



Hidden Cove on Diablo Lake.

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# WELCOME

**Y***ou are now in the Environmental Consequences Chapter. Here are the topics you can read about:*

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**Terms and Definitions**

**Cumulative Impacts**

**Impairment of Resources**

**Methods and Assumptions for Analyzing Impacts**

**Impacts from Alternative A (No Action)**

**Impacts from Alternative B (Preferred Alternative)**

**Impacts from Alternative C**

**Impacts from Alternative D**

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# CHAPTER 6: ENVIRONMENTAL CONSEQUENCES

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*The National Environmental Policy Act (NEPA) requires that environmental documents discuss the environmental impacts of a proposed federal action, feasible alternatives to that action, and any adverse environmental effects that cannot be avoided if a proposed action is implemented. In addition, the effects on historic properties are considered in accordance with the National Historic Preservation Act (NHPA). In this case, the proposed federal action would be the adoption of a general management plan for Ross Lake National Recreation Area.*

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The alternatives in this general management plan provide broad management direction. Thus, this environmental impact statement should be considered a programmatic document. If and when specific developments or actions are proposed subsequent to this general management plan for implementation, appropriate detailed environmental and cultural compliance documentation would be prepared in accord with NEPA and NHPA requirements. Those actions that implement guidance provided in the GMP may tier from this EIS.

This chapter begins with a discussion on terms and definitions used for determining environmental consequences, followed by a discussion on policy related to cumulative impacts, a description of the projects that make up the cumulative impact scenario, and finally a discussion on impairment. The second part of this chapter describes the methods and assumptions used for analyzing each impact topic. The impacts of the alternatives are then analyzed by alternative in the order they appeared in the “Alternatives” Chapter 4. Each impact topic includes a description of the impact of the alternative, a discussion of cumulative effects, and a conclusion. Where data are limited, professional judgment has been used to project environmental impacts. Professional judgment was based, in part, on observation, analysis of conditions, and responses in similar areas.

At the end of the impacts 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. The impacts of each alternative are also briefly summarized in the “Summary of Impacts” chart at the end of the “Alternatives” Chapter 4.

## TERMS AND DEFINITIONS

The following section defines the terms used for determining the environmental consequences of the actions in the alternatives. The environmental consequences to each impact topic are defined based on impact type, intensity, and duration, and whether the impact would be direct or indirect. Cumulative effects are also identified.

### Impact Type

The effects that an alternative would have on an impact topic could be either adverse or beneficial. Adverse impacts involve a change that moves the resource away from a desired condition or detracts from its appearance or condition. Beneficial effects are those that involve a positive change in the condition or appearance of a resource or a change that moves the resource toward a desired condition. In some cases, the action could result in both adverse and beneficial effects for the same impact topic.

### Intensity

Defining the intensity or magnitude on an impact is taken directly from Director’s Order 12: Conservation Planning, Environmental Impact Analysis and Decision-making (National Park Service 2001). Impact intensity is the magnitude or degree to which a resource would be beneficially or adversely affected. Each impact was identified as negligible, minor, moderate, or major. Because definitions of intensity vary by topic, separate intensity definitions are provided for each impact topic in the methodology section. Due to the broad nature of actions called for in this GMP, most intensity findings were expressed qualitatively.

### Duration

Duration refers to how long an impact would last. The planning horizon for the GMP is approximately 15 to 20 years. Unless otherwise stated, 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 one year or less, such as the 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 construction of a new facility. Although an impact may only occur for a short duration at one time, if it occurs regularly over a longer period of time the impact may be considered to be a long-term impact. For example, the noise from a vehicle driving on a road would be heard for a short time and intermittently, but because vehicles would be driving the same road throughout the 20-year life of the plan, the impact on natural soundscape would be considered to be long-term.

## Direct versus Indirect Impacts

Direct effects would be caused by an action and would occur at the same time and place as the action. Indirect effects would be caused by the action and would be reasonably foreseeable but would occur later in time, at another place, or to another resource.

## CUMULATIVE IMPACTS

Cumulative impacts result from the incremental impact of an action when added to other past, present, and reasonable foreseeable future action, regardless of what agency or person undertakes such other action. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time.

Cumulative impacts are considered for all impact topics and alternatives. The National Park Service assumes the types of use that are occurring now would continue, but there may be new or different future uses. These actions are evaluated in conjunction with the impacts of each alternative to determine if they have any cumulative effects on a particular resource. For most of the impact topics, the geographic area defined for the analysis was Ross Lake NRA. In some cases, the area of consideration was the Pacific Northwest.

To determine potential cumulative impacts, projects in the area surrounding the park were identified. Projects included in this analysis were identified

by examining other existing plans and by calls to local governments and to state and federal land managers. Projects identified for the purposes of cumulative impact analyses are past actions, plans or actions that are currently being implemented, and reasonable foreseeable future plans or actions. These projects were considered regardless of what agency, organization, or person undertakes them. Projects included in the cumulative impact analysis do not affect all resources equally.

The following land uses, operations and management actions make up the cumulative impact scenario:

- Continued operation of Skagit Hydroelectric Project
- Continued maintenance of North Cascades Highway
- Seattle City Light Proposed Gorge Second Tunnel
- History of Land Use – Mining (some continued)
- Development patterns and trends throughout the Greater North Cascades ecosystem, including population growth predictions
- Human-forced climate change scenarios

## IMPAIRMENT OF RESOURCES

In addition to determining the environmental consequences of the alternatives, NPS policies (Interpreting the National Park Service Organic Act, Management Policies 2006) require that potential effects be analyzed to determine whether or not proposed actions would impair the resources or values of Ross Lake NRA. An evaluation of impairment is not required for topics related to visitor use and experience, operations, or the socioeconomic environment.

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 resources and values. NPS managers must seek ways to avoid or minimize adverse impacts on the resources and values to the greatest degree practicable. However, laws do give the NPS management discretion to allow impacts on the resources and values when necessary and appropriate to fulfill the purposes of a unit, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the NPS this management discretion, it is limited by the statutory requirement that the NPS must leave the

resources and values unimpaired unless a particular law directly and specifically provides otherwise. Impairment is an impact that in the professional judgment of the NPS manager would harm the integrity of the resources and values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. An impact on any resource or value may constitute impairment. An impact would be most likely to constitute impairment if 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 unit or to opportunities for enjoyment of the unit; or
- identified as a goal in the general management plan or other relevant NPS planning documents.

Impairment might result from NPS activities in managing a unit, visitor activities, or activities undertaken by concessionaires, contractors, and others operating in Ross Lake NRA. Actions that occur outside NRA boundaries could cause impairment, but these actions would not be a violation of the Organic Act unless the National Park Service was in some way responsible for the action. In this chapter, a determination about impairment is presented in the conclusion section for each required impact topic related to the unit's resources and values. When it is determined that action(s) would have a moderate to major adverse effect, a justification for non-impairment is made. Impacts of only negligible or minor intensity would by definition not result in impairment.

## METHODS AND ASSUMPTIONS FOR ANALYZING IMPACTS

The planning team based the impact analysis and the conclusions in this chapter largely on the review of existing literature and studies, information provided by experts in the National Park Service and other agencies, and park staff insights and professional judgment. The team's method of analyzing impacts is further explained below. Impacts have been assessed assuming that mitigation measures, as described in Chapter 2, would be implemented. If mitigation measures were not applied, the potential for resource impacts and the magnitude of those impacts would increase.

The impact analyses for the No Action Alternative compare resource conditions throughout the life of the plan to existing conditions, based on the continuation of current management. The impact analysis for the action alternatives (alternatives B, C and D) compare the action alternative to the no-action. In other words, the impacts of the action alternatives describe the difference between no-action and implementing the action alternatives. To understand a complete "picture" of the impacts of implementation any of the action alternatives, the reader must also take into consideration that impacts would occur under the No Action Alternative.

## Natural Resources

Analysis of natural resources was based on research, knowledge of park resources, and the best professional judgment of planners, biologists, geologists, hydrologists, and botanists who have experience with similar types of projects. Information on Ross Lake NRA's natural resources was gathered from several sources, including maps, satellite imagery of vegetation, and assorted resource inventories. As appropriate, additional sources of data are identified under each topic heading.

This impact analysis evaluated impacts to various natural resources including Air, Water, Geology, Vegetation, Fish and Wildlife (including special status species). This analysis is based upon the following assumptions:

- Except for sensitive species, the distinction between beneficial and adverse impacts in this document is a value judgment based upon the causal agent or source of effect. Beneficial impacts would be associated with management actions that benefit or otherwise promote native ecosystem functions, values and processes. In contrast, adverse impacts would be associated with impacts from management actions that manipulate or influence natural ecosystem functions and processes.
- Impacts to sensitive or listed species would be considered beneficial to those species if they reduce the potential for harm to those species or their habitats. In some instances, adverse impacts to native ecosystem functions, values and processes could result in beneficial impacts to sensitive species, or vice versa.
- This analysis assumes a 15-20 year lifespan for the general management plan.

- The human population of the Greater Puget Sound metropolitan area has doubled from 2 million to 4 million since 1960, and population in the greater Puget Sound metropolitan area is anticipated to increase by approximately 1 million people in the next 15 to 20 years (Puget Sound Partnership, 2008). Accurate visitation trends for Ross Lake NRA have been difficult to assess due to unreliable data; however, available information suggest park visitation has remained relatively stable between 1991 and 2003. Given this information it is assumed that visitation trends could fluctuate and while visitation could remain relatively flat, it is reasonable to assume that visitation could increase relatively proportionate to population growth for the purpose of this analysis.
- North Cascades is a very dynamic environment, routinely affected by various natural events including, but not limited to severe weather, flooding, avalanches, rockfall, wildfire and landslides. These events routinely damage park roads, campgrounds and facilities, and disrupt visitor use. They are also fundamental components of natural ecosystem functions and values. It is assumed that these events would increase slightly in frequency and intensity for the next 15-20 years in response to human-forced climate change.
- Direct and indirect impacts to the natural resources of Ross Lake NRA would generally result from human activities related to (1) general visitor use and enjoyment of the area; (2) park management and operations intended to provide for visitor use and conserve the resources and values of the unit; and (3) activities associated with other administrative uses of the area including Seattle City Light's operation of the hydroelectric facilities and the Washington Department of Transportation in their maintenance of the North Cascades Highway (State Route 20).
- Seattle City Light will continue to operate and manage the Skagit River and Newhalem Creek hydroelectric projects in accordance with the FERC license terms and conditions, however, the project boundary for the Skagit River hydroelectric project may expand to accommodate the proposed Gorge Tunnel II project, and the project may be constructed within the timeframe of the plan.
- The North Cascades Highway will continue to remain closed during the peak winter months due to heavy snow and avalanche dangers.
- Climate change may result in higher peak flows, less snow pack, earlier spring runoff and lower summer flows; however, some of these projected effects may not materialize within the 15-20 year timeframe of this plan.
- Extreme natural phenomena such as periodic flooding, landslides, and wildfire will continue at current frequency and intensity.

Where possible, map locations of sensitive resources were compared with the locations of existing developments and proposed modifications, including management zoning. Predictions about short-term and long-term site impacts were based on previous studies of visitor and facilities development impacts on natural resources.

Impacts were predominately assessed qualitatively, given the programmatic nature of this document and consistent with the level of detail provided in the alternatives. However, when possible, impacts were assessed with quantitative data and analysis.

#### Air Resources

The area of consideration for this impact topic is the North Cascades NPS Complex. Impacts on the park's air quality would be based on anticipated changes from baseline conditions and national ambient air quality standards. The thresholds of change for the intensity of an impact are as follows.

**Negligible:** There would be no perceptible visibility impacts caused by anthropogenic air pollutants. The first highest three-year maximum for each criteria pollutant would be less than the national ambient air quality standards for criteria air pollutants.

**Minor:** There would be slightly perceptible visibility impacts on less than 180 days per year caused by anthropogenic air pollutants. The first highest three-year maximum for each pollutant would be less than the national standards.

**Moderate:** There would be moderately perceptible visibility impacts on less than 180 days per year or slightly perceptible visibility impacts on 180 days or more per year caused by anthropogenic air pollutants. The first highest three-year maximum for each criteria pollutant could be greater than national standards.

**Major:** There would be highly perceptible visibility impacts on 180 or more days per year caused

by anthropogenic air pollutants. The first highest three-year maximum for each criteria pollutant would be greater than national standards.

## Natural Soundscapes

The area of consideration for this topic is Ross Lake NRA. Context, time, and intensity together determine the level of impact for an action or activity. Noise for a certain period and intensity would be a greater impact in a highly sensitive context, and a given intensity would be a greater impact if it occurred more often, or for longer duration. For example, in very low level ambient soundscapes, like the wilderness, noises can be much more audible, thereby having greater impact intensities. It is usually necessary to evaluate all three factors together to determine the level of noise impact.

**Negligible:** Noise would rarely be greater than natural ambient sound levels, and/or there would usually be lengthy periods of time each day between noise events. Noise in a specific area would rarely result in a value for any noise metric that is more than a very small increment above the value for natural ambient sounds in the same area. Natural sounds would predominate.

**Minor:** Noise would be greater than natural ambient sound levels for a small portion of the day, and/or there would often be substantial periods of time each day between noise events. Noise in a specific area would rarely result in a value for any noise metric that is more than a small increment above the value for natural ambient sounds in the same area.

**Moderate:** Noise would be greater than natural ambient sound levels for an intermediate portion of the day, and/or there would rarely be more than intermediate periods of time each day between noise events. Noise in a specific area would rarely result in a value for any noise metric that is more than an intermediate increment above the value for natural ambient sounds in the same area

**Major:** Noise would be greater than natural ambient sound levels for a large portion of the day, and/or there would rarely be more than short periods of time each day between noise events. Noise in a specific area would often result in a value for a noise metric that is more than an

intermediate increment above the value for natural ambient sounds in the same area.

## Water Quality

The area of consideration for this topic is the surface waters of Ross Lake NRA. Potential impacts from management actions are based on professional judgment and experience with similar actions. The thresholds of change for the intensity of an impact are as follows.

**Negligible:** Impacts (chemical, physical, or biological effects) would not be detectable, would be well below water quality standards or criteria, and would be within historical or desired water quality conditions.

**Minor:** Impacts (chemical, physical, or biological effects) would be detectable, but would be well below water quality standards or criteria and within historical or desired water quality conditions.

**Moderate:** Impacts (chemical, physical, or biological effects) would be detectable, but would be at or below water quality standards or criteria; however, historical baseline or desired water quality conditions would be altered on a short-term basis.

**Major:** Impacts (chemical, physical, or biological effects) would be detectable and would be frequently altered from the historical baseline or desired water quality conditions; and/or chemical, physical, or biological water quality standards or criteria would be slightly and singularly exceeded on a short-term basis.

## Hydrologic Systems and Processes (Surface Hydrology, Wetlands, Floodplains)

The area of consideration for this topic is surface waters within Ross Lake NRA. Available information on surface hydrologic systems including surface hydrology, wetlands, and floodplains in Ross Lake NRA was compiled. While an additional Wetland Statement of Findings will be considered if management actions require the dredging of lacustrine wetlands, potential impacts from other management actions are included in this EIS and are based on professional judgment and experience with similar actions. The thresholds of change for the intensity of an impact are as follows.

**Negligible:** Effects on hydrologic systems would be at or below the level of detection, would occur in a small area, and the changes would be so small that they would not be of any measurable or perceptible consequence.

**Minor:** Effects on hydrologic systems would be detectable, but localized, small, and of little consequence.

**Moderate:** Effects on hydrologic systems would be readily detectable and have localized consequences or a measurable change to a hydrologic system

**Major:** Effects would be obvious and would have widespread, substantial consequences on hydrologic systems that would result in either a severely adverse or major beneficial impact with regional consequences.

### **Geologic Resources and Processes, including Soils**

The area of consideration for this topic is Ross Lake NRA. Available information on surface geologic resources and processes, including soils, in Ross Lake NRA was compiled. Potential impacts from management actions are based on professional judgment and experience with similar actions. The thresholds of change for the intensity of an impact are as follows.

**Negligible:** An action that could result in a change to a geologic feature or process, but the change would be so small that it would not be of any measurable or perceptible consequence.

**Minor:** An impact that could result in a change to a geologic feature or process, but the change would be small and localized and of little consequence.

**Moderate:** An action that would result in a change to a geologic feature or process; the change would be measurable and of consequence.

**Major:** An action that would result in a noticeable change to a geologic feature or process; the change would be measurable and the level of disturbance would be severe.

