communities' economies and a negligible impact on the regional economy. Additional employees would likely purchase some goods and services from within the gateway communities.

Approximately \$4,743,000 would be spent over the life of the plan on various projects, an increase of only \$943,000 compared to the no-action alternative. These expenditures could result in moderate to major, short-term, beneficial impacts on individual firms and employees (increased business and profits, increased employment opportunities, increased income, etc.). Overall impacts on the regional economy (effects on the economic indicators of income, unemployment rate, poverty rate, etc.), however, would be negligible because of the size and the phasing of the projects over the next 15 to 20 years. These projects might encourage some increased visitation to the parks, with beneficial

effects on the region and adjacent communities in terms of increased visitor expenditures for locally provided goods and services.

Moving some administrative functions and park employee housing outside the parks as space requirements dictate would result in the purchase or long-term lease of land and the construction of buildings in local gateway areas, with short-term, beneficial impacts on the local economy, mostly affecting the construction sector and a few landowners. The purchase of privately owned land (on a willing-buyer/willing-seller basis) by the federal government would result in some long-term loss of local real-estate tax revenue. However, the amount of property tax revenue lost to the three counties would be minor compared to the tax revenues collected by the three counties. Acquisition of other federally owned land for these purposes would not result in any change in real estate taxes.

UNAVOIDABLE ADVERSE EFFECTS

There would be no unavoidable adverse impacts of major intensity that would result from implementing alternative 2. Moderate adverse effects on park operations would occur due to increased maintenance and management operations. The negligible and minor impacts are described in the foregoing analysis.

RELATIONSHIP OF SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The vast majority of the park would be protected in a natural state and would maintain its long-term productivity. Disturbance of soils, vegetation, and wildlife habitat from visitor use and constructing facilities would reduce the long-term productivity of the environment in localized areas. Greater emphasis on research, partnering, and visitor education would indirectly contribute to improved resource conditions and the long-term productivity of the environment.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

Construction materials and energy used would be irretrievably lost. There would also be an irretrievable and irreversible commitment of resources in terms of funds expended on both labor and construction materials. Because it takes so long for soils to form, the loss of soils due to development and visitor use in localized areas would be an irreversible commitment of resources.

IMPACTS OF IMPLEMENTING ALTERNATIVE 3

CULTURAL RESOURCES

Archeological Resources

Implementation of alternative 3 on archeological resources would generally be the same as those listed under alternative 1, although the additional construction of trails to introduce visitors to a diverse range of ecosystems and terrain, could have some additional impacts on archeological sites. If known archeological resources could not be avoided, the range of potential adverse effects to archeological resources would be negligible to moderate depending upon the extent to which the resources were affected.

Cumulative Effects. Implementation of this alternative would generally have the same cumulative effects on archeological resources as those listed under alternative 1.

Conclusion. Implementation of this alternative would generally have the same impacts on archeological resources as those listed under alternative 1, although the additional construction of trails could have some additional impacts on archeological sites. If known archeological resources could not be avoided, the range of potential adverse effects to archeological resources would be negligible to moderate depending upon the extent to which the resources were affected.

There would be no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the cultural integrity or opportunities for enjoyment of the national park, or (3)

identified as a goal in this *General Management Plan* or other relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with archeological resources.

Section 106 Summary. For purposes of Section 106, the determination of effect of actions under this alternative on archeological resources would be no adverse effect.

Historic Structures/Buildings

Implementation of this alternative would have the same impacts on historic structures/buildings as those listed under alternative 1.

Cumulative Effects. Implementation of this alternative would have the same cumulative effects on historic structures/buildings as those listed under alternative 1.

Conclusion. Implementation of alternative 3 would have the same impacts on historic structures/buildings as those listed under alternative 1.

There would be no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the cultural integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this *General Management Plan* or other relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with historic structures/buildings.

Section 106 Summary. For purposes of Section 106, the determination of effect of actions under this alternative on historic structures/buildings would be no adverse effect.

Cultural Landscapes

Implementation of this alternative would generally have the same impacts on cultural landscapes as those listed under alternative 1, although provision for dispersed and expanded recreational opportunities and development of new trails to introduce visitors to a diverse range of ecosystems could result in additional impacts on the park's cultural landscapes. If known resources could not be avoided, the range of potential adverse impacts to cultural landscapes would be negligible to moderate depending upon the extent to which the resources were affected.

Cumulative Effects. Implementation of this alternative would generally have the same cumulative effects on cultural landscapes as those listed under alternative 1, although provision for decentralized recreational opportunities and development of new trails could result in additional cumulative effects on the park's cultural landscapes.

Conclusion. Implementation of this alternative would generally have the same impacts on cultural landscapes as those listed under alternative 1, although provision for decentralized recreational opportunities and development of new trails to introduce visitors to a diverse range of ecosystems could result in additional impacts on the park's cultural landscapes. If known resources could not be avoided, the range of potential adverse impacts to cultural landscapes would be negligible to moderate depending upon

the extent to which the resources were affected.

There would be no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the cultural integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this *General Management Plan* or other relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with cultural landscapes.

Section 106 Summary. For purposes of Section 106, the determination of effect of actions under this alternative on cultural landscapes would be no adverse effect.

Ethnographic Resources

Implementation of alternative 3 would generally have the same impacts on ethnographic resources as those listed under alternative 1, although emphasis on visitor enjoyment of the diverse and unique natural environment of the national park could have some barely perceptible or measurable, and hence negligible, impacts on such resources. Provision for a wider range of visitor experiences could result in some intrusion on sacred sites or landscapes and important traditional use activity areas and thus have minor adverse impacts on ethnographic resources, because the impacts would be noticeable but would neither appreciably alter resource conditions nor alter the relationship between the resource and the affiliated group's body of practices and beliefs.

Cumulative Effects. The cumulative effects to ethnographic resources resulting

from implementation of this alternative would be similar to those described for alternative 1, with the addition of minor adverse impacts associated with provisions for wider ranges of visitor experience. However, the minor adverse impacts associated with such provisions would represent a very small incremental increase in any overall adverse cumulative effect.

Conclusion. Implementation of this alternative generally have the same impacts on ethnographic resources as those listed under alternative 1, although emphasis on a wider range of visitor experiences to enjoy the diverse and unique natural environment of the national park could have some minor adverse impacts on such resources.

Section 106 Summary. No Traditional Cultural Properties are affected by actions under this alternative. Thus, Section 106 determinations are unnecessary.

Museum Collections

Implementation of this alternative would have beneficial minor to moderate long-term impacts on the park's museum collections because adequate staffing and space would be provided for their curation and storage and they would be stored in an on-site facility that met professional and National Park Service museum standards. Although adequate storage and workspace would be provided to improve curation and protection of the collections and staffing would be upgraded to reduce the cataloging backlog, park-related collection materials not currently owned or managed by the National Park Service would generally not be acquired. Access to the collections, both for NPS and non-NPS researchers, would be limited by

availability of museum staff to assist in use of the collections.

Cumulative Effects. Since the national park was established the combination of limited staffing and lack of storage and workspace meeting professional and National Park Service museum standards have hindered endeavors to improve care of and access to the museum collections and address the ever-increasing cataloging backlog. Thus, the park's museum collections have been subjected to minor to moderate long-term adverse impacts. Actions under this alternative, such as provision of adequate space to curate and store the park's museum collections in an on-site facility that met professional and National Park Service museum standards and adequate staffing to reduce the cataloging backlog, would contribute beneficial minor to moderate long-term effects to any overall cumulative impacts on the park's museum collections.

Conclusion. Implementation of alternative 3 would have beneficial minor to moderate long-term impacts on the curation and protection of the park's museum collections because adequate space would be provided for their curation and storage in an on-site facility that met professional and National Park Service museum standards.

There would be no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the cultural integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this *General Management Plan* or other relevant National Park Service planning documents. Consequently, there would be

no impairment of resources or values associated with museum collections.

NATURAL RESOURCES

Biotic Communities

Construction and use of new facilities (i.e., picnic areas, short trails) in frontcountry zones along the Rim Drive and other park roads would result in site-specific loss of soils, vegetation, and wildlife habitat. There would also be increased human disturbance to wildlife. Individuals, populations, and species vary in their sensitivity to disturbance and visitor use might disturb or displace some individual animals, particularly those species more sensitive to human disturbance. Certain wildlife may also become habituated to human presence or attracted to the increased food source visitors provide. Specific locations for new facilities have not been identified; however, siting them primarily in or adjacent to previously developed or disturbed sites within the park and avoiding sensitive resources such as wetlands or whitebark pine stands, would minimize additional loss of vegetation, soils, and habitat and disruption to wildlife. Long-term adverse impacts would be localized and minor. Mitigation measures such as topsoil salvage, erosion control, and revegetation would minimize construction impacts. Increased monitoring and restoration programs would be implemented to ensure that impacts from additional frontcountry development and more dispersed visitor use would be minimized and sensitive resources such as whitebark pine stands protected.

Increased contact with visitors could indirectly benefit native species, communities, and processes. There would be

greater opportunity to enhance the public's appreciation, understanding, and stewardship for these resources, which may reduce the potential for visitor related impacts. This broader base of public support and advocacy would also aid in accomplishing the park's resource protection and preservation programs and initiatives. Beneficial effects would likely be localized and minor.