### **Vegetation**

The area of consideration for this topic is Ross Lake NRA. Available information on vegetation in Ross

Lake NRA was compiled. Potential impacts from management actions are based on professional judgment and experience with similar actions. The thresholds of change for the intensity of an impact are as follows.

**Negligible:** The impact of vegetation (individuals or communities) would not be measurable. The abundance or distribution of individuals would not be affected or would be slightly affected. Ecological processes and biological productivity would not be affected.

**Minor:** An action would not necessarily decrease or increase an area's overall biological productivity. An action would affect the abundance or distribution of individuals in a localized area but would not affect the viability of local or regional populations or communities.

**Moderate:** An action would result in a change in overall biological productivity in a small area. An action would affect a local population sufficiently to cause a change in abundance or distribution, but it would not affect the viability of the regional population or communities. Changes to ecological processes would be of limited extent.

**Major:** An action would result in a change in overall biological productivity in a relatively large area. An action would affect a regional or local population of a species sufficiently to cause a change in abundance or in distribution to the extent that the population or communities would not be likely to return to its/their formal level (adverse), or would return to a sustainable level (beneficial). Key ecological processes would be altered.

### **Wildlife and Wildlife Habitat**

The area of consideration for this topic is Ross Lake NRA. Impacts on wildlife are closely related to the impacts on habitat. The evaluation considered whether actions would be likely to displace some or all individuals of a species in the park or would result in loss or creation of habitat conditions needed for the viability of local or regional populations. Available information on wildlife and wildlife populations was compiled. Predictions about short- and long-term impacts were based on previous studies of impacts to natural resources and recent monitoring data from the park. The thresholds of change for the intensity of an impact are as follows.



**Negligible:** Effects on wildlife would be at or below the level of detection, would be short term, and the changes would be so slight that they would not be of any measurable or perceptible consequence to the species' population.

**Minor:** Effects on wildlife would be detectable, but localized, small, and of little consequence to the species' population. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

**Moderate:** Effects on wildlife would be readily detectable but localized, with consequences at the population level. Mitigating measures, if needed to offset adverse effects, would be extensive and likely successful.

**Major:** Effects on wildlife would be obvious and would result in substantial consequences to the wildlife populations at the regional level. The change would result in a severely adverse or major beneficial impact, and possible permanent consequence on the species. Extensive mitigating measures would be needed to offset any adverse effects and their success would not be guaranteed.

## Aquatic Organisms

The area of consideration for this topic is Ross Lake NRA. Available information on aquatic organisms in Ross Lake NRA was compiled. Potential impacts from management actions are based on professional judgment and experience with similar actions. Predictions about short- and long-term impacts were based on previous studies of impacts to natural resources and recent monitoring data from the park. The thresholds of change for the intensity of an impact are as follows.

**Negligible:** Effects on aquatic organisms would be at or below the level of detection, would be short term, and the changes would be so slight that they would not be of any measurable or perceptible consequence to the species' population

**Minor:** Effects on aquatic organisms would be detectable, but localized, small, and of little consequence to the species' population. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

**Moderate:** Effects on aquatic organisms would be readily detectable but localized, with consequences at the population level. Mitigating measures, if needed to offset adverse effects, would be extensive and likely successful

**Major:** Effects on aquatic organisms would be obvious and would result in substantial consequences to the wildlife populations at the regional level. The change would result in a severely adverse or major beneficial impact, and possible permanent consequence on the species. Extensive mitigating measures would be needed to offset any adverse effects and their success would not be guaranteed.

## Special Status Species

The area of consideration for this topic is suitable and known occupied habitat in the North Cascades NPS Complex. Information on threatened, endangered, candidate species, and species of general concern was gathered from responsible agencies, research, and specialists. Known locations of habitat associated with threatened, endangered, candidate species, and species of special concern were compared with locations of development and facilities, and modifications of existing facilities.

In accordance with standard terminology used to describe effects on threatened and endangered species under the federal Endangered Species Act (USFWS 1998), potential effects on special status species are categorized as follows:

*No effect* – The proposed actions would not affect special status species or critical habitat.

*May affect / not likely to adversely affect* – The effects on special status species would be extremely unlikely to occur and could not be meaningfully measured, detected, or evaluated or they would be completely beneficial.

*May affect / likely to adversely affect* – Any adverse effect to listed species that might occur as a direct or indirect result of proposed actions, and the effect would not be discountable or would be beneficial.

*Is likely to jeopardize proposed species / adversely modify proposed critical habitat* – The appropriate conclusion when the National Park Service or the U.S. Fish and Wildlife Service identifies situations in which an action could jeopardize the continued existence of a proposed species or adversely modify critical habitat to a species within or outside park boundaries.

The thresholds of change for the intensity of an impact are defined as follows.

**Negligible:** The action would have no measurable effect to a listed species, suitable, potential, or critical habitat, resulting in a no effect determination.

**Minor:** The effects of the alternative would be discountable (extremely unlikely to occur), insignificant (not able to be meaningfully measured, detected, or evaluated), or completely beneficial. Any change would be small and localized and of little consequence, and result in a “not likely to adversely affect” determination and require informal consultation with the U.S. Fish and Wildlife Service.

**Moderate:** An action that would result in some change to a population or individuals of a species or designated critical habitat. The change would be measurable and of consequence but would most likely result in a “not likely to adversely affect” determination and require informal consultation with the U.S. Fish and Wildlife Service.

**Major:** An action that would result in a noticeable change to a population or individuals of a species or designated critical habitat. Any adverse effect to the species that may occur as a direct or indirect result of the alternative and the effect is not discountable, insignificant, or completely beneficial. Incidental take is anticipated to occur as a result of the action. The change would result in a “likely to adversely affect” determination and require formal consultation with the U.S. Fish and Wildlife Service.

## Cultural Resources

### National Register Eligible Properties

Potential impacts to those resources listed or eligible for listing in the National Register of Historic Places were identified and evaluated. The categories considered include archeological resources, cultural landscapes, museum collections, and historic structures. The cultural resources section also includes discussion on tribal issues and ethnohistory, even though these resources are not eligible for listing in the National Register. Evaluation was done in accordance

with the Advisory Council on Historic Preservation’s regulations implementing Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800, Protection of Historic Properties). This evaluation was done by (1) determining the area of potential effects; (2) identifying cultural resources in the area of potential effects that are listed in or eligible for listing in the National Register; (3) applying the criteria of adverse effect to affected resources; and (4) considering ways to avoid, minimize or mitigate adverse effects. Information used in this assessment was obtained from relevant literature and documentation, maps, and consultation with cultural resource professionals, as well as from interdisciplinary team meetings, field trips, and site visits.

Under the regulations of the Advisory Council on Historic Preservation, a determination of *adverse effect* or *no adverse effect* must be made for affected National Register-listed or National Register-eligible cultural resources. An adverse effect occurs whenever an action alters, directly or indirectly, any of the characteristics of a cultural resource that qualify it for inclusion in the National Register; that is, the action diminishes the integrity of the resource’s location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by the alternative that would occur later in time, be farther removed in distance, or be cumulative (36 CFR 800.5(a)(1)). A determination of no adverse effect means there is an effect, but the effect would not meet the criteria of adverse effect (36 CFR 800.5(b)).

The thresholds of change for the intensity of an impact are defined as follows.

**Negligible:** The effects on cultural resources would be at the lowest levels of detection, barely measurable without any perceptible consequences, either beneficial or adverse to cultural landscape resources, historic structures, or archeological resources. For the purposes of Section 106 and the National Historic Preservation Act, the determination of effect would be no adverse effect.

**Minor:** The effects on cultural resources would be perceptible or measurable, but would be slight and localized within a relatively small area. The action would not affect the character or diminish the features of a NRHP eligible or listed cultural landscape, historic structure, or archeological site, and it would not have a

permanent effect on the integrity of any such resources. For the purposes of Section 106 and the National Historic Preservation Act, the determination of effect would be no adverse effect.

**Moderate:** The effects would be perceptible and measurable. The action would change one or more character-defining features of a cultural resource, but would not diminish the integrity of the resource to the extent that its NRHP eligibility would be entirely lost. For the purposes of Section 106 and the National Historic Preservation Act, the cultural resources' NRHP eligibility would be threatened and the determination of effect would be adverse effect.

**Major:** The effects on cultural resources would be substantial, discernible, measurable, and permanent. For NRHP eligible or listed cultural landscapes, historic structures, or archeological sites, the action would change one or more character-defining features, diminishing the integrity of the resource to the extent that it would no longer be eligible for listing in the National Register. For purposes of Section 106, National Register eligibility would be lost and the determination of effect would be adverse effect.

The relationships between definitions of effects, including beneficial effects, and treatments of cultural resources, are analyzed in the impact analysis for each of the alternatives. Levels of beneficial effect are not directly linked to specific types of treatments; rather they depend on the particular treatment of given cultural resources. All treatments proposed under all of the alternatives would be in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*. All treatments proposed under all of the alternatives would have no adverse effect on known cultural resources.

### Ethnographic Resources

The intensity of potential impacts on ethnographic resources that are not traditional cultural properties is described below:

**Negligible:** Impact(s) would be barely perceptible and would neither alter resource conditions, such as traditional access or site preservation, nor

the relationship between the resource and the affiliated group's body of practices and beliefs.

**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 the relationship between the resource and the affiliated group's body of practices and beliefs.

**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.

**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.

**Beneficial impact — would allow access to and/or accommodate a group's traditional practices or beliefs.**

### Museum Collections

Museum collections (prehistoric and historic objects, artifacts, works of art, archival documents, and natural history specimens) are generally ineligible for listing in the National Register, and are not subject to Section 106 of the National Historic Preservation Act. The intensity of impacts on museum collections is defined as follows:

**Negligible:** Impact is at the lowest levels of detection, barely measurable with no perceptible consequences, either adverse or beneficial, to museum collections.

**Minor:** Adverse impact — would affect the integrity of 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.

## Wilderness Character

Working from definitions included in the Wilderness Act, and included in NPS Management Policies 2006, and the tradition of wilderness preservation and management at Ross Lake NRA and the North Cascades NPS Complex, the following wilderness characteristics have been identified for consideration in this analysis.

- The earth and its community of life are untrammelled by humans, where humans are visitors and do not remain.
- The area is undeveloped and retains its primeval character and influence without permanent improvements or human habitation.
- The area generally appears to have been affected primarily by the forces of nature, with the imprint of humans' work substantially unnoticeable.
- The area is protected and managed so as to preserve its natural conditions.
- The area offers outstanding opportunities for solitude or a primitive and unconfined type of recreation.

Impacts on natural and cultural resources, visitor access, soundscape, night sky, and other resources are evaluated elsewhere in the environmental consequences section. The analysis for this topic focuses on wilderness character and wilderness experience, which are integrally related because much of wilderness character can only be subjectively

determined by the visitor's experience (for example, solitude or freedom of movement).

The thresholds of change for the intensity of an impact are as follows:

**Negligible:** Impacts would not be detectable to most visitors and would have no discernible effect on wilderness character or experience.

**Minor:** Impacts would be slightly detectable to some visitors but would not be expected to have an overall effect on wilderness character or experience.

**Moderate:** Impacts would be clearly detectable by many visitors and could have an appreciable effect on wilderness character or experience.

**Major:** Impacts would have a substantial and noticeable effect for most visitors on wilderness character or experience and could permanently alter various aspects of the visitor experience.

## Wild and Scenic River

The impact analysis evaluates how well each alternative would protect and enhance outstandingly remarkable values for designated and eligible wild and scenic rivers. Outstandingly remarkable values include scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values or features.

Impacts are evaluated on a segment-wide basis in terms of whether they would be beneficial or adverse to outstandingly remarkable values that have been defined for a river segment. Beneficial impacts would result from actions that protect and enhance these values, while adverse impacts would result from actions that reduce those values. The duration of the impact considers whether the impact would be temporary and/or associated with transitional types of activities or if the impact would occur over a long period and affect the protection and enhancement of outstandingly remarkable values.

The thresholds of change for the intensity of an impact are as follows:

**Negligible:** Impacts would not be detectable to most visitors and would have no discernible effect on a river's outstandingly remarkable values.

**Minor:** Impacts would be slightly detectable to some visitors but would not be expected to have

an overall effect on a river's outstandingly remarkable values.

**Moderate:** Impacts would be clearly detectable by many visitors and could have an appreciable effect on a river's outstandingly remarkable values.

**Major:** Impacts would have a substantial and noticeable effect on most visitors or on a river's outstandingly remarkable values.

## Visitation

The impact analysis evaluates how visitation might vary between alternatives as a result of applying proposed actions and different management zones in the alternatives. The analysis is qualitative rather than quantitative because of the conceptual nature of the alternatives. Professional judgment was used to reach reasonable conclusions as to the intensity, duration, and type of potential impact. Impacts could be temporary or short-term (for example, delays and inconvenience caused by the construction of facilities) or long-term.

The thresholds of change for the intensity of an impact are as follows:

**Negligible:** The impact would be barely detectable, would not occur in primary visitor destination areas, or would affect few visitors.

**Minor:** The impact would be slight but detectable, would not occur in primary visitor destination areas, or would affect few visitors.

**Moderate:** The impact would be readily detectable, would occur in primary visitor destination areas, or would affect many visitors.

**Major:** The impact would be severely adverse or exceptionally beneficial, would occur in primary visitor destination areas, or would affect the majority of visitors.

## Visitor Opportunities

The impact analysis evaluates how visitor opportunities might vary between alternatives as a result of applying proposed actions and different management zones in the alternatives. The analysis is qualitative rather than quantitative because of the conceptual nature of the alternatives. Professional

judgment was used to reach reasonable conclusions as to the intensity, duration, and type of potential impact. Impacts could be temporary or short-term (for example, delays and inconvenience caused by the construction of facilities) or long-term.

The following areas have been analyzed in this section:

- **Recreation Opportunities:** this section analyzes the recreational opportunities for visitors in each alternative and includes opportunities along the North Cascades Highway, land- and trail-based recreation opportunities, and water-based recreation opportunities.
- **Visitor Recreation Facilities and Services:** this section analyzes the different recreational facilities and services available to visitors in each alternative, including visitor and information centers; campground facilities; trails and boat launches; picnic areas; and services including permits, reservations and fees.
- **Commercial Services and Facilities:** this section analyzes commercial services and facilities available to visitors in each alternative such as guide services and commercial lodging.

The thresholds of change for the intensity of an impact are as follows:

**Negligible:** Impacts would be barely detectable to the visitor and expected to have no discernable effect related to recreation opportunities, visitor facilities and services.

**Minor:** Impacts would be slightly detectable to the visitor, though not expected to have an overall effect on the visitor experience related to recreation opportunities, visitor facilities and services.

**Moderate:** Impacts would be clearly detectable to the visitor and could have an appreciable effect on the visitor experience related to recreation opportunities, visitor facilities and services.

**Major:** Impacts would be have substantial, highly noticeable influence on the visitor experience and could permanently alter access to and availability of various aspects of the visitor experience related to recreation opportunities, visitor facilities and services.

## Interpretation and Education

This section analyzes two aspects of the visitor experience: interpretation (which includes the elements of visitor information and orientation) and education. These two visitor experience components evaluate opportunities for and quality of visitor information, orientation, as well as interpretive and educational experiences. Impact analysis was based on whether there would be a change in the access to quality and diversity of media and programs throughout Ross Lake NRA in order to achieve the desired conditions called for by the alternatives.

This assessment focused on the intensity and duration of impacts that would result from the proposed actions in the plan relative to the aspects of the visitor experience related to interpretation and education, and whether those impacts were considered beneficial or adverse. The assessment specifically evaluated whether there were changes in the characteristics or quality of the experience.

The thresholds of change for the intensity of an impact are as follows:

**Negligible:** Impacts would be barely detectable to the visitor and expected to have no discernable effect related to interpretation and education opportunities.

**Minor:** Impacts would be slightly detectable to the visitor, though not expected to have an overall effect on the visitor experience related to interpretation and education opportunities.

**Moderate:** Impacts would be clearly detectable to the visitor and could have an appreciable effect on the visitor experience related to interpretation and education opportunities.

**Major:** Impacts would be have substantial, highly noticeable influence on the visitor experience and could permanently alter access to and availability of various aspects of the visitor experience related to interpretation and education opportunities.

## Access and Transportation

The impact analysis evaluates how each alternative would change access and visitation and the capacity of roads and facilities in Ross Lake NRA to accommodate that change. Access addresses the distribution of

visitors in Ross Lake NRA as well as access points and access options (motorized and non-motorized) to areas in Ross Lake NRA. Beneficial impacts would be associated with a decrease in the level of visitor congestion. Adverse impacts would be associated with the actions that reduce access to an area or increase the level of congestion.

The thresholds of change for the intensity of an impact are as follows:

**Negligible:** The effects would not be detectable and would have no discernable effect on the condition of roads and trails and/or traffic flow.

**Minor:** The effect would be slightly detectable, but there would not be an overall effect on the condition of roads and trails and/or traffic flow.

**Moderate:** Impacts would be clearly detectible, and the action could have an appreciable effect on the condition of roads and trails and/or traffic flow.

**Major:** Impacts would be substantial, with a highly noticeable influence, and the condition of roads and trails and/or traffic flow could be permanently altered.

## Socioeconomics

Economic effects are commonly expressed in terms of the number and types of jobs supported, changes in income, the number of visitors to the recreation area, and the resulting changes in local tourism spending. Less well-defined economic effects include the indirect effects from ongoing NPS operations and the effects on local government fiscal conditions. Examples of social impacts include effects on regional population growth and land use.

Socioeconomic impacts were determined based on applied logic, professional expertise, and professional judgment. The approach to these issues was based on the following factors directly related to implementation of the general management plan:

- estimated costs of building new facilities and infrastructure
- changes in the number of NPS staff and federal spending to operate the recreation area
- changes in the number of visitors to the recreation area
- changes in recreation area boundaries

Indirect consequences of these four factors, such as impacts on traffic, were also considered.

Costs were estimated using the best available tools for this level of detail, including estimates based on comparable projects and cost estimating calculators using RS Means data. Future staffing levels and operating costs were estimated by the project team. Actual future costs could be different than the estimates in this analysis because they would be based on future NPS policies, operations and maintenance policies adopted at the recreation area, and budgets approved by Congress for the NPS in general, or Ross Lake NRA specifically.

Projected visitor use was generally estimated as increasing or decreasing based on proposed visitor opportunities for each alternative.

Economic impacts associated with the GMP alternatives are assessed in terms of type/character of impact, duration, and scale/intensity. These three parameters are defined below.

This analysis relies on qualitative analysis of the impacts of each alternative, as actual visitor numbers are not estimated, spending values are for comparison only, and influence area data was mainly available at the broad county and regional district level. The three U.S. counties and one Canadian regional district were defined as the influence area for this analysis. Impacts of the alternatives are generally negligible to minor on the influence area. However, since Skagit and Whatcom Counties are much more densely populated in their western portions, the data is somewhat skewed. The area where the recreation area is located is less densely populated, and therefore changes in the number of jobs, personal incomes, business revenues, vacancy, and traffic all have greater impacts on the local area than they do on the influence area. Since consistent data was not obtainable in the immediately local area, the analysis was mostly done in the influence area, with some analysis done in the local area where noted. The local area is generally the closest towns to the recreation area, including Marblemount, Rockport, Concrete, Hope, Mazama, and Winthrop.

Beneficial impacts result in generally recognized improvements to established social and economic environment, or can be recognized as improvements to specific sectors and stated as such. Adverse impacts are those effects that are generally recognized to diminish the established social and economic

environment, or diminish the environment for particular sectors and stated as such.

Indeterminate effects are those for which the size, timing, location, or individuals or groups that would be impacted cannot be determined, or those that include both beneficial and negative effects—in some instances affecting different communities—such that the net effect is indeterminate.

Short-term effects are those that occur during and in response to the planning, design, construction, and major maintenance of buildings, trails, parking lots, and other improvements associated with federal spending. These effects diminish or disappear after the project is completed. “Short-term” may also describe the first or early response in social or economic conditions to more fundamental changes in recreation area management and operations and to changes in visitor use, but which give way to broader changes over time. Generally, “short-term” describes those effects that may last up to 5 years.

Long-term effects are those that last longer than 5 years, including some that may not begin until after completion of direct activities associated with the initial federal government spending or changes in management.

The thresholds of change for the intensity of an impact are defined as follows:

**Negligible:** Negligible effects would be below detectable levels or detectable only through indirect means and would have no discernible effect on the character of the social and economic environment.

**Minor:** Minor effects would be detectable, but localized in geographic extent or size of population affected and would not be expected to alter the character of the established social and economic environment.

**Moderate:** Moderate effects would be readily detectable across a broad geographic area or segment of the community and could have an appreciable effect on the social and economic environment.

**Major:** Major effects would be readily apparent, affect a large segment of the population, extend across an entire community or influence area and likely would have a substantial effect on the social and economic environment.

## Park Operations

Park management and operations refers to the current management structure of the park to provide policy direction for the protection, public use, and appreciation of the park, and the ability of the current staff to adequately protect and preserve vital resources and provide for an effective visitor experience.

The discussion of impacts on park management, operations, and staffing focuses on the type of management structure, the amount of staff available to ensure public safety, and the ability of the staff to protect and preserve resources given current funding and staffing levels.

Staff knowledgeable about the management of the park were consulted to evaluate the impacts of implementing each alternative.

The thresholds of change for the intensity of an impact are defined as follows:

**Negligible:** The effect would be at or below the lower levels of detection, and would not have an appreciable effect on park management and operations.

**Minor:** The effects would be detectable, but would be of a magnitude that would not have an appreciable adverse or beneficial effect on park management and operations.

**Moderate:** The effects would be readily apparent and would result in substantial adverse or beneficial change in park management and operations in a manner noticeable to staff and the public.

**Major:** The effects would be readily apparent and would result in substantial adverse or beneficial change in park management and operations in a manner noticeable to staff and the public, and would be markedly different from existing operation.

## IMPACTS FROM ALTERNATIVE A (NO ACTION)

### Natural Resources

#### Air Resources

##### *Air Quality*

Under the No Action Alternative, there would be no major changes in management or use of Ross Lake NRA, so no major changes to air quality conditions or trends would be anticipated as a result of the plan. Existing impacts to air quality from park operations would include localized, negligible to minor adverse impacts from sources such as vehicle emissions and fugitive dust. Periodic natural or human-caused wildfires would continue to temporarily and adversely affect air quality in Ross Lake NRA by releasing large quantities of smoke and particulate matter, causing negligible to major, short term adverse impacts to air quality. Recreational activities such as campfires would continue to have localized, minor adverse effects on air quality in the immediate vicinity of campgrounds and backcountry campsites. Vehicle emissions along the North Cascades Highway would also continue to release various air pollutants including volatile organic compounds and criteria air pollutants such as nitrogen oxides and carbon monoxides. Motorboat use on the reservoirs would also contribute negligible to minor, locally adverse impacts to air quality, especially use of two-stroke engines.

##### *Visibility (Regional Haze)*

North Cascades is one of 30 western National Parks with stable or improving visibility on both clear and hazy days. Management actions proposed for Alternative A would have no effect on this broad trend because except for periodic wildfires, the underlying causes of regional haze are beyond the scope of management actions that would take place as a result of the plan. Instead, adverse impacts to visibility would continue to result from regional and global air quality influences.

##### *Cumulative Impacts*

The North Cascades Complex, including Ross Lake NRA is estimated to have emitted approximately 6,800 metric tons of greenhouse gases in 2007 (NPS, 2009). The vast majority of these emissions occurred within Ross Lake NRA, as that unit has the most infrastructure, mobile sources, and operations-



related emissions. Emissions similar to these levels would be expected to occur within the timeframe of this plan under Alternative A. These emissions would contribute to negligible, adverse increases in human-forced global warming, because they would continue to be insubstantial compared to the global scale of greenhouse gas emissions that are collectively contributing to human-forced climate change.

One reasonably foreseeable management action that could have short term adverse impacts to air quality, but long-term negligible to minor benefits to air quality, is the proposed construction of a second tunnel from Gorge Dam to Gorge powerhouse. If constructed, this tunnel would reduce frictional losses from turbulence (presently occurring in the single power tunnel) and convert those losses into enough additional energy to power 5,420 homes in Seattle. This additional energy would theoretically help to offset fossil fuel emissions.

By far the most of the measurable impacts to air quality within Ross Lake NRA would result from various human activities outside of Ross Lake NRA, including the greater Puget Sound metropolitan area and from sources as far away as Asia. Population growth, more cars, and economic expansions may continue to push air pollutant emissions higher. Long-range transport of pollutants from Asia are projected to increase as those economies continue to develop and expand.

Predicted increases in population throughout the Puget Trough suggest the potential for cumulative increases in regional haze (NPS, 2005). Increasing trends in atmospheric ozone concentration at North Cascades underscore the possibility of future cumulative impacts to haze, as ozone and visibility impairment are often related.

The magnitude of potential adverse impacts to air quality from regional, and global emissions could range from negligible to moderate or even major, but is difficult to predict because fossil fuel consumption, and the technologies that enable such continued consumption, may be substantially affected by technological advances and consumer demand for alternative energy sources with reduced emissions. These uncertain future scenarios regarding trends in air quality make it difficult to predict the magnitude of potential cumulative impacts.

### *Conclusion*

Direct and indirect impacts to air quality under Alternative A would remain negligible to minor and adverse. These impacts would result from emissions

associated with park operations and visitor use. Wildland fire would occasionally result in minor to moderate adverse impacts to air quality, primarily via impacts associated with smoke, particulate matter and visibility reductions. Cumulative impacts to air quality would remain negligible to minor, because the air quality within Ross Lake NRA is predominately influenced by human activities outside of Ross Lake NRA, including regional and global sources of pollution. The management actions proposed under Alternative A would have short-term negligible to minor adverse impacts on air resources. There would be no derogation or impairment of air resources within Ross Lake NRA.

### **Natural Soundscapes**

Under the current management alternative, soundscape monitoring would occur as funding and equipment availability would allow, and human-caused sounds associated with park operations would be sporadically mitigated on a case by case basis. No additional restrictions or enforcement of noise associated with visitor use would be anticipated. The natural soundscape would be most impacted along the North Cascades Highway, where vehicle noise would predominate during daytime hours in the summer. Slight anticipated increases in visitation to Ross Lake NRA could create more traffic that would further impact the natural soundscape along and adjacent to the highway. Wintertime use such as snowmobiling along the highway, and WSDOT management actions such as avalanche control on an emergency basis would continue to adversely impact the natural soundscape. Along the highway, impacts would range from minor during the winter to major in the most developed areas during the peak summer season. In some areas, such as Colonial Creek Campground, there would rarely be more than short periods of time between daytime noise events. At Hozomeen Campground, the natural soundscape would be impacted by large groups of campers that congregate at night and create a “party atmosphere.”

On the reservoirs and the Skagit River, unlimited motorboat use with no restrictions will continue to impact the natural soundscape. Noise from seaplane landings would continue on Ross and Diablo lakes. Impacts to the natural soundscape on the reservoirs would be minor to moderate but fleeting, depending on the time of day and season. Because motorboat use on the Skagit River probably happens very infrequently, impacts would be short-term and minor.

In wilderness, natural sounds would continue to predominate in most areas. The backcountry permit system would help to manage and disperse use in the backcountry, thus protecting the natural soundscape. The closure of Thornton Lakes Road and parking lot in wilderness would reduce the effects of noise from motorized vehicle traffic in wilderness, providing additional protection of the natural soundscape. Impacts from airplane overflights and NPS administrative helicopter use would continue to impact the natural soundscape. The recommended 2,000 foot distance for airplane overflights may help to protect the natural soundscape in some areas. Vehicle noise from the North Cascades Highway would be audible in some areas in wilderness, especially on peaks closest to the highway. Overall, impacts to the natural soundscape in wilderness would be minor, since noise would be greater than natural ambient sound levels for only a small portion of the day.

#### *Cumulative Impacts*

Other past, present, or future actions that could impact the natural soundscape primarily include ongoing highway traffic, motorboat use, and aircraft use. Potential increases in visitation and corresponding increases in these uses could further impact the natural soundscape. Motorboat use by NPS, Seattle City Light, and the Ross Lake Resort concession would also contribute to adverse impacts on the natural soundscape. Administrative helicopter uses, such as those which would be needed to conduct prescribed burning on the slopes south of Hozomeen, described in the 2008 Fire Management Plan, other potential fire management activities within Ross Lake NRA, and installation of the Desolation radio repeater, would likely involve considerable helicopter use that would cause short-term adverse impacts. Seattle City Light day to day operations such as boat use, maintenance, and the phone on Ross Dam would continue to cause adverse impacts. Special Seattle City Light projects, such as the proposed Gorge Second Tunnel, would cause considerable impacts to the natural soundscape during construction. Depending on the action, the duration of each activity, and time of year, these actions could result in minor to moderate adverse impacts. In combination with the No Action Alternative, these cumulative impacts would result in minor to major impacts on natural soundscapes.

#### *Conclusion*

Impacts to the natural soundscape would vary based on the time of year, duration of the impact, and location. Major adverse impacts would occur in the daytime during peak use in heavily developed areas such as Colonial Creek Campground, where noise

events are closely spaced together. Minor impacts would occur in the wintertime along closed portions of the highway, and year-round along the Skagit River and in wilderness. Minor to moderate impacts would occur on the reservoirs due to boat and seaplane use. Cumulative impacts would range from minor to major. Implementation of this alternative would not result in impairment to this resource or value.

## **Water Resources**

### *Water Quality*

The water quality in Ross Lake NRA is generally considered to be excellent; however, there are various point and non-point sources of pollution that would continue to adversely affect water quality.

The NPS has no facilities with point source releases of effluent that could cause adverse effects to water quality. However, Seattle City Light operates waste water treatment facilities in Diablo and Newhalem. These facilities would remain unaffected by this alternative, so they would continue to release treated effluent with elevated levels of nutrients and fecal coliform bacteria. During periods of heavy rain, excess stormwater infiltration could overwhelm these systems and cause release of untreated effluent into Gorge Lake and the Skagit River. Water quality impacts from these facilities would be adverse, negligible to moderate (during high runoff) and long-term.

Nonpoint or diffuse sources of pollutants would continue to be released in varying degrees from approximately 1,115 acres of impermeable surfaces, including paved and unpaved roads, parking lots and various structures. Diffuse pollution from these impermeable sources would continue to include petroleum byproducts; metals such as lead, copper and zinc; various organic toxins and sediment (Novotny and Olem, 1994). The NPS has no water quality monitoring data regarding non-point source pollution from impermeable surfaces, but the impacts are believed to be negligible to minor and dispersed across the landscape. Adverse impacts would generally be higher after the first rainfall following long periods of dry weather. In addition, adverse impacts would be expected to be higher in areas with large contiguous tracts of impermeable surfaces, such as parking lots.

Septic fields associated with various facilities would also continue to contribute negligible to minor amounts of nutrients to ground water and surface water when the soils are saturated, or possibly via subsurface flow. Past monitoring of fecal coliform

counts indicate occasionally elevated concentrations in the vicinity of Colonial Creek Campground and Ross Lake Resort (Kuntz, 2000). Recent upgrades to the septic system at Ross Lake Resort are believed to have substantially reduced the fecal coliform concentrations, but there are no monitoring data available.

Given the relatively small area occupied by facilities and the transportation infrastructure, impacts to water quality from primarily non-point source pollution would be minor to moderate, long-term and adverse.

### *Hydrologic Systems (surface hydrology, wetlands, floodplains)*

This section evaluates the potential impacts to hydrologic systems including streams, creeks and the Skagit River. It also evaluates potential impacts to Ross, Diablo and Gorge reservoirs, wetlands, floodplains, and riparian zones that are substantially influenced by hydrologic processes.

### *Hydrologic Processes*

Hydrologic processes is a category that includes a wide variety of atmospheric, surface and subsurface physical and biogeochemical processes involving the transport, cycling and storage of water in the environment. The hydrologic processes of the Skagit River watershed within Ross Lake NRA would not be directly or indirectly affected by continued current management activities. Except for certain instances, the scale of potential management actions would simply be too small to have any measurable effect on the broad patterns and processes of weather, climate and precipitation that ultimately govern the hydrology and hydrologic processes of the Skagit River Watershed in Ross Lake NRA. One notable exception would involve the continued operation of the Skagit River and Newhalem Creek Hydroelectric Projects. The hydroelectric projects would continue to substantially modify the natural hydrology of the Skagit River and its tributaries. Management and operation of those facilities is governed by the terms and conditions of the licenses provided by the Federal Energy Regulatory Commission. Those licenses are beyond the scope of the management actions proposed in this plan, so the impacts of the hydroelectric facilities are discussed in the Cumulative Impacts section.