Winter recreational activities occur when wildlife are stressed by cold weather and food shortages. Disturbance or harassment of wildlife during this sensitive time can have negative effects on individual animals, and in some cases populations, particularly when populations are low. Winter recreation such as snowmobiling and skiing can create added energetic stress in winter when most wildlife species are already stressed (NPS 1999d). The effects of winter recreational activities in the park are unknown, although, disturbance would likely be limited because visitor use levels are expected to remain relatively low and would continue to occur within very limited areas within the park. However, some increase in snowmachine use could occur due to grooming of the North Entrance Road. The Park Service would initiate a long-term data gathering and monitoring program to evaluate winter use and associated impacts to ensure long-term protection of park resources. Management actions, such as restrictions on off-trail use, specific area closures, increased patrols, visitor education, or limits on use or party sizes, would be taken as necessary to address impacts. Consequently, long-term impacts from continuing or increasing winter activities would be offset by increased protection measures that would benefit wildlife, although the extent of potential beneficial effects would likely be localized and minor.

Cumulative Impacts. Cumulative impacts on biotic communities from land uses and activities in the park and surrounding lands would be similar to those described for alternative 1 (no-action alternative). Overall cumulative impacts would be long-term, and both major adverse and beneficial. Adverse impacts would be primarily because of the widespread logging and fire suppression on lands surrounding the park and beneficial impacts would be from restoration and protection programs affecting lands both within and outside of the park. Alternative 3's contribution to both adverse and beneficial cumulative impacts would be localized and minor.

Conclusion. Long-term adverse impacts from construction and use of new facilities would be localized and minor. Increased contact and education of visitors and possible implementation of protection measures to mitigate winter use impacts could have minor benefits to resources. Biotic communities would not be impaired by the actions proposed under this alternative.

Cumulative impacts would be long-term, and both major adverse and beneficial. Adverse impacts would be primarily because of the widespread logging and fire suppression on lands surrounding the park and beneficial impacts would be from restoration and protection programs affecting lands both within and outside of the park. Alternative 3's contribution to both adverse and beneficial cumulative impacts would be localized and minor.

Threatened, Endangered, and Sensitive Species

Similar to impacts discussed under biotic communities, increased monitoring and restoration programs and increased

contact with visitors would enhance the opportunities for positive effects on threatened and endangered species. Some inconsequential changes to habitat or loss of individuals might occur from new development or use as described below. New frontcountry facilities would be relatively small in scale, but would be constructed in more locations under this alternative. They would primarily be placed within currently developed or previously impacted areas or road corridors, where human use is already occurring, thus minimizing the potential for adverse effects. Site-specific surveys would be conducted before implementing specific actions to determine if special status species existed in any proposed project area. If any were located, or if an action occurred within suitable habitat, the National Park Service would consult with the U.S. Fish and Wildlife Service and Oregon Department of Natural resources to determine mitigation measures to avoid or minimize adverse impacts on the species.

As discussed under the biotic communities impact topic, the park service would initiate a long-term data gathering and monitoring program to evaluate winter use and associated impacts to ensure long-term protection of threatened and endangered species. Because of a number of factors such as limited occurrence, small populations, low densities, and/or low birth rates, these species are more vulnerable to impacts than general wildlife populations. Some species (lynx, wolverine, fisher) could benefit from increased protection measures, although the extent of potential beneficial effects is unknown. Greater beneficial effects would occur if for example, den sites were located and measures were taken to protect them from disturbance.

Similar to alternative 2, development proposed under alternative 3 may affect, but would not be likely to adversely affect special status species for the following reasons:

Canada lynx, California Wolverine, and Pacific Fisher. Although the park has conducted extensive surveys for Canada lynx and wolverine in the park, none have been detected. All these species require large expanses of land relatively free from human use. Because of the extent of suitable habitat within the park, new development and associated visitor use would likely occur within or near suitable habitat, which would incrementally contribute to habitat loss and fragmentation. New frontcountry development and trails would result in more dispersed use. This increased human noise and activity could disturb and displace these species. However, development and trails would be located in nonwilderness areas, primarily in or adjacent to existing developed areas and road corridors. Because of the existing development and use in these areas, adjacent habitat would not be readily used and would probably be avoided by these species. New development and use would affect only a very small portion of suitable habitat within the park.

Bald Eagle. There would have little if any adverse impact on the primary food sources (fish and carrion) of the bald eagle. No new development or use would occur near the existing nest site along the Crater Lake shoreline. Tour boats would continue to be restricted from areas on the lake that are near the nest site. The primary area for potential nest sites for this species would likely be within the caldera. Potential new development along the rim, such as trails and picnic areas, could affect potential nest site habitat. However, new

development would affect very little of the overall amount of suitable habitat along the rim or within the caldera. Prior to new development, surveys would be completed to identify suitable habitat and locate nest sites. New development would be sited and designed to avoid impacts to nesting eagles.

Northern Spotted Owl. Current management practices that would continue under alternative 2 include protecting identified nest sites from human activities. Although new development and associated use could be located within patches of old growth stands identified as suitable habitat, no development would occur near known nest sites or within associated protective buffer zones. Most development would be located in or adjacent to existing developed areas and roadways, thus minimizing the likelihood of disturbance.

Northern Goshawk. Development of frontcountry facilities along roadways (e.g., picnic and parking areas, trails) could result in the loss of goshawk habitat, primarily where facilities were located in forested habitats. These developments would be impact a relatively small area and would potentially affect only a small fraction of any nesting pair's much larger territory or the extent of suitable habitat. Surveys to locate nest sites would be completed prior to facility construction and those sites avoided.

Peregrine Falcon. Peregrines are known to be sensitive to disturbances such as human presence above their nest site. No new development would be located in or above the area of the one known nest site within the caldera. Tour boats would also continue to be restricted from areas on the lake that are near the nest site. New development such as trails or picnic areas

along the rim could result in visitor use above some caldera cliff faces that could provide potential nest sites. However, new development would affect very little of the overall amount of suitable habitat along the rim or within the caldera. Prior to new development, surveys would be completed to identify suitable habitat and locate nest sites. New development would be sited and designed to avoid impacts to nesting falcons.

Bull Trout. Some frontcountry development could occur within the Sun Creek drainage basin along Grayback Trail and Rim Drive. Runoff from areas disturbed by construction could lead to increased sedimentation that could affect bull trout habitat in Sun Creek. Design and location of facilities would take into consideration such parameters as soil types, slopes, and vegetative cover in order to minimize disturbance and potential runoff. A vegetative buffer would be maintained between facilities and creek headwaters. Best management practices such as erosion and sediment controls and revegetation would be implemented to eliminate or reduce both short- and long-term impacts. Use of the Grayback Trail would not change and the park would continue to take actions to stabilize and minimize areas of erosion along this trail.

Pumice Grapefern, Shasta Arnica, and Crater Lake Rockcress. The location of these plants would continue to be protected and the populations monitored. Because of the greater potential for new development and use along the rim under this alternative, loss of habitat or individual plants could occur. These plants exist in distinct locations and locations for any new development or trails would be surveyed for the presence of these species and measures to avoid or minimize adverse impacts would be implemented.

Cumulative Impacts. Cumulative impacts on threatened and endangered species from land uses and activities in the park and surrounding lands would be similar to those described for alternative 1 (no-action alternative). Overall cumulative impacts would be both adverse and beneficial. Adverse impacts would be primarily due to land management activities in the region. Park programs would adversely affect some individuals or habitat in the short-term, but would not likely adversely affect threatened and endangered species in the long-term because long-term effects would be beneficial. Alternative 3 could contribute some adverse effects on threatened or endangered species but could also contribute beneficial long-term effects to the overall cumulative impacts.

Conclusion. New development and more dispersed use could result in small, localized reductions in habitat and disturbance to individuals. The survey, avoidance, mitigation, and consultation actions that the Park Service would take would help ensure that this alternative would avoid or minimize adverse effects on threatened and endangered species. Alternative 3 could result in some adverse effects on threatened or endangered species but would not result in impairment to these species. Alternative 3 could contribute some adverse effects on threatened or endangered species but could also contribute beneficial long-term effects to the overall cumulative impacts.

Crater Lake

Alternative 3 seeks to allow a greater range of visitor opportunities to the extent that resources continue to be protected. Impacts on Crater Lake would generally be the same as those listed under alternative 1 (no-action alternative).

Minimizing development within the caldera and lake drainage would prevent addition of sediments, minerals, or contaminants that could reduce water quality. Current restrictions on access and boating would continue to minimize contaminants that could reduce water quality.

The long-term research and monitoring program would continue. Continued monitoring would result in long-term beneficial impacts on water quality.

Cumulative Impacts. Implementation of this alternative would generally have the same cumulative effects on Crater Lake as those listed under alternative 1.

Conclusion. Implementation of this alternative would generally have the same impacts on Crater Lake as those listed under alternative 1. This alternative would have a negligible, long-term, beneficial effect on water quality within Crater Lake. In accordance with the criteria for determining impairment, there would be no major adverse impacts on water quality, and therefore no impairment of water quality.