### *Hydraulic Processes*

Hydraulic processes are an impact topic that includes various dynamic physical processes and conditions that affect the surface and subsurface flow of water in the environment. In contrast to hydrologic processes, the hydraulic processes of surface streams, creeks and the Skagit River could be affected to varying degrees by the management actions proposed to continue for Alternative A. Broadly speaking, management actions intended to reduce erosion would continue to adversely impact the hydraulic processes of running waters to varying degrees as described in the following sections.

The NPS would continue to maintain and repair the transportation infrastructure, including roads, bridges, culverts, trails and transportation facilities. Areas most routinely affected include creek crossings under roads in the vicinity of Goodell Creek, Colonial Creek, Rhode Creek, Sourdough Creek, Damnation Creek, Thornton Creek and Pyramid Creek. These creeks routinely flood and damage roads and/or facilities via erosion, channel avulsion or both processes. Channel avulsion in particular often prompts emergency action to reopen roads and reroute the stream back under a bridge or through a culvert. Management actions such as installation of bank barbs, culvert replacement, or armoring of bridge abutments would be considered in consultation with various state and federal agencies with jurisdiction over running waters. When possible, the NPS would seek to address the underlying causes of damage (such as undersized culverts) and seek improved engineering solutions to reduce the risk of further damage, such as installation of vented ford crossings as an alternative to culvert replacement. This spectrum of potential management actions would generally cause long-term, negligible to moderate adverse impacts. Impacts would be greater in creeks such as Goodell Creek, where the scale of management intervention would be larger, and/or where other instream resources such as fish rely upon hydraulic processes to provide instream and off-channel spawning and rearing habitat.

The NPS would continue to maintain the Goodell Creek and Colonial Creek Campgrounds. Goodell Creek campground is situated on an alluvial fan at the confluence of the Skagit River. The alluvial fan is aggrading (i.e. the channel is filling) due to naturally high volumes of bedload transport in the creek. The bridge crossing along the North Cascades Highway at Goodell Creek is presently too narrow. It is constricting flows, reducing bedload transport and

causing alluvial material to build up upstream of the footings.

Colonial Creek Campground is constructed on the debris cones of Colonial and Rhode Creeks. Periodic debris flows from these creeks, especially Rhode Creek, block entrance roads and damage campground roads and facilities. These events also require periodic dredging of the boat ramp at Colonial Creek Campground to maintain a navigable channel. The NPS would continue to react to these events on a case-by-case basis by removing debris, maintaining the single constructed channel at Rhode Creek, and replacing/repairing damaged facilities as necessary, as long as dredging is feasible. These actions would continue to cause minor to moderate adverse impacts to the natural hydraulic processes on both of these systems. Should these activities, such as dredging, threaten lacustrine wetlands, a Wetland Statement of Findings would be considered at that time. Should dredging no longer be feasible and the NPS did not attempt to maintain the boat launch, these impacts would not continue, resulting in long term benefits to natural hydraulic processes.

#### *Cumulative Impacts*

The Skagit and Newhalem Creek Hydroelectric Projects would continue to cause cumulative adverse impacts to the quantity and quality of water resources within Ross Lake NRA. Water quality impacts would continue to be associated with point and non-point source pollutants from the hydroelectric facilities. Point source pollutants would include contributions from the wastewater treatment plants in Newhalem and Diablo and from effluents discharged from the hydroelectric facilities. These point sources would continue to release increased levels of nutrients, oils and greases, and trace low levels of various toxins including metals. The reservoirs would continue to release water that has been thermally modified (warmer in winter, cooler in summer) by reservoir storage, and chemically modified by loss of suspended sediment and other biogeochemical processes that take place when captured and stored in the reservoirs. When added to the past releases of various pollutants, including highly toxic materials such as PCB's, the cumulative impacts to water quality and quantity and timing of flows would be long-term, moderate to major and adverse.

Certain tributaries to the Skagit, including Ruby Creek and Thunder Creek, have experienced fairly extensive mining activity since the late 1800's. Some mining still occurs in Ruby Creek. The lingering past impacts of mining, coupled with the present impacts of continued

mining on Ruby Creek, could cumulatively contribute various heavy metals to the Skagit River watershed, however, there are no data to quantify the magnitude of adverse impact to surface waters.

Snowpack sustains most of the rivers, reservoirs, and aquifers in the North Cascades. The volume of the April 1st snowpack in the low- and mid-elevations of the Cascades has a high sensitivity to surface temperatures. Projected warming in the future will substantially diminish springtime snowpack in these watersheds and cause large changes in the timing of stream flows, with peak flows shifting from spring dominated flows caused by snowmelt, to fall and winter flows associated with increases in extreme precipitation during those times, including less snow at lower elevations.

Floodplains and wetlands have been impacted by past construction of roads and other facilities. Past, present, and future activities may include further bank armoring, replacement of culverts and bridges, and various channel modifications (such as dredging) to protect facilities and bridges. These actions will continue to cause long-term, minor to moderate adverse impacts on hydrologic systems by affecting streambed composition, sediment transport, natural stream dynamics, flow regimes, lateral water infiltration, and other hydrologic components and processes.

#### *Conclusion*

Direct and indirect adverse impacts to water quality would range from negligible to minor and adverse. Impacts would primarily be associated with operations and maintenance related activities. There would be negligible impacts to hydrology. Impacts to hydraulics would be localized, long-term, adverse and of negligible to moderate intensity. These impacts would be primarily associated with local manipulation of hydraulics to protect roads, campgrounds and facilities from erosion. Cumulative impacts to water resources would be negligible to major (depending upon location), long-term and adverse because there would be no substantive changes to existing park operations or operations associated with the Skagit River Hydroelectric Project. Moreover, the impacts from climate change on water resources are expected to remain relatively small within the 15-20 year lifespan of this plan. Direct and indirect adverse impacts to water resources would remain negligible to moderate and cumulative impacts would be moderate to major because there would be no substantial changes to current management. Therefore, there would be no impairment of water resources under Alternative A.

## Geologic Resources and Processes, including Soils

This impact topic includes surficial landforms and soils that would continue to be adversely affected by NPS management and operations and visitor use of the area.

No new facilities or substantial infrastructure changes would be implemented under Alternative A, therefore impacts to geologic resources would be limited to maintenance of existing facilities and minor changes to those facilities as necessary to respond to periodic damages from incidents such as severe weather events, avalanches, landslides, and flooding. Routine maintenance and park operations would have a negligible impact on surficial geologic resources because the facilities would generally remain in the same locations.

Visitor use of the area would likely lead to further social trail development in certain areas. Expansion of social trails would cause negligible adverse impacts to soils. Where bolted sport climbing is authorized, climbing related activities would have negligible to minor, long-term adverse impacts to cliff surfaces from drilling and placement of bolts to create sport climbing routes. Unintentional and/or incidental removal of rock surfaces from off-trail recreational pursuits such as climbing, scrambling, mountaineering and rappelling would cause negligible damage to surficial geologic resources and soils.

### *Cumulative Impacts*

A variety of past, present, and reasonably foreseeable actions have affected and will continue to affect geologic resources and soils in Ross Lake NRA. The soils and geologic resources of Ross Lake NRA have been variously modified over the past century by human activities such as mining, dam construction, highway and railroad construction, and construction of various NPS facilities. The Skagit River Hydroelectric Project has permanently flooded approximately 13,000 acres, and approximately 1,000 acres have been converted to roads and various facilities. Taken together, these permanent modifications account for approximately 12 percent of the natural landscape of Ross Lake NRA. This estimate does not include previous manipulations to the landscape caused by mining, logging, and fire suppression activities, as quantifiable estimates for these past activities are difficult to compile. The cumulative effects of these activities have been moderate to major, long-term and adverse.

Seattle City Light has significantly and irreversibly modified the surficial geology within Ross Lake NRA to construct and maintain the Skagit River Hydroelectric Project. Impacts include approximately one acre of lakeshore lost to erosion annually, sedimentation of the reservoir, changes to the natural hydrologic period, and the cut-off of gravel and large woody debris to the river. While no new above ground facilities are anticipated within the life of this plan, SCL does propose to construct an approximately 2-mile long tunnel from Gorge Dam to the Newhalem powerhouse. Most of the construction-related impacts to surficial geologic resources would be limited to the immediate vicinity of the tunnel portals as well as settling ponds and waste rock sites; however, this project has yet to be approved and no final construction designs have been submitted. Without additional information related to potential construction designs, it is difficult to quantify the magnitude of potential impact.

Regardless of the proposed tunnel, SCL would continue to operate and maintain the Skagit and Newhalem hydroelectric projects and cause adverse cumulative impacts to geologic resources. Operation and maintenance activities could include site-specific stabilization of steep, unstable slopes and related actions intended to mitigate the risks of rockfall. Additional activities includes maintenance of the road network in Ross Lake NRA to microwave sites, powerlines and towers, and the Newhalem Creek hydroelectric station. Some of these actions would occur on NPS lands within Ross Lake NRA, causing minor to moderate, adverse, cumulative impacts to surficial geologic resources and soils.

The surficial geology of Ross Lake NRA was significantly and adversely modified to construct the North Cascades Highway. The maintenance of the North Cascades Highway, SCL infrastructure, and Colonial Creek Campground will continue to have long-term moderate adverse impacts to the Skagit River and its tributaries. The Washington Department of Transportation would continue to cause minor to moderate adverse impacts to surficial geologic resources in certain areas in order to safely maintain the highway. These adverse impacts would be associated with routine maintenance and repairs along the highway, and periodically, more intensive repairs associated with flood damage, rockfall and avalanches.

Other human-caused activities have cumulatively and adversely affected soils and geologic resources in less-perceptible but nonetheless substantial ways. Atmospheric deposition of various pollutants from

regional and global sources has affected the natural chemical composition of soil by reducing soil pH and increasing nitrogen deposition. These impacts have already been documented in certain areas, and are likely to increase given population growth estimates both regionally and globally. The adverse cumulative impacts to soils are poorly understood as data are limited. Additionally, intense wildfires create situations where a hot burn will have serious impacts to soils and hillslope stability.

Global climate change may increase the severity and frequency of storms, and trigger landslides, increased rockfall, and increased soil erosion in unstable areas. Although few statistically significant changes in extreme precipitation have been observed to date in the area, regional climate model simulations generally predict increases in extreme high precipitation over the next half-century, particularly around Puget Sound (University of Washington 2009, p.2). Facility adaptations required to respond to these events could have long-term, major and adverse impacts to soils and geologic resources in the future.

#### *Conclusion*

Alternative A would cause minor to moderate, long-term, adverse impacts to the geologic resources locally within Ross Lake NRA and negligible to minor impacts overall, primarily from maintenance of the existing infrastructure of roads, trails, campgrounds and facilities. These actions would also manipulate some hydraulic processes to reduce erosion, causing minor indirect effects to some surficial geologic resources by locally modifying the underlying geologic processes that are fundamental to the dynamic landscape of North Cascades. Cumulative impacts would remain negligible to minor and long-term. Impacts to geologic resources would be negligible to minor. There would be no impairment of surficial geologic resources.

#### **Vegetation (including special status species)**

Impacts to vegetation from continued current management would result from management actions that directly or indirectly disturb vegetation communities. These management actions would generally include maintenance of roads, trails, campgrounds; vegetation management such as invasive plant management, site rehabilitation/restoration; and wildland fire management.

Adverse impacts to vegetation would vary according to location and activity, with minor to moderate adverse impacts expected in zones with concentrated development and human use, including the

frontcountry and Skagit River hydroelectric project management zones. Negligible to moderate impacts to vegetation would be expected in the less developed areas of the Skagit River and Backcountry zones. Negligible impacts to vegetation would be expected in the wilderness zones, because management actions would be limited to trail maintenance (such as brushing) and minor trail relocations as necessary to respond to floods, windfall, etc.

Human impacts from recreation and visitor use of these areas would continue to be correlated most closely with the quantity and intensity of recreation and visitor use of a given area. Adverse impacts from visitor use would primarily include social trail development, trampling and soil compaction and inadvertent introduction of weeds. Adverse impacts to vegetation would generally range from negligible to moderate, long-term and adverse.

There are no known federally listed plant species within Ross Lake NRA. As a matter of policy, the NPS would continue to survey areas in advance of taking management action that could adversely affect vegetation. If a rare or state listed plant species was found, management actions would be adjusted to avoid harm. In light of these current conditions and mitigations, there would be no adverse impacts to federally listed plant species.

#### *Cumulative Impacts*

Vegetation within Ross Lake NRA has been cumulatively and adversely affected from many different types of human activity. Construction and development of the Skagit River and Newhalem Creek Hydroelectric projects has significantly and adversely affected lower elevation forests. Approximately 13,000 acres of low elevation forests and riparian areas have been permanently inundated by Ross, Diablo and Gorge reservoirs. Several thousand acres of forest have also been removed to accommodate development of facilities, roads, campgrounds and related infrastructure associated with the hydroelectric projects, the North Cascades Highway, and National Park Service Operations. Portions of the Newhalem Creek watershed, Goodell Creek watershed and the Skagit River watershed above the dams have also been logged. The whole area has been affected to some degree from fire suppression.

In the reasonably foreseeable future, there are no substantial increases in roads, facilities or other related transportation, hydroelectric or visitor use infrastructure anticipated in the No Action Alternative that could adversely affect vegetation. Therefore,

compared with the past cumulative effects to vegetation, cumulative adverse impacts are expected to remain minor. These adverse cumulative effects would primarily be associated with ongoing operation and management of existing facilities, continued risk of invasion from invasive nonnative plants, fire suppression-related activities, and general visitor use of the area.

### *Conclusion*

Alternative A would continue to result in negligible to minor direct, indirect and cumulative impacts to vegetation, primarily from maintenance-related activities associated with roads, trails, campgrounds. There would be no impairment to vegetation as a result of this alternative.

### **Fish and Wildlife Resources (including special status species)**

Existing conditions and associated impacts from visitor use of the area would continue under the No Action Alternative. Impacts to fish and wildlife would include direct impacts from consumptive activities such as hunting and fishing, and indirect impacts caused by human disturbance of fish and wildlife habitat as consequence of recreational use.

Management of the park infrastructure would include various maintenance activities for facilities, campgrounds, roads and trails; some minor facility relocations would be anticipated. Various resource management-related stewardship projects would also cause some disturbance to wildlife

### ***Impacts from Hunting and Fishing***

The most consistent and reliable information for big game species taken in the Diablo Unit was for an 11-year period from 1997-2007. Deer take ranged from 2-20 animals with a mean of 12 deer taken per year. From 1997-2007 a total of 43 bears were taken, with annual rates ranging from 1-7 with a mean of 4 animals per year. Only one cougar was taken from the Diablo GMU during this time period. These data represent the take from the entire Diablo Unit, however 33 percent of the unit lies outside of Ross Lake NRA.

Take data for small mammals and waterfowl are more difficult to compile because they are reported by county as opposed to GMU. Ross Lake NRA spans a very small portion of Whatcom and Skagit County, so there is no reasonable way to draw meaningful conclusions from the data specific to game populations within Ross Lake NRA. However, NPS staff and

WDFW biologists mutually concur that hunting of small mammals and waterfowl occurs infrequently within Ross Lake NRA and therefore has a negligible to minor impact on wildlife (Robert Kuntz, NPS Wildlife Biologist, pers. comm.).

It is assumed that demand for hunting within Ross Lake NRA would remain relatively constant under the No Action Alternative. Relatively little is known about the population status of big game species such as deer, elk, bear, cougar and mountain goats in the North Cascades Complex, so there is some uncertainty regarding the magnitude of impact that hunting may have on big game populations. Should hunter takes persist at present levels, it is the professional judgment of NPS Biologists that hunting would continue to have minor impacts on populations of black bear and deer within Ross Lake NRA. There would likely be negligible impacts to cougar populations because cougar are not generally hunted. Information is also limited regarding the population status of furbearers, waterfowl, and upland game birds (Christophersen, 2009), but staff observations indicate that hunting of these species is so infrequent that impacts would remain at negligible to minor levels (Robert Kuntz, NPS Wildlife Biologist, pers. comm.).

Sport fishing in Ross Lake NRA occurs in the reservoirs, several mountain lakes, the Skagit River and various creeks and tributaries. The quality of sport fishing in Ross reservoir, the most popular fishing destination, appears to be declining for various reasons including an “aging” reservoir (less nutrients and reduced aquatic productivity) and possibly parasites. In recent years, the red sided shiner population has increased dramatically, resulting in increased rainbow and bulltrout populations that feed on red sided shiners. This relationship is in the process of being investigated and is not conclusive at this time. The quality of fishing in other areas varies, but in generally, overfishing does not appear to have an impact on fish populations. If fishing demand continues at present levels, it is unlikely that the impacts to native fish populations would rise beyond negligible to minor levels of adverse impact.

Several naturally fishless lakes in Ross Lake NRA contain non-native species of trout and char that were stocked to enhance recreational fishing opportunities. The NPS recently completed the Mountain Lakes Fishery Management Plan to address the longstanding issue of fish stocking. If Congress authorized continued fish stocking, then the plan calls for stocking of select lakes throughout the Complex, including

Ridley and Willow lakes within Ross Lake NRA. Otherwise, the plan mandates no further stocking of fish in any mountain lakes, and calls for the removal of reproducing populations of fish wherever feasible to do so. Within Ross Lake NRA, fish removal would include removal of brook trout from Hozomeen Lake, although there are no plans for removal of these fish in the near term, and the feasibility of removal remains uncertain because Hozomeen Lake is very large and deep. Impacts from continued stocking would remain long-term and negligible to moderate and adverse. If stocking is not authorized, impacts of discontinuing stocking would be long-term and beneficial. Impacts of fish removal, if feasible, would be long-term and beneficial.

### *Human Disturbance*

Visitor use of Ross Lake NRA occurs primarily along the North Cascades Highway corridor, and quickly drops off as one leaves the highway corridor and travels into the backcountry and wilderness area. The majority of Ross Lake NRA receives very little use because it is untrailed, rugged wilderness. Where recreational use is high, such as frontcountry areas, the presence and noise associated with human activity could displace various wildlife species and cause other conflicts. Some of the most common conflicts between recreation and wildlife would involve noise from motor vehicles, boats, and in places where high visitor use causes frequent noise and disturbance.

Staff and visitor observations and preliminary soundscape data suggest that vehicle traffic along the North Cascades Highway produces substantial noise well beyond the highway corridor. Motorcycles in particular are often perceived to be very loud, especially when traveling in large groups. Soundscape studies are presently underway to quantify existing noise and monitor the trends in noise duration, frequency and intensity in relation to visitor use and park operations. There are no data or studies available to correlate noise within Ross Lake NRA with disturbance to wildlife, so the present impact of noise is uncertain.

The North Cascades Highway is a very popular scenic drive from spring through fall. Thousands of vehicles travel the highway each day, causing an unquantified number of deaths to various species of wildlife. The impact of wildlife mortality from vehicles is presently unknown and will likely remain poorly defined given the challenges of monitoring. In addition to wildlife mortality, the extent to which the highway corridor disrupts wildlife movement is also poorly understood.

The risk of conflicts between bears and humans is of longstanding concern. The NPS presently manages this risk by educating visitors about the harm caused by poor food storage and inadvertently feeding bears (“a fed bear is often a dead bear”) and by providing bear proof food storage boxes at some frontcountry campsites and all boat-in sites on Ross Lake. To date there have been relatively few bear-human conflicts. If visitor use numbers continue to remain at current levels, the adverse impacts to bears would continue to remain at negligible to minor levels.

### *Special Status Species*

This subsection covers potential impacts to various special status species including federal and state listed species and other species of conservation concern. The No Action Alternative would continue the current management of these species, such as selective monitoring, mitigating disturbance from visitors and park operations, and cooperating with various agencies and organizations to improve recovery efforts throughout the greater ecosystem. The beneficial impacts from the protection of sensitive species and their habitat within the park would continue under Alternative A, primarily through continued protection of the largely unfragmented core habitat provided by the North Cascades NPS Complex.

Special status species such as grizzly bears will realize benefits from the NPS establishing a formal policy for maintaining high ratios of core area and ensuring impacts on high quality spring and fall grizzly bear habitat will be minimized, mitigated or avoided altogether. Trail construction will be routed to avoid sites assessed to be of special importance and/or unique for the general area. This policy will be consistent with anticipated direction among other agencies and partners in the greater North Cascades ecosystem, and ensure stability of habitat quality and availability over the long term.

Management of grizzly bears on federal lands within grizzly bear recovery zones is also guided by the Interagency Grizzly Bear Guidelines (1986). In accordance with these Guidelines grizzly bear presence will be actively discouraged only where human presence results in conditions which make grizzly presence untenable for humans and/or grizzly bears. This includes private property, Hozomeen, Colonial Creek, Gorge, Newhalem and Goodell Creek campgrounds; the Environmental Learning Center; North Cascades National Park Visitor Center; Ross Lake resort, Diablo and Newhalem. Grizzly bear-human conflicts will be “resolved in favor of grizzly



bears” (Interagency Grizzly Bear Committee citation), unless the bear is determined to be a nuisance.

Special status species such as grizzly bear would realize additional benefits from the NPS establishing quantifiable targets for maintaining core area and from adopting more formal policies for maintaining core area habitat. These policies could also stimulate action among other agencies and partners in the greater North Cascades ecosystem, resulting in additional long-term benefits.

Some unavoidable adverse effects associated with ongoing park operations and recreational use would continue. These impacts would include disturbance in the vicinity of frontcountry areas and along other areas such as trails. Management and operation of the transportation and facility infrastructure would continue to adversely affect habitat for special status species, especially along the North Cascades highway corridor. Backcountry trail and campsite maintenance would potentially displace certain species in the vicinity of the affected areas. Recreational use of Ross Lake NRA could also potentially displace certain species that are sensitive to human disturbance.

To mitigate these adverse effects, the NPS would continue to conduct plant and wildlife surveys in advance of taking management actions. Should species be present, the timing and location of management activities would be adjusted to minimize disturbance. Seasonal closure of certain areas would also be implemented as necessary to prevent disturbance. For example, to prevent disturbance to nesting loons, Hozomeen Lake would continue to be closed to visitor use during the nesting season. Seasonal closure of the Newhalem Crag would be implemented if surveys find continued nesting of peregrine falcons in that area.

Special status wildlife species would continue to receive some beneficial impacts within Ross Lake NRA by virtue of the area’s protected status as a unit of the NPS, including the large quantity of relatively undisturbed habitat within and surrounding the unit.

This management alternative may affect, but is not likely to adversely affect the following federally listed species wolf, bear, lynx, murrelet, owl, trout and salmon. This “may affect, but is not likely to adversely affect” determination is based upon the conclusion that effects would be limited to inadvertent, short term disturbance to listed species, the wide variety of undisturbed habitats available throughout Ross Lake NRA, and no anticipated changes in current management and operations.

### *Cumulative Impacts*

No new facilities, roads, major trail construction, or related changes in park infrastructure or operations are anticipated under the No Action Alternative, so the cumulative impacts of park operations on fish and wildlife resources would be limited to those ongoing impacts associated with current park operations and associated recreational use of the area. These cumulative impacts would be minor, long-term and adverse because no additional habitat loss or fragmentation would be anticipated within the boundaries of Ross Lake NRA.

Beyond the park boundaries, a broader qualitative analysis of development trends occurring within the greater North Cascades ecosystem suggests there will be more fish and wildlife habitat loss, degradation and fragmentation in order to accommodate an estimated population growth of one million people in the next 15-20 years (University of Washington Climate Impacts Group, 2009). The cumulative impacts related to population growth and habitat loss and consumptive actions such as hunting and fishing outside the boundary of Ross Lake NRA may have adverse effects on populations of terrestrial species with large home ranges, anadromous aquatic species such as salmon, and certain migratory bird species that rely on unprotected habitat outside the park boundary. The degree of impact to these species is uncertain to predict, and will ultimately depend upon the relative success—or failure—of various large scale efforts currently underway to protect and restore the greater North Cascades ecosystem.

There is a great deal of uncertainty regarding the rate and magnitude of human-forced climate change and its potential to impact ecosystem health, including fish and wildlife habitat. However, there is general scientific consensus regarding several broad patterns of effect that are likely to unfold. Predictions within the planning horizon indicate reduced snowpack, rising streamwater temperatures, higher summer temperatures, expansion of drier (water-limited) forest types, and increased acreage of burned forests and other habitat types (University of Washington Climate Impacts Group, 2009). How these environmental changes will affect fish and wildlife species and habitats is less certain.

High elevation habitats such as those associated with sub-alpine and alpine environments are likely to shift upward in elevation and become smaller. Latitudinal shifts northward in species ranges are also expected, as these shifts have already been documented for

landbird species such as American three-toed woodpecker and pine siskins (Audubon Society, 2009). Wildlife species incapable of dispersing, and/or dependent upon alpine and subalpine environments will likely experience adverse impacts. Conversely, some species may benefit from expansion of habitat ranges precipitated by climate change. The magnitude of impacts, both beneficial and adverse, is uncertain.

Fish species will also be affected to varying degrees from climate change. Models predict that western Washington will experience reduced snowpack, lower summer stream flows, higher stream temperatures and more severe storms with greater precipitation extremes. The changes will likely reduce the quality and quantity of freshwater habitat to varying degrees through a combination of adverse habitat effects including thermal stress, streambed scouring and barriers to migration created by lower flows. These adverse impacts are likely to be most severe for species that migrate, spawn or rear in summer and fall, such as summer Chinook, coho salmon, summer steelhead and bull trout.

The impacts to fish species will take time to unfold, and may not be notable within the timeframe of this plan. In addition, the impacts to the quantity, timing, and temperature of flows from the reservoirs into the Skagit River may buffer some of the potential adverse impacts, at least in the near term. Taken together, the cumulative impacts to fish caused by climate change are likely to be adverse, but the magnitude of impact is uncertain and will vary among species.

### *Conclusion*

Consumptive recreational uses such as hunting and fishing would continue to cause minor adverse impacts to fish and wildlife populations. Other recreational uses within Ross Lake NRA would have negligible to minor impacts, primarily associated with temporary disturbance such as noise and transient human presence. Park management and operations would continue to result in minor direct, indirect and cumulative impacts to fish and wildlife, primarily due to localized disturbance of habitats to operate and maintain the transportation and facility infrastructure within Ross Lake NRA. These management actions may affect, but are not likely to adversely affect federally listed species. Direct, indirect and cumulative impacts would remain minor to moderate and adverse. There would be no impairment of fish and wildlife species or their habitats.

## Cultural Resources

The No Action Alternative is required by the National Environmental Policy Act and provides the baseline from which to compare the other alternatives. Under Alternative A, current management practices would continue, as funding allows. The emphasis in this No Action Alternative would be to protect the values of the park without substantially increasing staff, programs, funding support or facilities.

## Archeological Resources

Under Alternative A, the archeology program would continue to:

- A) Focus on identification, documentation, assessment and protection of archaeological sites.
- B) Conduct research investigations, through the archeology program and in partnership with others, that increase understanding of human use of the North Cascades.
- C) Offer qualified researchers and visitors opportunities to participate in archeological excavations.

Activities associated with the archeology program would contribute to long-term preservation and enhanced understanding of archeological resources and human use in Ross Lake NRA. Engaging qualified researchers and visitors in excavations could result in building future stewards for archeological preservation. These activities would result in moderate long-term benefits to archeological resources.

Resources adjacent to or easily accessible from trails or day-use areas would continue to be vulnerable to surface disturbance, inadvertent damage, and vandalism. Loss of surface archeological material, alteration of artifact distribution, and a reduction of contextual evidence could result in loss of site integrity. Continued ranger patrol, staff presence throughout Ross Lake NRA, and thoughtful site design at areas like the Newhalem Rockshelter would discourage inadvertent destruction of cultural remains and vandalism, and no adverse effects would be anticipated. Known archeological resources would be avoided to the greatest extent possible whenever ground disturbing activities such as road and trail maintenance or construction of new facilities was needed. Archeological surveys and/or monitoring would precede any federal undertaking, consistent with the mitigation measures outlined in this plan. If National Register-eligible or listed archeological resources could not be avoided, impacts on such

resources could be minor to major and adverse, and an appropriate mitigation strategy would be developed in consultation with affiliated tribes and the Washington State Historic Preservation Officer.

#### *Cumulative Impacts*

A number of cultural resources, including archeological resources, have undoubtedly sustained adverse impacts from natural and human forces over the lengthy period of human occupation of the area. Ross Lake NRA has the largest number of surveyed archeological sites in the park complex and overall lands within Ross Lake NRA have a high level of archeological sensitivity. However, much acreage of Ross Lake NRA has not been surveyed and inventoried, therefore it is possible that archeological sites, especially those with archeological resources exposed on or located near the surface, have been disturbed by past development, construction, management actions, vandalism, artifact collection, and natural processes. Past actions and processes include the construction of hydroelectric facilities, prescribed burns, trail rehabilitation and relocation, rehabilitation of park roads, effects of climatic conditions, visitor use, unintentional disturbance, vandalism and artifact hunting, and stream and shoreline erosion. Cumulative natural impacts such as erosion and general weathering, coupled with human impacts have resulted in adverse impacts of unknown intensity.

Dam and reservoir construction during the 20th century, along with construction of related hydroelectric facilities (including the company towns of Newhalem and Diablo), likely resulted in major cumulative adverse impacts to cultural resources, including archeological resources, that continue today. Filling of the Ross, Diablo, and Gorge reservoirs undoubtedly inundated an unknown number of prehistoric and historic cultural resources. Archeological sites are known to currently exist in drawdown zones of Ross Lake. It is likely that the degradation of recorded and unrecorded sites along shorelines and drawdown zones as a result of wave action, changing reservoir levels, and recreational activity creates ongoing negligible to major adverse site-specific impacts to archeological sites, depending on the site or resource. Inventory and appropriate mitigation of these vulnerable resources would be of benefit to these resources.

Implementation of Alternative A would not contribute to the overall adverse cumulative effects on archeological resources.

#### *Conclusion*

Activities associated with the archeology program would contribute moderate long-term benefits from enhanced preservation activities and increased understanding and awareness of resources. Avoidance of National Register eligible or listed archeological resources during excavation, construction, and demolition would result in no adverse effect. If, however, archeological resources could not be avoided, the historic property would be managed in accordance with 36 CFR Part 800. Implementation of Alternative A would not contribute to overall adverse cumulative effects on archeological resources. There would be no impairment to this resource as a result of implementing this alternative.

#### **Historic Structures and Cultural Landscapes**

~~Under Alternative A, historic structures and landscapes would continue to be surveyed, inventoried, and evaluated under National Register of Historic Places criteria to determine their eligibility for listing in the National Register. Current preservation maintenance would continue on historic structures and cultural landscapes within the park. Designed park landscapes including developed areas, and park trail systems and associated features would be stabilized and preserved. These activities would result in moderate, long-term benefits.~~

Alternative A would be expected to have no adverse effects on historic structures and cultural landscapes. The continued program of cultural resources management in the park, including preservation and maintenance activities, would have minor to moderate beneficial impacts on these resources. The park would carry out preservation maintenance on historic structures. Those historic structures and cultural landscapes located in wilderness would be stabilized and preserved according to the pertinent laws and policies governing cultural resources and wilderness, using management methods that are consistent with the preservation of wilderness character and values, consistent with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (1995).

Under Alternative A, the buildings and infrastructure in the Hollywood district of Diablo, including historic properties that are and may be eligible for listing on the National Register, would continue to be owned and managed by Seattle City Light. ~~If the buildings continued to remain under SCL, even if eligible or newly listed buildings were added, SCL would still who would be responsible for complying with the terms of the FERC Settlement Agreement with respect to cultural resources. The NPS would continue to~~

lease individual buildings for staff housing as needed and made available by Seattle City Light. The NPS leasing of housing would result in long-term benefits to historic structures.

Seattle City Light's need for their former company townsites in Diablo and Newhalem along with other infrastructure, such as water towers and the incline lift among others, has changed as new technologies evolve. Seattle City Light is currently implementing a plan from the 1990s that calls for housing only essential staff that would be needed to respond to emergencies (Email from Chip Jenkins, October 28, 2009).

Seattle City Light is consolidating their housing in Newhalem, using only those houses in the historic district (approximately twelve to thirteen houses). All houses not in the historic district would be removed. These houses outside the historic district were constructed using creosote treated lumber for floor joists and the rehabilitation costs exceed the value of the buildings (Email from Chip Jenkins, October 28, 2009). Seattle City Light is also working to renovate and restore the former "hotel" in Newhalem, providing an opportunity for future adaptive reuse of the property (Email from Chip Jenkins, May 20, 2009).