Water Resources

The construction or rehabilitation of facilities and more dispersed visitor use would have the potential to impact water quality through ground disturbance, which would result in increased surface runoff and erosion. However, due to the limited extent of proposed developments and implementation of mitigation measures such as silt fences, erosion control measures, designated trails, and revegetation to control impacts, increased sedimentation and turbidity would be temporary and negligible.

Under this alternative, grooming the North Entrance Road to accommodate snow coaches could increase use of both snow coaches and snowmobiles, although, use volumes would not be expected to increase appreciably. Similar to alternative 1 (no-action alternative), because snowmobiles raise concerns about long-term impacts from high pollution emissions, the Park Service would initiate a long-term data gathering and monitoring program to evaluate use and associated impacts as part of an overall winter recreational use study. Management actions to mitigate nonpoint source pollution would be implemented if necessary. Additional impacts from some increased use would be mitigated by increased protection measures. Water quality could benefit from increased protection measures, although the extent of potential beneficial effects would likely be localized and minor.

Cumulative Impacts. Cumulative impacts on water resources from land uses and activities in the park and surrounding lands would be similar to those described for alternative 1 (no-action alternative). The park's fire management program may adversely impact water quality (e.g. sedimentation, erosion) due to the effects of fires, particularly high intensity fires. Park construction and rehabilitation proposals would also contribute to adverse impacts from increased surface runoff and erosion. Best management practices such as erosion and sediment controls would be employed to minimize these impacts. Impacts would be localized, short-term and minor. Minor beneficial cumulative actions would include ongoing trails rehabilitation and relocation within the park that would reduce localized erosion and runoff.

The replacement of the waterline from Munson Springs to Garfield would likely reduce water loss by the system. Implementation of actions within the visitor services plan would also reduce water use within the park. Reductions in water use would have a minor beneficial effect on water quantity in Annie Creek .

The impacts of other actions described above in conjunction with the impacts of alternative 3 would result in localized, minor adverse and beneficial impacts on water quality and minor to moderate beneficial effects on water quantity in Annie Creek. Alternative 3 would contribute a negligible adverse impact on water quality and negligible decrease in water quantity in Annie Creek to the overall cumulative impact.

Conclusion. Alternative 3 would have a negligible adverse effect on water quality due to construction activities and a negligible effect on Annie Creek water quantity. Water quality could benefit from increased protection measures, although the extent of potential beneficial would likely be localized and minor. Water resources would not be impaired by the actions proposed under this alternative. The cumulative actions in conjunction with alternative 3 would result in short- and long-term negligible to minor adverse and beneficial impacts on water quality and quantity. Alternative 3 would contribute a negligible adverse impact on water quality and negligible decrease in water quantity in Annie Creek to the overall cumulative impact.

Air Quality

Implementation of a shuttle system would result in an incremental reduction in traffic and thus emissions along the Rim Drive and the roadway between the rim

and Mazama. This would likely result in localized, negligible beneficial effects on air quality.

There would be some short-term, localized impacts on air quality resulting from particulates or machinery fumes generated during construction, removal, or rehabilitation of facilities under some alternatives. Mitigation measures such as watering and revegetation of disturbed areas, requiring machinery to meet emission standards, would be employed. Effects would be short-term and negligible, lasting only during the construction period.

Under this alternative, grooming the North Entrance Road to accommodate snowcoaches could increase use of both snowcoaches and snowmobiles, although, use volumes would not be expected to increase appreciably. Similar to alternative 1 (no-action alternative), because snowmobiles raise concerns about long-term impacts from high pollution emissions, the Park Service would initiate a long-term data gathering and monitoring program to evaluate use and associated impacts as part of an overall winter recreational use study. Management actions to mitigate nonpoint source pollution would be implemented if necessary. Additional impacts from some increased use would be mitigated by increased protection measures. Air quality could benefit from increased protection measures, although the extent of potential beneficial would likely be localized and negligible.

Cumulative Impacts. Cumulative impacts on air quality from actions in the park and surrounding lands would be similar to those described for the no-action alternative. The park's air quality is good with negligible effects from regional

pollution sources outside the park. Forest fires on surrounding lands could contribute particulates for limited periods of time. Degradation of air quality from the park's fire management program could result in moderate short-term impacts, but the program would be in conformance with the Clean Air Act, Oregon State Smoke Management Plan, and the Oregon Visibility Protection Plan. Park construction and rehabilitation proposals would cause localized increases in dust and emissions from construction vehicles and equipment, resulting in localized, short-term effects on air quality. The cumulative actions in conjunction with the no-action alternative would result in short-term, moderate, adverse impacts on air quality. Alternative 3 would contribute a negligible short-term, adverse, and negligible, long-term, beneficial increment to the cumulative effect.

Conclusion. Long-term beneficial impacts to air quality within the park under this alternative would be negligible. Short-term construction related impacts would be negligible. Air quality would not be impaired by the actions proposed under this alternative. The cumulative actions in conjunction with alternative 3 would result in short-term moderate adverse impacts on air quality. Alternative 3 would contribute a negligible, short-term, adverse, and negligible, long-term, beneficial increment to the cumulative effect.

VISITOR USE

Diversity of Recreational Opportunity

Under alternative 3 visitors would experience the entire range of visitor experiences through recreational opportunities and educational programs. Scenic driving, front and back country

hiking, camping, and picnicking, nature viewing, and boat tours would be available to a greater diversity of user groups. Visitor use would be dispersed in an expanded front country and park visitors would find increased opportunities for high-quality recreation activities and experiences. Additional hiking and picnicking opportunities would be developed in frontcountry areas along the park's road system and new hiking and biking opportunities would be available along east rim drive between Cleetwood Cove and Kerr Notch. More park facilities would be open to use enabling visitors to experience the park's cultural resources in their rustic setting. Additional back-country trails and camping opportunities would be explored. Winter access to Rim Village and winter activities including snow camping, cross-country skiing, and snowshoeing would continue as would snowmobile access along the North Entrance Road to North Junction. Use of snow coach access would be encouraged on the North Entrance Road. Motorized recreational opportunities would be available along Grayback Drive. Because the change in the diversity of visitor experience would be highly noticeable, exceptionally beneficial, and would affect relatively large numbers of visitors, alternative 3 would have a major, beneficial impact on the diversity of visitor opportunity.

Visitor Access and Circulation

Under alternative 3 motorized accessibility would change with the closure of one lane of Rim Drive between Cleetwood Cove and Kerr Notch to vehicular traffic. Rim Drive would accommodate one-way traffic between these points. Road access to Rim Village during the winter would be maintained. Traffic congestion during the summer season, particularly along Rim

Drive, would be managed by improving existing pullouts, parking areas, overlooks and by the addition of a transportation shuttles. A feasibility analysis would determine whether the shuttle would be a concession, Park Service operated, or a service contract. These rider-optional shuttles would operate between Rim Village and Cleetwood Cove and between Mazama Village and Rim Village. At peak visitor periods, interpretive and educational information and orientation to the park would be provided for shuttle riders. Other roads in the park, including Grayback Drive, would remain accessible for motorized travel. Loss of two-way motorized access to East Rim Drive would be readily apparent, but would inconvenience a relatively small number of visitors desiring to travel in both directions along East Rim Drive between Cleetwood Cove and Kerr Notch, resulting in negligible to minor, long-term, adverse impacts to the motorized visitor experience of the park.

Relative to the no-action alternative there would be no change in winter access to the park. Visitors would continue to have private vehicle access to Rim Village in the winter, and snowmobile access would continue on the North Entrance Road. Snowcoach use would also be encouraged on the North Entrance Road. No change in winter access would result in no to negligible impacts to winter vehicular access to the park.

Access to trailheads and opportunities for day hikes on front country trails along the park's road system would be expanded. New trails would be developed in localized front country areas along the park's road system. These trails would be located to introduce visitors to a diverse range of ecosystems and terrain and to accommodate ability and experience

levels. In addition, one-lane of Rim Drive between Cleetwood Cove and Kerr Notch would be closed to private vehicles to offer new opportunities for nonmotorized activities. Closure of sections of East Rim Drive would improve front country caldera rim hiking opportunities. There would be an associated and detectable change in visitor safety resulting from multiple use of East Rim Drive between Cleetwood Cove and Kerr Notch where the roadway would be shared by vehicles, hikers, and bicyclists. Overall, improvements to existing frontcountry hiking trails and development of new frontcountry trails would result in greater trail accessibility, and visitor surveys indicate that short trails are important to most visitors.

Because frontcountry trail access would be expanded, there would be detectable changes in visitor hiking and biking experiences. These changes would affect a relatively large number of visitors but would be localized in areas, resulting in minor, beneficial impacts to visitor experience of trails accessibility. Overall changes in visitor access and circulation would be readily apparent and would affect a relatively large number of visitors, resulting in a moderate, beneficial impact on visitor access and circulation.

Education and Orientation

Relative to the no-action alternative, alternative 3 would result in changes in the availability and focus of interpretive and educational information and education programs. Education and interpretation would focus on minimizing impacts, leaving no trace, and acquisition of skills for outdoor recreation. Educational programs would be in suites to provide appropriate levels of education and interpretation for a variety of groups.