Under the current plan, all Seattle City Light staff would be moved out of Hollywood in Diablo. Seattle City Light employees housed in Diablo would occupy houses on Reflector Bar, requiring approximately eleven houses. After condition assessments and eligibility determinations are completed, Seattle City Light would be prepared to remove or rehabilitate the houses in Hollywood, depending on their needs. The cookhouse in Diablo would also be closed and torn down as structural issues make it cost prohibitive to rehabilitate. (Email from Chip Jenkins, October 28, 2009).

Future plans for Hollywood would depend largely on the outcome of the National Register Eligibility Determination for Hollywood and the facility condition assessments of the buildings currently underway. The magnitude of impacts are difficult to assess without additional eligibility information and plans for the site, but impacts could range from no effect (if buildings are not deemed eligible) to major and adverse (if buildings are deemed eligible and removed).

#### *Cumulative Impacts*

Over the years historic structures and cultural landscapes in the park have been adversely affected

by natural processes and wear and tear associated with visitor access, administrative use, and deferred maintenance. In addition, some structures that would be considered historic today were moved, removed or modified in the past.

Seattle City Light's continued use and maintenance of historic buildings and landscapes would have long-term benefits. Should SCL choose to remove buildings or alter landscapes there could be adverse effects to cultural resources; however, the intensity of those effects would be determined through SCL's consultation with the State Historic Preservation Office as projects are identified.

Resource management activities would continue to consider the natural resource values of cultural landscapes as well as their culturally important character-defining patterns and features. Cultural landscapes would be preserved and maintained. Overall, the cumulative effects would be long-term, minor to moderate, adverse, and beneficial. Alternative A would provide beneficial effects to historic structures and cultural landscapes and would not contribute to the adverse cumulative effects.

#### *Conclusion*

The implementation of the No Action Alternative would have no adverse effect on the historic structures and cultural landscapes of Ross Lake NRA. The continued program of cultural resources management in the park, including preservation and maintenance activities, would have minor to moderate beneficial impacts on these resources. The magnitude of cumulative impacts to cultural resources is also dependent on SCL's future plans and could be both adverse and beneficial. The magnitude of impacts to the Hollywood district could range from no effect to major and adverse depending on the outcome of National Register Eligibility determinations and Seattle City Light's plans to concentrate operations in Newhalem and reduce their presence in Diablo. The cumulative effects from past activities could have adversely affected these resources. Ongoing cultural resource management, such as the identification, preservation, and maintenance of historic structures and cultural landscapes, has resulted in minor beneficial cumulative effects, resulting in no adverse effect. This alternative would contribute modestly to the overall beneficial cumulative effects, and would not contribute to the adverse cumulative effects. There would be no impairment to this resource or value as a result of implementing this alternative.

## Tribal Issues and Ethnohistory

Under Alternative A, the park would:

- A) Consult with the Skagit Tribes, upon request, to access locations used for ceremonial activities. Monitor levels of use and potential resource effects.
- B) Upon request, conduct tours and guided visits for the Skagit Tribes and selected groups to archeological and ethnographic sites.
- C) Consult with Skagit Tribes to document traditional resource use areas and traditional cultural properties.
- D) Research and inventory traditional tribal uses of traditional plant, animal, and mineral resources.
- E) Continue to conduct oral histories and research investigations documenting human use of the North Cascades.

Consultation with the Skagit Tribes for ceremonial activities, guided tours, and assessing traditional resource use areas and traditional cultural properties would continue to promote and encourage positive relationships with tribal members. Activities associated with research, inventory and monitoring of traditional plant, animal and mineral resources as well as locations used for ceremonial activities would generally result in moderate, long-term benefits to these resources.

Inadvertent visitor use and park-related actions could potentially impact ethnographic resources, however, should such impacts occur, communications among the NPS, affected Tribes, and the State Historic Preservation Officer would be initiated, and any adverse effects would be mitigated to negligible through a cooperative agreement.

### *Cumulative Impacts*

Dam and reservoir construction during the 20th century, along with construction of related hydroelectric facilities (including the company towns of Newhalem and Diablo), likely resulted in cumulative adverse impacts to cultural resources, and potentially impacted ethnographic resources. Magnitude of these impacts is unknown. Inventory and appropriate mitigation of these vulnerable resources would be of benefit to these resources.

Park development and administrative/maintenance operations, as well as increasing visitor use of the national park since its establishment, could contribute to cumulative long-term adverse impacts

on ethnographic resources through resource loss from ground disturbing activities or vandalism.

Alternative A's contribution to any adverse impacts on ethnographic resources would be negligible to minor.

### *Conclusion*

Actions under Alternative A would result in moderate long-term benefits from ongoing consultation with Skagit Tribes and any adverse effects to ethnographic resources would be mitigated to negligible through a cooperative agreement. Past actions including dam and reservoir construction have contributed cumulative long-term adverse impacts on ethnographic resources in Ross Lake NRA of unknown magnitude. Alternative A would also contribute a negligible to minor increment to the long-term adverse cumulative impacts. There would be no impairment to this resource or value as a result of implementing this alternative.

## Museum Collections

Under the No Action Alternative, the park would maintain collections and archives in their existing locations and provide access for qualified researchers and maintain existing exhibits that contain collections objects. These activities associated with collections management would have long-term benefits to the preservation of museum collections.

### *Cumulative Impacts*

The history of park collections has been one of growth during which collections dispersed to available spaces then consolidated again with the development of the dedicated collection facility in 1993. This has allowed for increased efficiency in curation and maintenance of the collections as well as provided for access by park staff, outside researchers, and others with interest in the collections. The program will continue to improve collection preservation and access. The planned collection upgrade will be equipped to maintain collections for the next 10 to 20 years when the upgrade is completed. These efforts would have a major long-term beneficial impact on museum collections in the park. The cumulative impacts would result in major beneficial long-term impacts on the museum collections.

### *Conclusion*

The ongoing program has resulted in major beneficial impacts on the museum collections. The planned cumulative activities would result in major beneficial long-term impacts. Alternative A would not add to these impacts. There would be no impairment to this

resource or value as a result of implementing this alternative.

## Wilderness Character

Under the current management alternative, the Stephen Mather Wilderness within Ross Lake NRA would continue to be managed as it is now. A Minimum Requirement Analysis would be used to determine if, when, and how actions that might impact wilderness character could be implemented. The backcountry permit system would remain in place and would continue to be used to manage overnight use. Opportunities for visitors to experience wilderness character would continue to be abundant.

Current management actions that manipulate wilderness include the stocking or removal of non-native fish and fire suppression. Since these actions would only be slightly detectable (after the action is taken) to some visitors and would not have an overall effect on wilderness values or recreational opportunities, the impact of these actions would be adverse and minor.

There are a number of natural resource issues that currently have an impact on the natural quality of wilderness character. These issues include invasive species issues, increases in the range of certain species, such as the barred owl, that impact listed species, such as the northern spotted owl, persistent pollutants in vegetation and fish tissue, habitat loss and migration alteration, and a number of climate change impacts. Although most of these impacts would only be slightly detectable to most visitors, the potential for landscape-scale changes could occur, especially as a result of vegetation changes due to invasive species, fire suppression, and climate change. Therefore, adverse impacts to the natural quality of wilderness character would range from minor to moderate.

Infrastructure and facilities within wilderness include one installation, the Ruby Mountain radio repeater, numerous recreational developments (well-developed trails, bridges, and camps), and two historic structures. Motorized equipment, including helicopters and chainsaws, is used by park employees for emergency activities and non-emergency administrative purposes throughout the wilderness. Examples of emergency operations include fire suppression and search and rescue operations while examples of non-emergency practices include trail maintenance, resource management projects, and some fire management activities. Most non-emergency work

that uses motorized equipment in wilderness has been evaluated using the Minimum Requirement Analysis, and found to be the minimum tool necessary to administer the area. However, these features impact the undeveloped quality of wilderness as well as opportunities for solitude and unconfined recreation. Although trails and other developments would be clearly detectable by most visitors, the use of motorized equipment would be more locally noticeable, and of a short-term duration. Therefore, impacts to the undeveloped quality of wilderness character would range from minor to moderate.

Opportunities for solitude become more abundant with distance from the reservoirs and the North Cascades Highway. Noise intrusions still occur from aircraft throughout the wilderness, and in many places motorboats and highway vehicles can still be heard. Management restrictions such as required backcountry permits for designated campsites and limitations on campfire opportunities can reduce opportunities for unconfined recreation; however, the same restrictions help to manage visitor use by reducing impacts to natural qualities. Since these conditions would only be slightly detectable to some visitors and clearly detectable to others, impacts on opportunities for solitude or primitive and unconfined recreation would range from minor to moderate.

### *Cumulative Impacts*

Other past, present, or future actions that could impact wilderness character are mostly related to ongoing activities such as the existence and maintenance of infrastructure and facilities, including trails, bridges, camps, and historic structures. Maintenance could involve motorized equipment such as chainsaws, power drills, and helicopters, resulting in minor to moderate adverse impacts. The planned installation of the Desolation Peak radio repeater, which was determined to meet the minimum requirement, would have moderate adverse impacts. Other park administrative uses that might require helicopter use, such as fire management (including suppression and prescribed burns), search and rescue operations, and other resource management tasks would result in minor to short-term moderate impacts to wilderness character. The impacts of climate change on naturalness could result in minor to moderate impacts. In combination with the No Action Alternative, these cumulative impacts would result in minor to moderate impacts.

### *Conclusion*

Adverse impacts to wilderness character would range from minor to moderate. Minor impacts would result

from manipulation of wilderness by fish stocking or removal and fire suppression. Minor to moderate impacts would result from natural resource issues, development, motorized vehicle and equipment use, and management restrictions on unconfined recreation. Cumulative impacts would range from minor to moderate. Implementation of this alternative would not result in impairment.

## Wild and Scenic River

### *Beneficial Measures Common to All Alternatives*

Under all alternatives measures would be taken to protect and enhance the Outstandingly Remarkable Values (ORVs) and free-flowing condition of eligible rivers as described in the alternatives. These measures include evaluation of water resources projects in accordance to the criteria in section 7 of the WSR Act. While these rivers are not officially designated, it is NPS policy to apply the same standard of review for eligible rivers. NPS mission and Ross Lake NRA's enabling legislation direct NPS to protect natural resources while also providing for high quality visitor experiences. All alternatives include protection measures regarding natural, scenic, and cultural resource monitoring and restoration; maintaining and enhancing recreation opportunities; collaboration with SCL on maintaining Skagit River flows for fishery resources; and managing impacts on riverbanks. These measures will provide minor to moderate benefits to the eligible river segments, free-flow character, and the ORVs. Backcountry use on eligible rivers including camping and trail use is regulated via a permit process limiting the party size and number of people in the backcountry. Use of front-country and back-country is also limited by number and size of existing facilities including parking lots, trails, river access areas, roads, and camping opportunities. Existing limitations provide minor to moderate beneficial impacts to natural resources and the visitor's experience on eligible WSR segments.

### *Impacts Common to All*

The Skagit River and Newhalem Creek Hydroelectric Projects, owned by Seattle City Light, will continue to operate in accordance with their FERC licenses. These projects would continue to have moderate adverse impacts on flows in the Skagit River and minor adverse impacts to Newhalem Creek. Both of these licenses contain a number of measures to avoid and mitigate adverse impacts and enhance resources related to fish, wildlife, cultural, and recreational values. Park managers will continue to work with SCL to restore

and enhance resources impacted from these facilities. In addition, the waste water treatments plants would continue to be operated. These facilities are regulated by the Washington State Department of Ecology to high water quality standards. However, during storm events, these systems may be overloaded, causing temporary discharges that exceed water quality standards.

In addition, the North Cascades Scenic Highway, existing SCL and park facilities, and trails are expected to have continued impacts on eligible river segments. These facilities would have minor to moderate adverse impacts on scenic, fishery, and free-flow values due to erosion and river bank manipulation projects constructed to protect the facilities. In addition, these facilities would have beneficial impacts to visitor experiences providing access to Ross Lake NRA and opportunities for people to enjoy the Skagit River and its tributaries.

### *Analysis*

Under Alternative A, there would be some beneficial long-term impacts to wild and scenic river resources and values such as to free-flow, water quality, fish, wildlife, geologic, recreation, scenery and cultural resources due to on-going monitoring, management, and restoration efforts related to these resources. Depending on the type and duration of future flood events and the response taken, there could be minor to moderate localized adverse impacts to free-flow and scenery due to emergency bank stabilization methods such as riprap or similar techniques being employed. NPS would be conducting water resource evaluations on all federally assisted projects to avoid adverse effects on river values. These evaluations often are not able to occur during emergency situations.

For recreation, depending on the increase in use, there could be negligible to minor adverse impacts to the whitewater boating experience on the Skagit because of the presence of motor boats and lack of active monitoring or management of the private non-motorized users. Commercial boating use on the Skagit would continue to be regulated through the permit process. There would be negligible adverse impacts to Newhalem Creek, Goodell Creek, Thunder Creek, and Big Beaver Creek due to increase in erosion due to trail use by people and stock. Activities including fishing and overnight use would continue to be regulated and available in formal frontcountry campgrounds and dispersed backcountry sites; helping protect recreational values.

### *Cumulative Impacts*

In the past, flows and resources in the Skagit River and Newhalem Creek were adversely impacted due to the construction and operation of the hydroelectric facilities on the river system. These projects were relicensed in the mid-1990s and new flow regimes were developed to protect and enhance river values. SCL is currently proposing an amendment to Skagit Hydroelectric Project to construct a new tunnel between Gorge Dam and powerhouse. A detailed impact analysis will be conducted by SCL and reviewed by park managers once the proposal is further developed. However, this project is not expected to change the flows in the Skagit River and therefore will have limited impact to flow-dependent values including fish, recreation, and free-flow character. Some adverse impacts to water quality and scenery may occur due to this project.

In the past construction and reconstruction of roads (North Cascades Scenic Highway and other smaller access roads) and park facilities contributed to minor to moderate adverse impacts on scenic values and free-flow character. These roads and facilities also have beneficial impacts to recreation providing access to boating, fishing, hiking, camping, and climbing opportunities.

### *Conclusion*

Impacts due to the No Action Alternative are dependent on unknown factors regarding flood events and what actions would be taken to protect roads or facilities vs. river protection. Impacts are also dependent on the type and amount of boating and trail recreation use that occurs in the future. Resource and river values are also expected to have beneficial impacts due to water resource project evaluations done to avoid adverse impacts and continued monitoring, management and restoration of resource areas. Overall, some minor adverse impacts are likely to occur under the No Action Alternative. There would be no impairment of wild and scenic river resources or values.

## **Visitation**

Visitation would be expected to increase proportionate to regional population growth. Heaviest use would still occur along the North Cascades Highway, and traffic congestion during peak summer weekends would continue. Waysides and pull-outs may become slightly more crowded. Auto campgrounds that are currently filled to capacity only a few weekends each summer may be at capacity

more often. In developed areas, visitation would be limited by the number of facilities, parking spaces, and campsites available. In the backcountry, overnight visitation would be limited by the number of campsites available and permits issued. At Ross Lake Resort and the Environmental Learning Center, overnight stays would be limited by the number of beds available. Day use may slightly increase along trails, particularly on those segments that are closest to the highway and within one to two miles of trailheads. Wintertime and shoulder season use may also slightly increase; however, little to no crowding or congestion would occur.

During most of the year, the impacts of increased visitation would be negligible. Infrastructure and facilities would accommodate additional visitors easily. However, during the peak summer season, especially on weekends, impacts would be adverse and range from minor to moderate. Since the majority of visitors to Ross Lake NRA limit their visits to areas within the highway corridor, most of them would be affected by traffic congestion and crowding at facilities during the busy summer season.

### *Cumulative Impacts*

Potential future actions could include general road, trail, or campground maintenance and various types of work on the North Cascades Highway by WSDOT. Although traffic delays may occur during road projects, there is no planned expansion of roadway capacity, and visitors would not likely alter their travel destinations. Occasional road or trail closures occur due to fire, avalanches, rockfalls, etc. Overall impacts to visitation due to these cumulative impacts would be negligible.

### *Conclusion*

The impacts of continuing current management on visitation would result in adverse negligible impacts during most of the year, and minor to moderate impacts during the peak summer season. Because visitation to Ross Lake NRA is condensed into a few months per year, and is largely concentrated along the North Cascades Highway, actions that occur along the highway will impact a large proportion of NRA visitors.

## **Visitor Opportunities**

### *General Recreation Opportunities*

Recreational activities would continue to be characterized by frontcountry experiences along the scenic North Cascades Highway, backcountry and



some frontcountry lake and river recreation, and the ability to experience wilderness and use Ross Lake NRA as a gateway to explore the greater North Cascades. Continuation of these recreation activities would have long-term moderate benefits to visitor opportunities.

### *North Cascades Highway based opportunities*

Along the North Cascades Highway, a wide variety of recreational activities would continue to be available, including scenic driving, enjoying overlooks and wayside exhibits, picnicking and road biking. There are opportunities to view the wilderness and experience a natural setting while accessing numerous amenities and services. Continuation of these activities would have long-term benefits for visitors along the North Cascades Highway.

Car camping opportunities with a range of amenities would continue to be available at Goodell Creek, Newhalem Creek, Gorge Lake, Colonial Creek, and Hozomeen Campgrounds, plus Upper and Lower Goodell and Newhalem group camps. Campgrounds that are especially susceptible to changing stream flows and storm events, particularly Colonial Creek Campground and Goodell Creek Campground (lower group camp and main sites), would be rebuilt in place if possible. If reconstruction is not possible some sites or parts of these campgrounds may need to be abandoned and a reduction in camping opportunities over time could occur as storm events dictate. Loss of campsites, depending on the number and location of sites, could result in long-term minor to moderate adverse impacts.

Hozomeen Campground will continue its current loosely organized arrangement, with no delineated sites or use limits at Winnebago Flats, providing RV- and car-camping opportunities limited only by the physical restraints of the space. Continuation of the current management at Hozomeen would have both beneficial and adverse impacts – benefitting those who prefer unstructured camping and adversely affecting those who prefer more organization to their camping experience.

Currently, stock parties do not have a car-camping option, as there are no campgrounds with a formal capacity for stock parties, resulting in a moderate adverse impact.

Winter activities are limited by lack of road access to much of Ross Lake NRA as well as adverse weather, and primarily include skiing, snow-shoeing, and bird

watching, as well as snow-mobiling along the North Cascades Highway corridor. Continuation of this limited access to wintertime recreation opportunities would have minor impacts, both beneficial and adverse, to winter recreationists.

### *Land/trail-based opportunities*

These opportunities allow visitors to move beyond the road corridor for short or long distances and times for a variety of activities, and to launch deeper wilderness explorations. A number of short walks ranging in length from 100 yards to a few miles would continue to be available, as well as access to longer day hikes, backpacks, stock trails, and mountaineering routes in the wilderness and greater North Cascades. There are over 100 miles of trail within Ross Lake NRA, over half of which are open to stock use. Several of the trails within Ross Lake NRA are long-distance segments that continue on into North Cascades National Park or the Pasayten Wilderness. Perpetuation of these opportunities provides a long-term moderate benefit to visitor opportunities.

Hunting would continue to be allowed within the entirety of Ross Lake NRA (including all backcountry camps), with the following existing exceptions: hunting is not allowed within ¼ mile of: nature trails, Thunder Knob Tail, the first few miles of Thunder Creek Trail as far as the Thunder Creek Bridge, Happy Creek Boardwalk, North Cascades Environmental Learning Center, Hozomeen Road, Ross Lake Resort, Colonial Creek and Goodell Creek Campgrounds, the towns of Newhalem and Diablo, the dams and their powerhouses, and the Ross Dam Trail and haul road. The potential for safety issues or conflicts of interest would continue between the small number of hunters and the majority of non-hunters—including many families and youth groups—who may be backpacking, camping, or hiking in the same areas, some of which are very busy, including the camps along Ross Lake, resulting in moderate to major adverse impact. Sport climbing in the Newhalem Gorge would continue in four designated areas under an Adopt-a-Crag program, and new and emerging uses such as canyoneering would be managed as any resource protection or visitor experience issues arose.

Overall, the impact on land/or trail-based recreational activities would be minor to moderate, both beneficial and adverse and long-term as a result of a potential increase in users on short day hikes as visitation increases, potential minor adverse impacts on non-hunters concerned for safety or conflict of interest with hunters, and minor beneficial impacts to hunters

because the activity continues as currently established. Impacts on the sport climbing community would be negligible, beneficial, and long-term because activities would continue within established parameters. For other recreational activities, effects are negligible and beneficial, as these opportunities would continue to be available.

Additional hiking opportunities and providing new trails in the future could be constrained by formal policies for maintaining core habitat for special status species such as grizzly bear, resulting in a negligible to minor long-term impact given the extent of the land base and likelihood of expanding trails beyond the highway corridor and into core area habitat.

### *Water-based opportunities*

Visitors would continue to have access to a range of water-based recreation in both front and backcountry, as well as numerous associated day and overnight activities. There are 19 boat-accessible camps on Ross Lake (including Hozomeen Campground) and three on Diablo Lake. On average there are three sites per camp, but numbers range from one to seven sites per camp. Nine of the sites are also accessible by trail. Over half of the sites have boat docks and group site availability. All sites are furnished with picnic tables, bear boxes for storage, well-defined tent pads, and outhouses. Group party size is limited to 12 in the backcountry, regardless of location. Overnight boat-in camping on Ross and Diablo lakes would remain accessible by all watercraft (motorboat, seaplane, non-motorized craft), with use limits set by the capacity of the current docks and campsites, as administered by the backcountry permit system.

Unlimited day use opportunities, including recreational towing, would also be available on all three reservoirs for all boat types, and on Ross and Diablo lakes for seaplanes. Current seaplane use, which is infrequent according to anecdotal data and staff observation, would remain unrestricted in the future. The overwhelming majority of boats on Ross Lake are currently paddle-craft or small motorized boats. Under Alternative A, there would continue to be no limit to the size, horsepower, wake zone, or speed of motor boats (with the exception of personal watercraft, which are prohibited). Self-powered watercraft (and motor boats, where feasible) would continue to have unlimited day use opportunities on the Skagit River, with unlimited party size. Fishing would continue under current Washington State regulations.

Under current conditions, there would be a long-term minor to moderate adverse impacts to most current and potentially future users of water-based recreation opportunities. Continuation of current management and available activities would have long-term moderate benefits. If seaplane use were to increase greatly, or if more, larger, or faster boats were to increase in number, impacts could be moderate and adverse. There would be a negligible to minor beneficial effect for seaplane users and visitors who enjoy speed-boating or large-horsepower boating as these activities would continue with no restrictions. Impacts would be long-term because of repeated use over time. There would also be a negligible to minor positive and negative effect to boaters on the Skagit River, as rafters and kayaks may continue to experience conflict and big wakes from power boaters, or as those who desire to boat up the entire Skagit continue their use. For other recreational activities, effects are negligible and beneficial, as these opportunities would continue to be available.

### *Visitor and Information Centers*

A range of facilities and services currently exist to meet a variety of visitor needs for Ross Lake NRA. The NPS information centers at Marblemount, Sedro-Woolley, Hozomeen, and the North Cascades Visitor Center in Newhalem provide orientation, information and trip-planning services to an average of 70,000 park visitors annually. Current staffing levels and hours would be maintained as funding priorities allow. Currently, only Sedro-Woolley maintains year-round visitor services. Most other stations are closed during winter and spring months, generally November to May.

For visitors entering Ross Lake NRA from the east side, there are no NPS visitor contact facilities. However, visitors can stop at the U.S. Forest Service ranger station in Winthrop for limited information. This station also has limited, non-weekend hours. The Wilderness Information Center in Marblemount was recently upgraded to include expanded staff and search and rescue areas, but the visitor side of the building is older and in need of updated displays and services. The station in Hozomeen has very limited hours due to the poor condition of this facility and periodic lack of staffing, so the services offered here are very limited and access is variable.

Impacts under Alternative A would be short to long-term, beneficial for those stations that continue an adequate service level, or minor to moderately adverse impacts at those stations with reduced or limited staffing and services.

## *Permits, Reservations, and Fees*

Primary backcountry permitting services are provided at the Wilderness Information Center in Marblemount, with limited ancillary services available at Newhalem, Sedro-Woolley, and Hozomeen (occasionally Winthrop, Chelan, and Glacier). Backcountry permits are free and required for all overnight backcountry stays in Ross Lake NRA, including all boat-in and hike-in camps. Demand varies from very high for sites on Ross Lake, especially the south end, to very low. Permits could continue to be obtained up to a day in advance, but no earlier, and no reservations are available for the general public. Impacts from lack of reservations can be both beneficial for those who prefer spontaneous trips and adverse for those visitors who prefer advanced confirmation for their trip planning.

There is a limited mail-in reservation service for commercial companies with a fee, a beneficial impact on those organizations that allows advance coordination of their commercial services. The majority of frontcountry car campgrounds would also continue to be first-come, first-served, with reservations available six months in advance at one loop of Newhalem Campground, and the three group camps. Campground fees would continue to vary from free (Gorge and Hozomeen Campgrounds) to \$32. Where reservations are available, there is an additional fee.

Overall, the permit and reservation systems would continue to ensure quality recreation experiences that distribute use and maintain opportunities for solitude, a long-term benefit to visitor opportunities. There would be long-term, minor to moderate beneficial impacts to those spontaneous users, ensuring popular areas are not booked far in advance, and maintaining no fees for permits, and also ensuring permit holders receive current first-hand information. There would be long-term minor to moderate adverse impacts to those users who prefer advance trip planning, a guarantee of a specific campsite and/or do not want to have to drive out of their way to obtain a permit first-hand.

## *Campground Facilities*

Maintenance will continue on the five campground facilities and three group camps, some of which are very susceptible to damage from storm events—particularly Colonial Creek and parts of Lower Goodell Group and Goodell Creek Campgrounds. In the event that a campground is impacted by flooding, debris flow, or erosion, the campground would be

repaired when possible and practicable. Some net loss of sites could occur, resulting in a moderate long-term adverse impact. Hozomeen Campground, especially Winnebago Flats, is currently poorly delineated and organized. Existing facilities vary between campgrounds, but there are no hook-ups or showers at any campground. No campground has overnight facilities for stock users.

The NPS would also rehabilitate Hozomeen Campground and Winnebago Flats to provide a more traditional camping experience, as well as partnering with BC Parks to provide a joint campground host to provide additional visitor services. Users at Hozomeen who enjoy traditional camping would benefit from rehabilitation and reconfiguration of the area and Winnebago Flats, but there would be less capacity overall which could result in a moderate adverse impact. In addition, those recreationists who like the current unconfined configuration of the campground would be adversely affected.

Under Alternative A, there would be a moderate to potentially major long-term adverse impact on visitor opportunities if some net loss of camping facilities occurs, but impact on most campground facilities would be negligible, long-term and beneficial as there would be no change. Impacts at Colonial Creek would be more severe because finding a comparable location would be extremely difficult. Impacts at Hozomeen would be minor and adverse due to poor layout of this facility; however, some campers who prefer the unstructured nature of Hozomeen would benefit. There would be a minor negative impact on stock users wanting a stock facility for car-camping.

## *Trails, Boat Launches, Picnic Facilities, etc.*

The current number of trails and trail uses would be maintained at current levels, with any potential new trails or trail closures evaluated on a case by case basis. There are over 100 miles of trail within Ross Lake NRA, over half of which are open to stock use. Several of the trails within Ross Lake NRA are long-distance segments that continue on into North Cascades National Park or the Pasayten Wilderness. Existing park entrance signs, picnic sites, waysides, and overlooks would be maintained in a variety of locations along the North Cascades Highway corridor. Current lake and river boat launches and boater facilities would be maintained at existing locations. There is some threat that the main boat launch at Colonial Creek Campground may slowly silt in as debris washes from Rhode Creek into Diablo Lake and the Thunder Creek Delta expands, making this launch

more difficult to use, especially for larger boats. Should this boat ramp become unusable in the future, the NPS would relocate the boat launch to the north side of the highway in the vicinity of Diablo Lake boathouse. Ensuring access to a boat launch in the vicinity of Colonial Creek Campground would have a long-term benefit to visitors. Facilities and services specifically for bicyclists are limited, but those that exist would be maintained under Alternative A.

Under Alternative A, there would be long-term moderate to major beneficial impacts as most uses continue, with some minor adverse impacts if some trails close or boat launches silt in. Cyclists who lack additional facilities may also experience minor adverse impacts.

### *Commercial Services and Facilities*

Under Alternative A, commercial services and facilities would continue at present levels, with any new proposals considered on a case by case basis. Ross Lake Resort would be maintained at its existing capacity, with any replacement facilities following established NPS guidelines. The Resort would continue to operate portage service between Ross and Diablo lakes, as well as a single water taxi for shuttles on Ross Lake. An unlimited number of commercial use authorizations would continue to be given to guiding outfits, camps, and other commercial or special use enterprises in Ross Lake NRA, mainly for use on Ross Lake but with some land-based services as well. In Diablo and other areas, Seattle City Light and NPS would continue present uses, with no public lodging or other services here. SCL would also continue to run the General Store and North Cascades Visitor Center in Newhalem, providing snacks and beverages to visitors as well as orientation to SCL history and activities, such as the dam tour.

Impacts under Alternative A would be long-term, mostly negligible and beneficial for those uses that would continue at present levels, or minor adverse if demand for some services, such as overnight lodging or water taxi, increases. Impacts of services provided by commercial use authorizations would be beneficial to those who use the services but potentially adverse if these services grow to the point that public use is displaced.

### *Cumulative Impacts*

Ample recreation opportunities would continue to be available both regionally and in areas adjacent or in close proximity to Ross Lake NRA that complement those available in Ross Lake NRA. Additional

recreation activities including winter recreation, climbing, equestrian and stock use, motor-boating, hunting, and seaplane use are all available on public lands both east and west of Ross Lake NRA, offsetting demand for use within Ross Lake NRA. Many of these areas offer similar settings to Ross Lake NRA, including Baker Lake and Lake Chelan NRA. Areas or lakes that emphasize paddle craft or small motorized boats are less common in the region, making the perpetuation of the current visitor opportunities at Ross Lake NRA important to preserve.

Awareness raising initiatives about the North Cascades may highlight recreation opportunities in the region and increase demand for recreation opportunities, facilities, and services.

Visitor and recreation facilities and services in the area would also continue to complement those available at Ross Lake NRA, notably trails, ranger stations, visitor support facilities and camping facilities. The closure of some U.S. Forest Service ranger stations to the east of Ross Lake NRA, notably at Twisp, and reduced hours and staffing levels could result in increased demand for visitor information and easier access to permits and reservations within Ross Lake NRA.

Commercial services and facilities, including lodging, food services, and additional types of recreation, cultural and educational opportunities would continue to be provided in the region, complementing what is available in Ross Lake NRA. The construction of the Environmental Learning Center for overnight stays associated with educational programming with the North Cascades Institute increased the capacity for overnight stays within Ross Lake NRA. The conversion of Baker Lake Resort to camping only may increase demand for additional overnight lodging within Ross Lake NRA. Most of these operations would continue to remain seasonal, resulting in no year-round enclosed lodging within Ross Lake NRA or in immediate proximity.

Taken as a whole, the reasonably foreseeable past, present and future cumulative actions would continue to provide diverse and expansive visitor experiences, recreational opportunities, and visitor services and facilities within the region, resulting in long-term moderate benefits to visitors. However, some visitors may wish to have year-round lodging opportunities within Ross Lake NRA, or be able to have easier access to greater portions of Ross Lake NRA. The impacts above, in combination with the impacts of implementing the No Action Alternative, would result in moderate long-term beneficial cumulative impacts. This alternative's contribution to these cumulative impacts would be a modest to moderate increment.

### *Conclusion*

The full spectrum of visitor opportunities would continue to provide for visitor enjoyment and recreation activities. Continuing current management practices under Alternative A, little would change in the array of opportunities along the North Cascades Highway or in Ross Lake NRA's backcountry areas and designated wilderness. Impacts would be negligible to moderate, long-term, and both beneficial and adverse. Beneficial impacts would be minor to moderate from the continuation of existing opportunities that serve the needs of most visitors. Adverse impacts could occur from reservations and fees, conflicting uses, possible loss of campsites due to severe weather or reorganization of Hozomeen, lack of stock-accessible front country camping opportunities, and limited access to wintertime activities.

There would be moderate long-term beneficial cumulative impacts on visitors in the broader North Cascades. Implementation of this alternative would have a modest contribution to these cumulative impacts.

## **Information, Interpretation and Education Opportunities**

Under Alternative A, on-site non-personal services, such as waysides and nature trails, provide opportunities for resource immersion within Ross Lake NRA. Personal services and formal interpretive programs, including interpretative walks, talks, and roving interpreters, provide opportunities for visitors to explore interpretive themes. Educational programs will be offered at existing facilities, within Ross Lake NRA, and in the local communities. NPS staff will also participate in outreach to provide programming for organized groups and events outside Ross Lake NRA boundaries. Other non-personal services, such as websites and publications, provide information and educational messages that can be accessed remotely and inside Ross Lake NRA.