Some orientation and education efforts could occur offsite in local hotels and/or on tours to prepare visitors for and foster stewardship to groups on their way to and within the park. Interpretive programs would stress the natural and cultural resources of the park in a regional recreational setting. Many interpretive opportunities at the park would be self-directed or self-serve and contact with park interpretive staff would necessitate visitors stopping at Visitor Information Building or at Rim Village. Changes in interpretive programs would be detectable and would affect a relatively large number of visitors resulting in moderate, long-term, adverse impacts on visitor opportunities to participate in interpretive programs.

Visitor Facilities and Services

Opportunities for visitors to access and use park facilities and services would increase. New and expanded uses of park facilities would open some park buildings and structures for visitor use and enjoyment. Visitors would gain opportunities to enjoy a hiking or biking experience on east Rim Drive. Grayback Drive would continue to provide motorized opportunities year-round. These changes in visitor experience of park facilities would be highly noticeable and would affect a relatively large numbers of visitors, resulting in a major beneficial impact on visitor experience of park facilities and structures.

Soundscapes and Scenic Quality

Development of frontcountry trails would occur along the park's transportation, corridor resulting in detectable changes to the natural sound environment in these areas which would result in minor, long-

term, adverse impacts to soundscapes at park trailheads.

Relative to the no-action alternative, there would be no change in views of the lake. Scenic views from the caldera rim would continue to be shared with vehicular traffic. There would be small but detectable changes in visitor ability to enjoy scenic views of the park's natural and cultural resources. Increases in front-country areas along the park's transportation corridors would open more front-country opportunities for visitors to enjoy scenic views. This change would affect a relatively small number of visitors and be localized in nature, resulting in minor, long-term beneficial impacts to opportunities to enjoy scenic views in the park.

Cumulative Impacts. Past and ongoing projects, including development of front-country trails, reconfiguration of Rim Village, and adaptive use of historic structures in Munson Valley and Rim Village have long-term, major, beneficial impacts on the visitor experience. Past actions, such as the completion of the Cleetwood Trail and the development of the Castle Crest and Godfrey Glen Trails, have increased visitor access to front country trails. Reconfiguration of Rim Village would change the way visitors access views of the lake at Rim Village. A walk along the promenade would be possible without having to compete with vehicular traffic. Opportunities to participate in interpretive programs would expand with the use of historic structures at Munson Valley, and a year-round visitor contact station at the rim that would enable winter views of the lake for people of all abilities. Overall these projects have the potential to increase the diversity of visitor experience, enhance the range of interpretative programs, expand access to park facilities, and improve the quality of

visitor experience values such as sounds of nature and scenic views. The impacts of the above other actions, when combined with the impacts of the no-action alternative would result in an overall major, long-term beneficial impact. Alternative 3 would contribute a moderate to major beneficial increment to cumulative impacts to visitor experience, because Alternative 3 would increase and expand existing visitor opportunities. Alternative 3 would also contribute minor to moderate, long-term adverse increment to cumulative impacts due to a reduction in the range of interpretive programs and impacts on soundscapes at some park trailheads.

Conclusion. Alternative 3 would have a major beneficial impact on the diversity of the visitor experience. Under alternative 3 visitors would experience minor, long-term, adverse impacts on vehicular access with the closure of East Rim Drive to two-way traffic, but would gain minor, long-term, beneficial impacts with frontcountry trails accessibility. Because interpretative programs would primarily focus on “leave no trace” ethics and there would be less emphasis on educational programs, there would be a reduction in the range of interpretive programs, resulting in moderate, long-term, adverse impacts to visitor enjoyment of interpretive programs. Access to park facilities and services would increase, resulting in a major beneficial impact to visitor’s enjoyment of park facilities. There would be minor long term adverse impacts to visitors’ perceptions of soundscapes. Opportunities for visitors to enjoy scenic views would be expanded resulting in minor beneficial impacts to scenic viewing opportunities.

Cumulative actions in conjunction with alternative 3 would have an overall major

long-term beneficial impact. Alternative 3 would contribute a moderate beneficial increment to cumulative impacts to visitor experience, because alternative 3 would increase and expanding existing visitor opportunities. Alternative 3 would also contribute minor to a moderate, long-term, adverse increment to cumulative impacts due to a reduction in the range of interpretive programs and impacts on soundscapes at some park trailheads.

OPERATIONS

Park Operations

Under Alternative 3 existing buildings and facilities would remain and some may be adaptively used for new functions and uses. Development of new frontcountry trails, closure of a portion of Rim Drive to two-way traffic, and adaptive use of historic structures for visitor use would increase the level of maintenance required to support these new visitor activities. Year-round residences at Steel Circle and summer season residences at Sleepy Hollow at Munson Valley would continue to be maintained. Park maintenance staff would continue to maintain park roads, utilities, and structures. The Munson Valley Road to Rim Village would continue to be cleared of snow during the winter months, and Rim Drive would continue to be plowed to allow summer access as early in the spring as weather dictates.

Most park functions would remain in the park. Staff functions would shift to a greater emphasis on resource protection and interpretation. There would also be an increased need for maintenance operations to maintain expanded front country trails and visitor services. Changes in park operations would be perceptible but would not be expected to have an overall

detrimental effect on the ability of the park to provide desired services and facilities, resulting in minor, adverse impacts to park operations.

Cumulative Impacts. Past facility development, particularly at the rim, has affected park operations. Ongoing actions, including scaling back development at Rim Village and improving parking and circulation, have impacted park operations. Overall these projects have the potential to have a moderate long-term beneficial effect on park operations and improvement in the ability of the park to provide desired services and facilities. Impacts of the above other actions in conjunction with the alternative 3 would result in moderate long-term beneficial cumulative impacts. Alternative 3 would contribute a minor adverse increment to cumulative impacts to park operations.

Conclusion. Alternative 3 would result in minor, adverse impacts to park operations. Cumulative actions in conjunction with alternative 3 would result in moderate long-term beneficial cumulative impacts. Alternative 3 would contribute a minor, adverse increment to cumulative impacts to park operations.

Concession Operations

Relative to the no-action alternative, there would be a change to concessioner activities under alternative 3. There would be a moderate, long-term, beneficial impact on concession operations. Increased partnering with commercial operators would provide for additional opportunities.

Cumulative Impacts. Past actions, including restoration of the Crater Lake Lodge, and ongoing actions, such as reconfiguration of park facilities at the rim

and at Mazama Village have had an impact on concessioner activity. Consolidation of concession activity at Mazama and the closeness of Mazama Village to Oregon State Highway 62 would facilitate concession operations and inventory staging, resulting in readily apparent changes in concession operations that would have a long-term, moderate, beneficial impact on concessioner operations. Impacts of the above other actions in conjunction with alternative 3 would result in an overall moderate, long-term beneficial cumulative impact. Alternative 3 would contribute a moderate, adverse increment to cumulative impacts on concession operations.

Conclusion. Alternative 3 would result in a moderate, long-term adverse impact on concession operations. Cumulative actions in conjunction with alternative 3 would result in an overall moderate, long-term, beneficial cumulative impact. Alternative 3 would contribute a moderate adverse increment to cumulative impacts on concession operations.

SOCIOECONOMIC ENVIRONMENT

This alternative emphasizes that the full range of recreational opportunities and educational experiences be offered to a most diverse public. The widest possible range of visitor groups is sought out to acquaint, educate, and foster an appreciation of the natural environment in a more diverse park clientele. Most current facilities continue to be used and maintained. Historic structures and fabric are preserved without adaptive reuse. Trails are developed to provide access to a broad range of the park's ecosystems and environments. Partnerships with other public and private entities are fostered to provide a wide range of educational and

interpretative services to the public. Some interpretative activities and opportunities occur outside the park. Staffing levels increase for ranger and interpretative activities adding 5.5 full-time FTE's. A transit system is evaluated and possibly developed to provide access for the public to some areas of the park. A base operating budget of \$5,454,900 is needed to fund this alternative.

Achieving these changes in park operations requires the expenditure of additional funds in the amount of \$3,934,000 – which is \$134,000 less than the no-action alternative. These funds are spent over the life of the plan for various projects provide some impacts (e.g., increase in income, creation of jobs, etc.) to individual firms and workers which would be moderate to major, short term, and beneficial. Impacts on the economic indicators within the affected area would be negligible because of the relative size of the regional economy (approximately \$5.0 billion in earnings and about 187,000 jobs in 2001) and the phasing of the projects over the next 15 to 20 years.

Commercial businesses/concessions, such as tours, would continue within the park and such businesses would be encouraged to provide interpretative information and services to park visitors. Any expansion of these businesses would provide additional employment opportunities.

The pattern of increasing visitation is expected to continue. Providing additional programs, services, and outreach would encourage more visitor use at the parks. The amount of additional use is indeterminate at this time. Also, attracting more visitors and offering visitor programs outside the park may result in additional tourism-related spending within the region and gateway towns, increasing

business opportunities, income, and employment which would benefit some retail establishments, restaurants, or motels in the travel corridors.

The need for additional staff may increase the need for housing. Combined with this, the increasing desirability of living in the gateway communities adds to the demand for local housing and other locally provided goods. Hiring additional staff results in a small increase in the local population that contributes to the overall growth in the gateway communities. As described above, in conjunction with other past, present and reasonably foreseeable actions, alternative 3 would have minor to moderate long-term beneficial impacts on the socioeconomic climate of the local gateway communities but these changes in benefits are negligible at the three-county regional level.

Cumulative Impacts. Additional changes or shocks (either positive or negative) to the local and regional socioeconomic environment are not expected. No other actions that could have cumulative effects when combined with the impacts of alternative 3 have been identified during this planning process, which has included public participation and input. In conjunction with other past, present, and reasonably foreseeable actions, no additional cumulative impacts are expected.

Conclusion. An increase in park staffing levels by 5.5 full-time employees would have a moderate impact on the local gateway communities' economies and a negligible impact on the regional economy. Additional employees would likely purchase some goods and services from within the gateway communities.

Approximately \$3,934,000 (in addition to ongoing actions and projects) would be spent over the life of the plan on various projects, and an increase of only \$134,000 compared to the no-action alternative. These expenditures could result in moderate to major, short-term, beneficial impacts on individual firms and employees (increased business and profits, increased employment opportunities, increased income, etc.). Overall impacts on the regional economy (effects on the economic indicators of income, unemployment rate, poverty rate, etc.), however, would be negligible because of the size and the implementation (timing) of the projects over the next 15 to 20 years. The actions of this alternative may encourage some increased visitation to the parks, with beneficial effects on the region and adjacent communities in terms of increased visitor expenditures for locally provided goods and services.

UNAVOIDABLE ADVERSE EFFECTS

There would be no unavoidable adverse impacts of major intensity that would result from implementing alternative 3. A reduction in the range of interpretive programs would result in moderate long term adverse impacts to visitor enjoyment of interpretive programs. An increase in concessioner staffing to maintain and operate the shuttle system would result in

moderate long-term adverse impacts on concession operations.

RELATIONSHIP OF SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The vast majority of the park would be protected in a natural state and would maintain its long-term productivity. Disturbance of soils, vegetation, and wildlife habitat from visitor use and constructing facilities would reduce the long-term productivity of the environment in localized areas. Increased contact with visitors could indirectly contribute to improved resource conditions and the long-term productivity of the environment.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

Construction materials and energy used would be irretrievably lost. There would also be an irretrievable and irreversible commitment of resources in terms of funds expended on both labor and construction materials. Because it takes so long for soils to form, the loss of soils due to development and visitor use in localized areas would be an irreversible commitment of resources.

IMPACTS OF IMPLEMENTING ALTERNATIVE 4

CULTURAL RESOURCES

Archeological Resources

Implementation of this alternative would generally have the same impacts on archeological resources as those listed under alternative 1. Although the resource preservation emphasis of this alternative could be expected to have some negligible to minor, long-term, beneficial impacts on archeological sites, removal of non-essential buildings could have some negligible to minor, long-term and permanent, adverse impacts on such resources.

Cumulative Effects. The cumulative effects to archeological resources would be similar to those described for alternative 1, with the addition of minor beneficial impacts resulting from the resource preservation emphasis of this alternative and some negligible to minor, long-term and permanent, adverse impacts on such resources resulting from removal of nonessential buildings. The minor beneficial impacts, as well as the negligible to minor, long-term and permanent adverse impacts associated with implementation of this alternative would, however, be a small component of any overall cumulative effect.

Conclusion. Implementation of this alternative would generally have the same impacts on archeological resources as those listed under alternative 1, although resource preservation emphasis could be expected to have some negligible to minor long-term beneficial impacts on archeological sites.

There would be no adverse impacts on resources or values whose conservation is

(1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the cultural integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this *General Management Plan* or other relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with archeological resources.

Section 106 Summary. For purposes of Section 106, the determination of effect of actions under this alternative on archeological resources would be no adverse effect.

Historic Structures/Buildings

Implementation of this alternative would have impacts on historic structures/buildings that are similar to those listed under alternative 1. Alternative 4 would have minor to moderate, long-term, beneficial impacts on historic structures/buildings because they would be subjected to less wear and tear as a result of reduced adaptive use, modifications, and winter use and appropriate preservation treatments would be determined for all historic structures in accordance with the Secretary of the Interior's *Standards* in consultation with the Oregon state historic preservation officer and the historic preservation community.

Cumulative Effects. In the past, documented values of some historic structures/buildings in the park have been subjected to cumulative adverse, minor to moderate, long-term, and permanent impacts. Actions under this alternative would have impacts on historic structures/buildings that are similar to those listed under alternative 1 (including, among

other things, application of appropriate preservation treatments for all historic structures, would contribute beneficial, minor to moderate, long-term effects to any overall cumulative impact on historic structures/buildings.

Conclusion. Implementation of alternative 4 would have minor to moderate, long-term, beneficial impacts on historic structures/buildings.

There would be no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the cultural integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this *General Management Plan* or other relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with historic structures/buildings.

Section 106 Summary. For purposes of Section 106, the determination of effect of actions under this alternative on historic structures/buildings would be no adverse effect.

Cultural Landscapes

Implementation of this alternative would have minor to moderate, long-term, beneficial impacts on cultural landscapes in the park because the Munson Valley, Rim Village, and Rim Drive cultural landscapes would be managed as cultural heritage zones to maximize preservation of their significant documented values and features. Although this alternative would have a minor to moderate, long-term, adverse effect on Rim Drive, because a portion of the road would be closed to vehicular traffic and thus alter historic use

of the road, rehabilitation of most pull-offs, parking areas, and overlooks along the roadway to their original designed appearance would have minor to moderate, long-term, beneficial impacts on the Rim Drive cultural landscape. Removal of nonhistoric structures and facilities throughout the park would generally have minor to moderate, long-term, beneficial impacts on cultural landscapes in the park.

Cumulative Effects. In the past lack of concern for the preservation of cultural landscapes in the park has resulted in minor to moderate long-term adverse impacts on such resources because decisions about site development and resource management have compromised some of the character-defining patterns and features as well as the documented values of cultural landscapes. Actions under alternative 4, such as management of the Munson Valley, Rim Village, and Rim Drive cultural landscapes as cultural heritage zones, and removal of nonhistoric structures and features, would contribute beneficial minor to moderate long-term effects to any overall cumulative effect on cultural landscapes.

Conclusion. Implementation of this alternative would have minor to moderate, long-term, beneficial impacts on cultural landscapes in the park because the Munson Valley, Rim Village, and Rim Drive cultural landscapes would be managed as cultural heritage zones to preserve their documented values, and nonhistoric structures and facilities would be removed throughout the park.

There would be no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the cultural

integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this *General Management Plan* or other relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with cultural landscapes.

Section 106 Summary. For purposes of Section 106, the determination of effect of actions under this alternative on cultural landscapes would be no adverse effect.

Ethnographic Resources

Implementation of this alternative would generally have the same impacts on ethnographic resources as those listed under alternative 1. However, emphasis on natural resource preservation and restoration and reduction of human presence on the natural landscape could be expected to have negligible to minor, beneficial, long-term impacts on such resources. Emphasis on natural resource preservation/restoration and reduction of human presence on the natural landscape could be expected to reduce intrusion on sacred sites or landscapes and important traditional use activity areas, thus resulting in some negligible to minor, beneficial, long-term improvement in ethnographic resource conditions and access to and/or accommodation of various groups' traditional practices or beliefs relating to such sites.

Cumulative Effects. National Park Service development and administrative/maintenance operations, as well as increasing visitor use of the national park since its establishment, have had and are continuing to have cumulative adverse, negligible to minor effects on ethnographic resources. As sacred sites in south-central Oregon have been lost over time, those remaining in the park have become

more significant to the Klamath Tribes and other affiliated Native American groups. Actions under this alternative such as natural resource preservation and restoration and reduction of human presence on the natural landscape would contribute negligible to minor long-term beneficial effects to any overall cumulative effect on ethnographic resources.

Conclusion. Implementation of this alternative would generally have the same impacts on ethnographic resources as those listed under alternative 1. However, emphasis on natural resource preservation/restoration and reduction of human presence on the natural landscape could be expected have negligible to minor beneficial long-term impacts on such resources.

There would be no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the cultural integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this *General Management Plan* or other relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with ethnographic resources.

Section 106 Summary. No Traditional Cultural Properties are affected by actions under this alternative. Thus Section 106 determinations are unnecessary.

Museum Collections

Implementation of this alternative would have beneficial minor to moderate long-term impacts on the park's museum collections because the increased volume of the collections that would result from

as acquisition of pertinent park-related collection materials not currently owned or managed by the National Park Service, would be stored in an offsite facility that met professional and National Park Service museum standards. Thus, provision for adequate storage and workspace would be provided to improve curation, protection, and access to the collections, and staffing would be increased to reduce the cataloging backlog.

Cumulative Effects. Since the national park was established the combination of limited staffing and lack of storage and workspace meeting professional and National Park Service museum standards have hindered endeavors to improve care of and access to the museum collections and address the ever-increasing cataloging backlog, thus having minor to moderate long-term adverse effects on such resources. Actions under this alternative such as expansion of the collections and their storage in an offsite facility that meets professional and National Park Service museum standards and provision for adequate storage, workspace, and staffing to improve curation, protection, and access to the collections would contribute to beneficial, minor to moderate, long-term effects to any overall cumulative effect on the park's museum collections.

Conclusion. Implementation of alternative 4 would have beneficial, minor to moderate, long-term impacts on the park's museum collections. There would be no adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the national park's establishing legislation, (2) key to the cultural integrity or opportunities for enjoyment of the national park, or (3) identified as a goal in this *General Management Plan* or other

relevant National Park Service planning documents. Consequently, there would be no impairment of resources or values associated with the park's museum collections.

NATURAL RESOURCES

Biotic Communities

The following actions would potentially have localized minor to more widespread moderate long-term beneficial effects on biotic communities. The intensity of the effects would likely be greater over time as more knowledge of the resources is accumulated, partnerships expand, and resource management and restoration actions are implemented that further the preservation and restoration of native species, communities, and processes.

Removing facilities and restoring areas to more natural conditions and routing trails away from sensitive areas such as wetlands would reduce impacts to biotic communities.

Expanding resource management programs, data collection, resource staff, and partnering would indirectly contribute to improved resource conditions by enhancing the Park Service's knowledge and capabilities for restoring and maintaining native species, communities, and processes.

Emphasizing visitor activities that have low environmental impact and focusing interpretive programs on resource stewardship would also indirectly contribute to improved resource conditions by reducing the potential for visitor related impacts.

Closing roads (i.e., portion of Rim Drive, Grayback Road) could reduce road kills,

disturbance to wildlife, and off-road driving and associated impacts to roadside resources (e.g., soils, vegetation).

Eliminating snowmobiling along the North Entrance Road and winter plowing to the rim would seasonally reduce use and disturbance to wildlife in these areas and could enhance wildlife migration patterns. The plowed road corridor would be less of an impediment to wildlife movement (e.g., elk, deer, bear).

Although snowmobiling would no longer be allowed, other winter recreational activities can create added energetic stress in winter when most wildlife species are already stressed. The Park Service would initiate a long-term data gathering and monitoring program to evaluate winter use and associated impacts to ensure long-term protection of park resources. Management actions, such as restrictions on off-trail use, specific area closures, increased patrols, visitor education, or limits on use or party sizes, would be taken as necessary to address impacts.

Adaptive use or removal of existing buildings is not expected to result in new resource impacts. These buildings are located in existing, previously disturbed developed areas. Park functions relocated from the park to nearby communities would be housed in existing structures if possible. However, if new buildings were necessary, construction activities would have short-term effects on soils and vegetation. Depending on whether or not facilities were built on previously disturbed sites, the long-term, adverse effects with mitigation would be negligible to minor.

Cumulative Impacts. Cumulative impacts on biotic communities from land uses and activities in the park and surrounding

lands would be similar to those described for the no-action alternative. Overall cumulative impacts would be both long term, minor to major, adverse, and beneficial. Adverse impacts would be primarily because of the widespread logging and fire suppression on lands surrounding the park and beneficial impacts would be from restoration and protection programs affecting lands both within and outside the park. Alternative 4's contribution to these adverse impacts would be negligible to minor. However, actions under alternative 4, particularly reduced development and enhanced resource management programs, would promote the further protection, maintenance, and restoration of native biological communities. Therefore, alternative 4 would also contribute a minor to moderate beneficial effect to the overall cumulative impacts.

Conclusion. The greater emphasis on reduction in development and expanded resource management programs and restoration in the park along with increased visitor education under this alternative would contribute to improved resource conditions within the park, potentially having localized minor to more widespread moderate, long-term, beneficial effects on biotic communities. Biotic communities would not be impaired by the actions proposed under this alternative.

Cumulative impacts would be long-term, and both major adverse and beneficial. Adverse impacts would be primarily because of the widespread logging and fire suppression on lands surrounding the park and beneficial impacts would be from restoration and protection programs, affecting lands both within and outside the park. Alternative 4's contribution to adverse impacts would be minor and its

contribution to beneficial effects minor to moderate.

Threatened, Endangered, and Sensitive Species

Alternative 4 emphasizes preservation of native species and restoration of disturbed areas. A number of actions would reduce the extent of impacts from development and human presence in the park. There would be fewer buildings and facilities in the park. Grayback Trail could be removed and a large section of Rim Drive would be closed to motorized use.

Eliminating snowmobiling along the North Entrance Road and winter plowing to the rim would seasonally reduce use and disturbance to wildlife in these areas and could enhance wildlife migration patterns and habitat for winter carnivores (e.g., wolverine, fisher, lynx). A long-term data gathering and monitoring program would evaluate winter use and associated impacts to ensure long-term protection of threatened and endangered species.

Overall, alternative 4 would have a beneficial effect on threatened and endangered species and their habitat.

Cumulative Impacts. Cumulative impacts on special status species and their habitat from land uses and activities in the park and surrounding lands would be similar to those described for alternative 1 (no-action alternative). Adverse impacts would occur primarily because of the alteration and fragmentation of forests surrounding the park due to the persisting impacts of logging and fire suppression. Restoration and protection programs affecting lands both within and outside of the park may have adverse short-term effects, but would not be likely to adversely affect special status species over the long-term.

Alternative 4 would contribute beneficial

long-term effects to the overall cumulative impacts.

Conclusion. Greater emphasis on resource evaluations, surveys, monitoring, and facility removal and restoration would enhance the opportunities for positive effects on threatened and endangered species and their habitat within the park. Thus, alternative 4 would not be likely to adversely affect and would not result in impairment to these species. Alternative 4 would contribute beneficial long-term effects to the overall cumulative impacts.

Crater Lake

Alternative 4 emphasizes the preservation of natural resources. In addition to the current preservation actions – minimizing development with the caldera and lake drainage, and restricting access and boating as in alternative 1 – the park would seek to restore the natural systems of Crater Lake. Winter plowing to the rim would stop, except for spring opening. Vehicular access to the rim would be via snow coach. Minimizing snow plowing to the rim would begin to restore natural deposition processes and would minimize potential hydrocarbons and other vehicle caused pollutants.

Snowmobile access along North Junction Road would be stopped. Snowmobiles raise concerns about long-term impacts from high pollution emissions. Emissions from 2-stroke engine exhaust include monoxide, hydrocarbons, nitrous oxides, and particulate matter (NPS 1999e). These concerns include the possibility that accumulations of pollutants in the snow pack and resultant snow pack runoff may be having adverse impacts on water quality and associated aquatic systems, although impacts from snow pack runoff that is contaminated with snowmobile pollutants

have not been found. Impacts on water quality are likely short term and localized along travel routes because of the low volume of use and because snowmobiles are restricted to the north entrance road, which does not follow near any streams. Although snowmobile use is not expected to appreciably increase, the Park Service would initiate a long-term data gathering and monitoring program to evaluate use and associated impacts as part of an overall winter recreational use study.

Management actions to mitigate no point source pollution would be implemented if necessary. Water quality could benefit from increased protection measures, although the extent of potential beneficial effects is unknown, but would likely be localized and minor.

The long-term program would expand to monitor a diverse array of chemical, physical, and biological properties beyond those in alternative 1. Most of the sample and data collection would continue to occur in the summer months when the lake is easily accessible. Occasional winter studies are also conducted. The program would continue to add devices capable of year-round sample and data collection to gain a better understanding of processes occurring during the winter months. Emphasis would be on ensuring that all research is as non-manipulative as possible. Sample and data processing, along with data analysis and trend monitoring, would occur on a regular basis. Results of the monitoring studies are documented on an annual basis with special emphasis on long-term trend analysis. Increased monitoring would result in long-term beneficial impacts on water quality.

Cumulative Impacts . Cumulative actions would contribute both adverse and beneficial impacts to water quality. Implementation of this alternative would generally have the same cumulative effects on Crater Lake as those listed under alternative 1.

Conclusion. Implementation of this alternative would generally have the same impacts on Crater Lake as those listed under alternative 1. This alternative would have a negligible, long-term, beneficial effect on water quality within Crater Lake. In accordance with the criteria for determining impairment, there would be no major adverse impacts on water quality, and therefore no impairment of water quality.

Water Resources

The removal or adaptive use of facilities would have the potential to impact water quality through ground disturbance, which would result in increased surface runoff and erosion. However, due to the limited extent of potential ground disturbance and implementation of mitigation measures such as silt fences, erosion control blankets, mulch, and revegetation to control impacts, increased sedimentation and turbidity would be temporary and negligible.

Reduction in the extent of facilities and use in the park would reduce water use in the park. This would likely have a minor beneficial effect on water quantity in Annie Creek because although overall development would be reduced, the major developed areas in the park would remain. Closure of the Grayback Trail and a section of the Rim Drive to traffic and elimination of winter access to the rim via private vehicles, including snowmobiles, could benefit water quality because

vehicular emissions or deposition of petroleum products would be eliminated, at least seasonally, in these areas. Beneficial effects would be localized and minor.

Cumulative Impacts. Cumulative impacts on water resources from land uses and activities in the park and surrounding lands would be similar to those described for alternative 1 (no-action alternative). The park's fire management program may adversely impact water quality (e.g., sedimentation, erosion) due to the effects of fires, particularly high intensity fires. Park construction and rehabilitation proposals would also contribute to adverse impacts from increased surface runoff and erosion. Best management practices such as erosion and sediment controls would be employed to minimize these impacts. Impacts would be localized, short-term, and minor. Minor beneficial cumulative actions would include ongoing trails rehabilitation and relocation within the park that would reduce localized erosion and runoff.

The replacement of the waterline from Munson Springs to Garfield would likely reduce water loss by the system. Implementation of actions within the visitor services plan would also reduce water use within the park. Reductions in water use would have a minor, beneficial effect on water quantity in Annie Creek.

The impacts of other actions described above in conjunction with the impacts of alternative 4 would result in localized, minor, adverse, and beneficial impacts on water quality and minor to moderate beneficial effects on water quantity in Annie Creek. Alternative 4 would contribute a localized, negligible, adverse, and minor, beneficial impact on water quality, and a minor increase in water

quantity in Annie Creek to the overall cumulative impact.

Conclusion. Alternative 4 would have a negligible adverse effect on water quality due to construction activities and a minor beneficial effect on Annie Creek water quantity. Water quality could benefit from reduced vehicle use in some areas of the park, although the extent of potential beneficial would likely be localized and minor. Water resources would not be impaired by the actions proposed under this alternative. The cumulative actions in conjunction with alternative 4 would result in short- and long-term, negligible to minor, adverse, and beneficial impacts on water quality and quantity. Alternative 4 would contribute a localized, negligible, adverse, and minor, beneficial impact on water quality, and a minor increase in water quantity in Annie Creek to the overall cumulative impact.

Air Quality

Possible closure and restoration of the Grayback Trail would benefit air quality because of vehicular emissions would be eliminated in this area. Closure of a section of the Rim Drive to traffic and elimination of winter access to the rim via private vehicles, including snowmobiles, would have similar seasonal effects. Beneficial effects would be localized and negligible because air stagnation that would allow concentration of pollutants is rare and/or relatively low levels of use that would be eliminated.

There would be some short-term, localized impacts on air quality resulting from particulates or machinery fumes generated during removal or rehabilitation of facilities. The elevation and geography make the park susceptible to winds that tend to disperse particulates and other

pollutants. Mitigation measures, such as watering and revegetation of disturbed areas, requiring machinery to meet emission standards, would be employed. Effects would be short-term and negligible, lasting only during the construction period.

Cumulative Impacts. Cumulative impacts on air quality from actions in the park and surrounding lands would be similar to those described for the no-action alternative. The park's air quality is good with negligible effects from regional pollution sources outside the park. Forest fires on surrounding lands could contribute particulates for limited periods of time. Degradation of air quality from the park's fire management program could result in moderate short-term impacts, but the program would be in conformance with the Clean Air Act, Oregon State Smoke Management Plan, and the Oregon Visibility Protection Plan. Park construction and rehabilitation proposals would cause localized increases in dust and emissions from construction vehicles and equipment, resulting in localized, short-term effects on air quality. The cumulative actions in conjunction with the no-action alternative would result in short-term, moderate, adverse impacts on air quality. Alternative 4 would contribute a negligible, short-term, adverse and negligible, long-term, beneficial increment to the cumulative effect.

Conclusion. Long-term beneficial impacts to air quality within the park under this alternative would be negligible. Short-term construction related impacts would be negligible. Air quality would not be impaired by the actions proposed under this alternative. The cumulative actions in conjunction with alternative 4 would result in short-term, moderate, adverse impacts on air quality. Alternative 4 would

contribute a negligible, short-term, adverse, and negligible, long-term, beneficial increment to the cumulative effect.

VISITOR USE

Diversity of Recreational Opportunity

Relative to the no action alternative, Alternative 4 would reduce the range of visitor experience. Visitor experience would stress low environmental impact on and harmony with the park's resources. During the summer, many existing opportunities for scenic driving and back country hiking and camping would continue. Nature viewing and boat tours would also continue to be available. New opportunities for hiking and solitude along the caldera rim would be added with the closure of a portion of Rim Drive between Cleetwood Cove and Kerr Notch to vehicular traffic. Visitors would be able to experience the caldera rim and views of the lake without the intrusion of vehicular traffic. There would be a reduction in front country areas and a corresponding decrease in the number of short interpretive hiking trails. Backcountry hiking and camping opportunities would increase.

Winter access to the park beyond Mazama Village would be by snow coach only, which would offer a new visitor experience. There would be no winter private vehicle access to Rim Village, which would eliminate the traditional visitor experience of driving to the rim in the winter. Snowmobile access along the north entrance road to North Junction would not be allowed, resulting in a loss of this winter visitor experience. There would be no motorized access and no maintained trail on Grayback Drive, which would be allowed to return to natural

conditions. Visitors would gain a new winter snowcoach experience and the new experience of hiking without vehicular traffic on a portion of Rim Drive. These new experiences would be offset by a loss of the Rim Drive automobile experience which is very important to most visitors. Overall, the change in the diversity of visitor experience would be readily apparent and would affect a relatively large number of visitors, resulting in moderate, adverse impacts on the diversity of visitor opportunity.

Visitor Access and Circulation

Relative to the no action alternative, under alternative 4 motor vehicle accessibility to the park would be reduced. During peak use most of the park's road system would be accessible and visitors would be able to drive to many locations in the park. A portion of Rim Drive between Cleetwood Cove and Kerr Notch would be closed to motorized travel. The Grayback Drive would also be closed to motorized travel and the centerpiece of the automobile tour experience in the park would be lost. During the winter months the park would not be accessible via private vehicle beyond Mazama Village. To alleviate traffic congestion, especially along Rim Drive during the summer season, use of a mandatory alternative transportation system would be explored. A feasibility analysis would determine whether the shuttle would be concession, Park Service operated, or a service contract.

Changes in motorized accessibility would be detectable and localized in area; however modification to traffic flow on Rim Drive would affect a large number of visitors, resulting in moderate, long-term, adverse impacts to motorized accessibility. Closure of a portion of Rim Drive may have moderate long-term, adverse,

impacts on Rim Drive as the centerpiece of the Volcanic Legacy Scenic Byway and All American Road.

Access to trailheads and opportunities for day hikes on frontcountry trails along the park's road system would be reduced and many front country short trail hiking experiences would be lost. The entire trail system would be reviewed and new backcountry trails might be provided (e.g. low elevation nature trails). Some trails might be eliminated and the area rehabilitated. Rim Drive between Cleetwood Cove and Kerr Notch would be closed to private vehicles, and would thus offer new opportunities for non-motorized activities. Loss of frontcountry trails is important because visitor surveys indicate that short trails are extremely important to a majority of visitors. A reduction of frontcountry trail access would affect a relatively large number of visitors. Overall, changes in the way visitors access the park would be readily apparent and would affect a moderate number of visitors resulting in moderate, long-term, adverse impacts to park accessibility.

Education and Orientation

Under alternative 4 interpretive and educational programs would focus on stewardship and resource protection of the park's natural and cultural resources. Interpretive programs would offer in-depth information on park resources. Many orientation and education efforts would occur offsite to prepare visitors for and foster stewardship. Many interpretive opportunities at the park would be self-directed or self-serve, and contact with park interpretive staff would necessitate visitors stopping at Visitor Information Building or at Rim Village. Changes in interpretive programs would be detectable and would affect a relatively large number

of visitors resulting in moderate, long-term, adverse impacts on visitor opportunities to participate in interpretive programs.

Visitor Facilities and Services

Opportunities for visitors to access and use park facilities and services would decrease. Most existing visitor use facilities would remain, however during the winter months facilities beyond Mazama Village would not be available. This decrease would be partially offset by a slight increase in visitor use of facilities at Mazama Village associated with snowcoach operations. Portions of park roads would be closed to private vehicles. Changes in visitor experience of park facilities would be readily apparent and would affect a relatively large number of visitors, resulting in a moderate, adverse impact on visitor experience of park facilities and structures.

Soundscapes and Scenic Quality

Opportunities to visit the backcountry to experience natural sounds and tranquility would increase. Frontcountry areas would be reduced and noise levels associated with trailheads and front country areas would also be reduced. During the long winter season, visitors would arrive at the caldera rim via snowcoach and would have the opportunity to experience what they perceive as a pristine winter landscape and untrammeled lake views at the caldera rim. The number of frontcountry developments would be reduced resulting in a readily apparent change in the way visitors view and perceive the park's natural resources. Therefore alternative 4 would result in moderate, beneficial impacts to scenic vistas.

Cumulative Impacts. Past and ongoing projects including development of front country trails, reconfiguration of Rim Village, and adaptive reuse of historic structures in Munson Valley and Rim Village have long-term major beneficial impacts on visitor experience. Past actions, such as the relocation of the Cleetwood Trail and the development of the Castle Crest and Godfrey Trails, have increased visitor access to front country trails. Reconfiguration of Rim Village would change the way visitors view the lake at Rim Village. Overall these projects have the potential to increase the diversity, of visitor experience, enhance the range of interpretative programs, expand access to park facilities, and to improve the quality of visitor experience values such as sounds of nature and scenic views. Cumulative actions in conjunction with alternative 4 would have an overall major long-term beneficial impact. Alternative 4 would contribute a moderate, adverse increment to cumulative impacts to visitor experience. Alternative 4 would also contribute a moderate beneficial increment to cumulative impacts to scenic vistas.

Conclusion. Alternative 4 would have a moderate, long-term adverse impact on the diversity of visitor opportunities, visitor accessibility, and on the ability of visitors to participate in educational and interpretive programs. There would be moderate, long term adverse impacts on visitor enjoyment of park facilities and services. There would also be a moderate, beneficial impact to winter scenic vistas at the rim. Cumulative actions in conjunction with alternative 4 would have an overall major, long-term, beneficial impact. Alternative 4 would contribute a moderate adverse increment to cumulative impacts to visitor experience.

OPERATIONS

Park Operations

Under alternative 4 the trend in the built environment would be a reduction in facilities. Buildings that are not historic and not essential to park functions would be removed and the area rehabilitated. Removal of some buildings and closing most buildings during the winter months would reduce maintenance and utilities requirements. The park maintenance staff would continue to support park operations from the central maintenance facility located at Munson Valley. Maintenance staff would continue to maintain park roads, utilities, and structures. The Munson Valley Road to Rim Village would not be plowed during the winter months. Spring snow removal from Rim Drive would increase in difficulty and complexity, because maintenance crews would first have to clear the park roads from Mazama Village up Munson Valley before tackling the heavy snows on Rim Drive. This would increase the time for spring snow-clearing with the consequent increase in maintenance responsibility.

Many park functions would be located outside of the park. Park functions that are by necessity park-based, such as maintenance and law enforcement would be retained in the park. Different options for accommodating operations outside the park boundary would be studied before implementing any actions. Actions that propose purchasing property outside the boundary would require additional authorization. The composition of the staff would increase in the areas of resource preservation, protection, restoration, and education activities. There would be a decreased need for maintenance operations during the winter

months. The Munson Valley Road would need some level of grooming to enable operation of the winter snowcoach. Decreased winter maintenance needs would be partially offset by a concentrated need in the early spring to open park roads to vehicular traffic. Changes in park operations would be readily apparent and would have appreciable effects on park and concession abilities to provide necessary services and facilities, resulting in a moderate, beneficial impact on park operations.

Cumulative Impacts. Past facility development, particularly at the rim, has affected park operations. Ongoing actions including scaling back development at Rim Village and improving parking and circulation have had a moderate, beneficial, cumulative impact on park operations. Alternative 4 in conjunction with past and ongoing activities would have a moderate to major, beneficial cumulative effect. This alternative would contribute a moderate beneficial increment to beneficial cumulative impact to park operations.

Conclusion. Alternative 4 would result in moderate, beneficial impacts to park operations. Alternative 4, in conjunction with past and ongoing activities, would have a moderate to major beneficial cumulative effect. This alternative would contribute a moderate increment to beneficial cumulative impact to park operations.

Concession Operations

During peak use in the summer concession activities would remain the same. Winter access to the rim would be via snowcoach rather than private vehicle. The change is not predicted to have an impact on the small number of visitors to the rim in the

winter; however, the change in access could have a moderate, long-term, adverse impact on operations at the rim due to changes in access for supplies and employees.

Cumulative Impacts. Past actions, including restoration of the Crater Lake Lodge, and ongoing actions, such as reconfiguration of park facilities at the rim and at Mazama Village, have had a moderate, beneficial impact on concessioner activity. These actions, in conjunction with alternative 4, would have both moderate adverse and beneficial cumulative impacts on concession operations. Alternative 4 would contribute a moderate, adverse impact to the cumulative effect.

Conclusion. Alternative 4 would result in a moderate, long-term adverse impact on concessioner activities and would contribute moderate, beneficial cumulative impacts on concession operations.

SOCIOECONOMIC ENVIRONMENT

Natural resource preservation and restoration are driving elements of alternative 4. Low-impact visitor activities are emphasized. The built environment is reduced. Nonhistoric buildings that are not essential to park operations would be removed and the land restored. Vehicle access to some parts of the park would be curtailed. Some trails and some roads may be removed and rehabilitated. Part of the Rim Road becomes accessible to pedestrians only. Winter access would be limited to Route 62 and snowcoach from Mazama parking lot. This alternative calls for most park operations and visitor contact facilities to be relocated outside the park.

These and other actions would require an increased budget and an increased number of staff positions in the areas of resource preservation, restoration, protection, and education. Staffing would increase by 1 additional FTE to achieve preservation and restoration goals. A base operating budget of \$4,419,760 is needed to fund this alternative.

In addition, approximately \$3.9 million would be spent over the life of the plan on various projects and services, an increase of \$140,000 compared to the no-action alternative. These expenditures could result in moderate to major, short-term, beneficial impacts on individual firms and employees (increased business and profits, increased employment opportunities, increased income, etc.). Overall impacts on the regional economy (effects on the economic indicators of income, unemployment rate, poverty rate, etc.), however, would be negligible because of the size and the phasing of the projects over the next 15 to 20 years.

Moving some administrative, operations, and visitor contact functions to areas outside the park would result in the purchase and/or long-term lease of land and building(s) and/or the construction of new buildings in gateway areas. The need for additional staff may increase the need for housing; this, combined with the increasing desirability of living in the gateway communities adds to the demand for local housing and other locally provided goods. Hiring additional staff results in a small increase in the local population that contributes to the overall growth in the gateway communities. New facility construction would result in a short-term, positive impact on the regional economy, mostly affecting the construction sector of the economy. The purchase of land (on a willing-

buyer/willing-seller basis) by the federal government would result in some long-term loss of local real-estate tax revenue. However, the amount of property tax revenue lost to the three counties would be minor compared to the tax revenues collected by Douglas County (tax revenues \$ 58.2 million in 2002/03), Jackson County (tax revenues \$148.1 million in 2002), and Klamath County (tax revenues of about \$37 million, 2002). Acquisition of other federally owned land for these purposes would not result in any change in real estate taxes.

Visitor use of the park would be reduced. Removal of facilities and services from the park and the shift to less use of motorized vehicles and reduced accessibility for motorized vehicles would tend to reduce the number of visitors to the park. Road closures and restoration, reduced winter snow plowing, and closing the north junction road to snowmobiling would also reduce access and use of some parts of the park. Concession businesses may be reduced or eliminated as incompatible with the new direction for this park.

The need for additional staff may increase the need for housing; this, combined with the increasing desirability of living in the gateway communities adds to the demand for local housing and other locally provided goods. Hiring additional staff results in a small increase in the local population that contributes to the overall growth in the gateway communities.

Cumulative Impacts. Additional changes or shocks (either positive or negative) to the local and regional socioeconomic environment within which the park exists are not expected. No other actions that could have cumulative effects when combined with the impacts of alternative 4 have been identified during this planning

process, which has included public participation and input. In conjunction with other past, present, and reasonably foreseeable actions, no additional cumulative impacts are expected.

Conclusion. An increase in park staffing levels by 1 full-time employee would have a moderate impact on the local gateway communities' economies and a negligible impact on the regional economy. Additional employees would likely purchase some goods and services from within the gateway communities.

Approximately \$3.9 million (in addition to ongoing actions and projects) would be spent over the life of the plan on various projects, an increase of \$140,000 compared to the no-action alternative. These expenditures could result in moderate to major, short-term, beneficial impacts for individual firms and employees (increased business and profits, increased employment opportunities, increased income, etc.). Overall impacts on the regional economy (effects on the economic indicators of income, unemployment rate, poverty rate, etc.), however, would be negligible because of the size and the phasing of the projects over the next 15 to 20 years.

Moving park functions and visitor contact facilities outside the park may increase the numbers of visitors that stop in gateway towns. This may result in additional tourism related spending for locally provided goods and services within the region and gateway towns perhaps increasing business opportunities, income, and employment. On the other hand, reduced access to the park may reduce the numbers of visitors that come to the park, perhaps negatively affecting the gateway communities and the regional tourism related businesses.

Moving administrative functions and park employee housing outside the parks would result in the purchase or long-term lease of land and the construction of buildings in local gateway areas, with short-term, beneficial impacts on the local economy, mostly affecting the construction sector and a few landowners.

The need for additional staff may increase the need for housing; this, combined with the increasing desirability of living in the gateway communities adds to the demand for local housing and other locally provided goods. Hiring additional staff results in a small increase in the local population that contributes to the overall growth in the gateway communities.

UNAVOIDABLE ADVERSE EFFECTS

Concession activities would also change in the winter to accommodate snowcoach access to the park, requiring a year-round maintenance responsibility. These changes would result in a moderate adverse impact on concession operations. The negligible

and minor impacts are described in the foregoing analysis.

RELATIONSHIP OF SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The vast majority of the park would be protected in a natural state and would maintain its long-term productivity. The short-term disturbance of soils, vegetation, and wildlife habitat from removing facilities and rehabilitating disturbed areas would be offset by the increased long-term protection of soils and restoration of vegetation and wildlife habitat.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

Construction and restoration materials and energy used would be irretrievably lost. There would also be an irretrievable and irreversible commitment of resources in terms of funds expended on both labor and materials.