Interpretive programs and materials that offer visitors opportunities to learn about and find meaning in resources throughout Ross Lake NRA, along with information provided through both formal and informal ranger-led programs and activities, exhibits, and diverse media (such as video, publications, website, etc.) will have a moderate, long-term beneficial impact to visitor experience .

Curriculum-based programs will help educate students about the North Cascades ecosystem and

history, resulting in a moderate beneficial impact to visitor experience as they generate curiosity, passion, and respect for park resources among students.

The NPS would continue to participate in community meetings, festivals and events, which would have a moderate long-term beneficial impact on visitor experience through the communication of Ross Lake NRA's themes and messages.

Visitor orientation and informal education would continue to be offered throughout Ross Lake NRA and off-site via waysides, signs, interpretive trails, multi-media and additional visitor contact stations, such as the Park and Forest Information Center and the Wilderness Information Center which will have a moderate beneficial impact on visitor experience. NPS information centers along the North Cascades Highway would continue to be located a short drive off the main road, which could result in a minor to moderate adverse impact to those visitors who miss turn-offs to obtain information.

The use of partnerships to help interpretive messages reach a broader audience through programs, additional interpretive displays, and distribution of interpretive material and media, including retail will have a moderate beneficial impact on visitor experience through expanded stewardship. Continued reliance on Seattle City Light (SCL) to provide interpretive information about the history, function, and value of the Skagit Hydroelectric Project would have a moderate impact on visitor experience through their engagement with the Skagit Tours Information Center, interpretive trails, boat tours, and the passenger ferry on Diablo Lake.

### *Newhalem*

The maintenance of the existing North Cascades Visitor Center with exhibits and multi-media will have a moderate beneficial impact on visitor experience through opportunities to explore the essence of the North Cascades.

### *Environmental Learning Center*

Maintenance of existing partnerships with North Cascades Institute in a range of education and interpretation programs offered at the Environmental Learning Center would have a moderate beneficial impact on visitor experience through interpretive rangers available to conduct programs and assist in program development.

## *Hozomeen*

Continued maintenance of the partnership with British Columbia Parks and the interpretive shelter at International Point would have a moderate beneficial impact on visitor experience through regularly scheduled joint NPS/Canadian interpretative programs.

### *Cumulative Impacts*

Current management would result in additional improvements to information, interpretation, education and outreach. The North Cascades Institute continues to provide additional educational programming that complements the information and programs available within Ross Lake NRA and in the surrounding region.

Opportunities for visitors to obtain information from a variety of outside local, state, and federal offices are somewhat limited. The closure of the Twisp ranger station and reduction of hours of other U.S. Forest Service ranger stations would limit outlets for visitors to obtain information outside Ross Lake NRA, notably on the east side. Maintenance of the information desk in Sedro-Woolley for year round information would continue to benefit visitors. Seattle City Light's visitor center would also continue to benefit visitors.

These facilities and information outlets would result in long-term moderate beneficial cumulative impacts on visitor enjoyment in Ross Lake NRA. Implementation of Alternative A would have a moderate, long-term beneficial impact on visitor enjoyment as it relates to opportunities to access useful information and orientation, to interact with interpretive and educational programs and media, and have meaningful experiences and interaction with resources in Ross Lake NRA.

### *Conclusion*

Overall, the impacts of implementation of Alternative A, the No Action Alternative, would result in long-term moderate beneficial impacts to visitor experiences. Continuation of current programming and activities would generate curiosity, interest and respect for resources. NPS information centers Ross Lake NRA along the North Cascades Highway would continue to be located a short drive off the main road, which could result in a minor to moderate adverse impact to those visitors who miss turn-offs to obtain information.

Opportunities for visitors to obtain information from a variety of outside local, state, and federal offices

would continue. These facilities and information outlets would result in long-term moderate beneficial cumulative impacts on visitor enjoyment in Ross Lake NRA. Implementation of Alternative A would have a cumulative moderate, long-term beneficial impact on visitor enjoyment as it relates to opportunities to access useful information and orientation, to interact with interpretive and educational programs and media, and have meaningful experiences and interaction with resources in Ross Lake NRA.

## **Access and Transportation**

Under the No Action Alternative, access would not change from current levels and conditions. The number and capacity of roads, parking lots, and other visitor facilities would stay the same. However, visitation numbers are expected to increase proportionate to regional population growth. Consequently, some additional crowding and congestion could occur, especially on weekends during the peak summer season. Some of the more popular areas, such as Diablo Overlook, the North Cascades Visitor Center, and the Ross Dam Trailhead parking lot may see more crowding and congestion more frequently, resulting in minor to moderate adverse impacts.

During weekdays, the shoulder seasons, and in the wintertime, visitation would be low enough that crowding and congestion would not occur. Access to popular destinations would not be affected by overuse. Impacts would be beneficial and negligible.

### *Cumulative Impacts*

Potential future actions could include general road, trail, or parking lot maintenance and various types of work on the North Cascades Highway by WSDOT. Although traffic delays may occur during road projects, there is no planned expansion of roadway capacity, and visitors would not likely alter their travel destinations. Occasional road or trail closures occur due to fire, avalanches, rockfalls, etc. Overall impacts to access due to these cumulative impacts would be negligible.

### *Conclusion*

The impacts of continuing current management on access and transportation would result in adverse, minor to moderate impacts during the peak season and beneficial, but negligible impacts during non-peak times. Access would be most impacted during busy summer weekends at popular destinations.

## Socioeconomic Environment

This analysis of the No Action Alternative compares impacts of current management to impacts of continued current management for the 15-20 year life of the plan. Continuing impacts are those that do not change over time from the current condition. New impacts are those that change over time.

### *Impacts to Demographics*

The recreation area has an authorized employment level of 133 FTE (full-time equivalencies). If the recreation area were able to fund additional authorized FTEs, a slight change in the local population would occur. However, additional FTEs may not be funded.

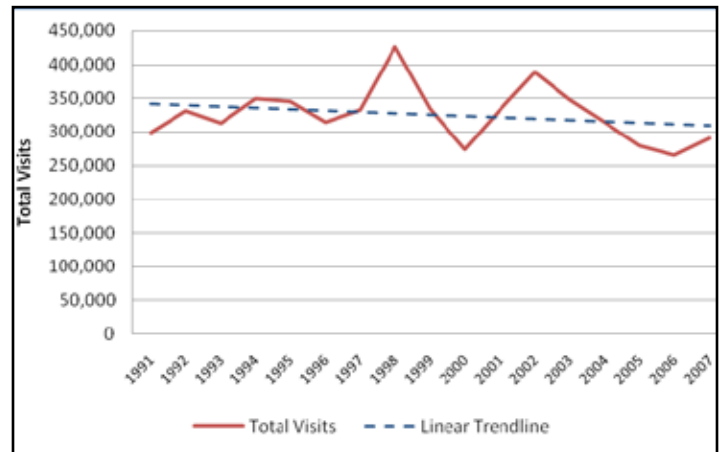
Beneficial impacts of population increases include increased demand for housing, which can cause an increase in home values and rental rates; and increased government tax revenues. Adverse socioeconomic impacts of population increases include potential for more crowding on roads and in public areas and greater demands on government services, including schools, sanitation, and water.

Population increases due to Alternative A would be minute compared with the total population of the influence area, which is about half a million people; therefore the impact would be negligible, long-term, and of indeterminate effect since there are both adverse and beneficial impacts to population growth. The local area has a much smaller population. The combined population of Sedro-Woolley, Concrete, Rockport, and Marblemount is approximately 12,000, with the majority of those living in Sedro-Woolley (US Census 2007). Even so, the addition of new employees and their families would represent a small but detectable number. The impact of hiring to the fully authorized level would be long-term, minor, and of indeterminate effect.

### *Economic Impacts to Influence Area*

The North Cascades NPS Complex has \$6.6 million funded for future projects in Fiscal Year 2009, including construction. Increases in National Park Service spending during construction of new facilities would result in short-term impacts; long-term impacts may also result from increases in yearly budgets for maintenance of any new facilities or wages for additional employees. Companies in the construction industry would see increased business if contracted to provide services. This in turn would strengthen construction employment and incomes,

**Figure 6.1 Ross Lake National Recreation Area Visitation Statistics, 1991-2007**



Source: NPS 2008.

meaning that perhaps instead of providing new jobs, workloads would expand to fill unused worker capacity. Construction workers frequenting the area would spend income on food and materials, increasing service business and government sales tax revenues. However, \$6.6 million is small in comparison to the influence area's \$7.7 billion in total personal income (Washington State 2006, BC Stats 2006). Construction spending would result in negligible, short-term, beneficial impacts to the influence area's economy, since this amount likely would be spread over the 20-year planning timeframe.

The North Cascades NPS Complex's spending would also have long-term effects. Employment of staff would keep jobs in the influence area and generate personal income that would be spent in the area. The staff spends a percentage of income on housing, food, entertainment, and other services, which would increase incomes in those industries, government tax revenues, and housing. However, new staff would put demand on local government services such as schools. NPS spending on operations at the recreation area also has a long-term positive impact on employment and incomes. Annual spending on NPS operations in 2009 was \$7.1 million. The continued impact of this spending is moderate, long-term, and beneficial; however, since the No Action Alternative proposes no changes to annual operational spending, no new impacts would occur.

Since 1991, visitation levels to Ross Lake National Recreation Area have varied from year-to-year but have trended slightly downward. Under the No Action Alternative, visitation trends could remain stable or increase proportionate to regional population growth. Visitor spending patterns would not be expected to

change appreciably due to the No Action Alternative. However, visitation would continue to affect the economic environment by providing business sales, employment, incomes, and government tax revenues. See Figure 6.1.

### *Economic Impacts to Local Commercial Services and Neighboring Businesses*

The communities of Sedro-Woolley, Marblemount, Rockport, Concrete, Hope, Mazama, and Winthrop have varying degrees of economic relationship to the national recreation area. These communities offer lodging, food, shopping, and other services to tourists; as well as housing and other needed services for staff. Under the No Action Alternative, stable visitation trends could result in some adverse to no economic change to local businesses. While present management policies and programs would continue, new construction spending would impact local businesses, especially those in the construction and related industries. The impact from construction spending would be short-term, minor, and beneficial to the local construction industry. The continuing impact from visitation and recreation area operations would be long-term, moderate to major, and beneficial to local businesses.

### *Impacts to Social Characteristics*

Construction activities would affect traffic and congestion, as construction vehicles may be moving slowly and turning in and out of construction areas. There would be an increased level of traffic due to workers coming to the area and the presence of construction vehicles. Construction activities would result in a minor, short-term, adverse impact to traffic.

The presence of a national recreation area is a beneficial social impact to the influence area, allowing residents and visitors to experience beauty and solitude in the outdoors. This benefit would continue under the No Action Alternative and therefore would result in no new impact to the social character of the influence area.

Because the No Action Alternative would continue existing trends in the national recreation area, the current baseline socioeconomic effects to the influence area economy would continue. While there is a mix of beneficial and adverse impacts, the overall continuing impact to social characteristics in the influence area would be short- and long-term, moderate, and beneficial.

### *Cumulative Impacts*

Projects that are not associated with the general management plan can interact with projects proposed in the GMP alternatives, resulting in a cumulative impact on the influence area's social and economic environment.

Continued WSDOT operations along the North Cascades Highway as well as continued SCL operations contribute to the economy by providing employment that results in incomes that are spent largely within the local economies. The continuing impacts of WSDOT and SCL operations would result in both short- and long-term, minor, beneficial impacts to the influence area's socioeconomic environment.

The 2008 Fire Management Plan will be implemented during the life of this general management plan. The plan proposes to continue with the current fire management budget, including worker payroll, which provides a stable input to the local economy. The economy is and would continue to be affected by this source of personal income that is spent on goods, services, housing, and food in the area. If fire suppression activities were to occur in the area, tourism could be affected due to road or trail closures, visibility impairment, and physical irritation from smoke; this could lead to decreased spending in local communities if visits are shortened or cancelled. However, closures that impact tourism could be offset by the presence of fire personnel during suppression operations, who would need food, supplies, and temporary housing. The Fire Management Plan will result in negligible long-term impacts to the influence area's socioeconomic environment, but impacts would be of indeterminate effect since the adverse and beneficial impacts could offset each other.

Implementation of the Mountain Lakes Fishery Management Plan would have a negligible long-term effect on the socioeconomics of the local and regional area due to changes in expenditures associated with sport fishing (NPS, 2005).

The narrowband radio implementation project, implementation of the Invasive Plant Management Plan, and the Seattle City Light Gorge project would strengthen employment and incomes in the influence area during implementation of these programs. The impacts would be short- and long-term, negligible to minor, and beneficial to the influence area's socioeconomic environment.



Impacts of implementation of Alternative A, in combination with the short- and long-term, minor, beneficial effects on the influence area described above, would result in both short-and long-term moderate, beneficial cumulative impacts to the influence area's social and economic environment. Alternative A would have a substantial contribution to the overall cumulative impact.

### *Conclusion*

The No Action Alternative would have a continuing moderate, beneficial impact to the influence area socioeconomics, but adverse impacts on traffic. The impact would be greater in the immediate areas surrounding the recreation area. The impacts of the No Action Alternative and impacts of other projects would combine to have short- and long-term, moderate, beneficial cumulative impacts to the influence area's social and economic environment.

## **NPS Operations**

### *Facilities and Sustainability*

Most of the infrastructure and development for the entire North Cascades NPS Complex, including the majority of operational facilities, is located in Ross Lake NRA. While there are some facilities, including trails, campgrounds and parking areas, throughout Ross Lake NRA, major visitor and operational buildings and infrastructure, including headquarters, staff offices, and visitor centers, are concentrated in Sedro-Woolley, Marblemount, Newhalem, Diablo, and Hozomeen. Under the No Action Alternative, there would be no major changes to these facilities. The ongoing routine maintenance of these facilities would continue under current management and there would be little overall change to park operations. Incremental changes in green facility design, continued maintenance of hybrid vehicles of in Ross Lake NRA's vehicle fleet and implementation of photovoltaics at select facilities could all have minor long-term benefits to the sustainability of park operations.

### *Operational Efficiency*

Maintenance of the current infrastructure in Alternative A would result in no change to the distribution of staff and work areas in Ross Lake NRA.

### *Staffing*

Funding for staffing levels would continue to be inadequate to meet the increased resource management, interpretation, visitor protection and

safety, maintenance and administrative needs of Ross Lake NRA, resulting in long-term minor adverse impacts to NRA operations. Implementation of Alternative A would incrementally result in minor adverse impacts on park operations.

### *Cumulative Impacts*

Past and ongoing projects, including road, trail, and facility maintenance and repairs have had long-term moderate beneficial impacts on park operations. Aging facilities and infrastructure, including utilities and systems, would continue to be repaired, upgraded or replaced as needed on a case-by-case basis, subject to available funding. Over time, more sustainable and efficient facilities and infrastructure would replace those that are aging or no longer meet the needs of Ross Lake NRA, resulting in moderate, long-term benefits to the recreation area by reducing maintenance needs.

### *Conclusion*

Under Alternative A, there would be little overall change to facilities for park operations, and sustainability of the facilities and operations would improve incrementally, resulting in minor long-term benefits. Staffing levels would continue to be inadequate to meet the future needs of NRA operation, resulting in minor, long-term adverse impacts to NRA operations. As more projects are completed that repair, upgrade, and replace aging facilities and infrastructure, and more sustainable systems are installed, maintenance needs would be reduced, resulting in moderate, long-term benefits. However, until those facilities are replaced, periodic and extensive maintenance would be required. The overall effects of implementing Alternative A on park operations would be long-term, minor and beneficial.

## **Unavoidable Adverse Impacts**

Unavoidable adverse impacts are defined as moderate to major impacts that cannot be fully mitigated or avoided.

Under the No Action Alternative, there would be a negligible potential for unavoidable adverse impacts on natural resources because there would be little new development. There would be no unavoidable adverse impacts on cultural resources.

Some existing conditions have resulted in unavoidable adverse impacts. The location of park facilities, the Skagit Hydroelectric Project, and roads, including the North Cascades Highway, in floodplains, and

the maintenance of this infrastructure has resulted in adverse impacts to floodplains and riparian areas. Most of the infrastructure would remain in these locations. Additional unavoidable impacts would likely occur on vegetation and soils, primarily in the existing developed areas where visitor use is concentrated.

## Relationship between Local Short-Term Uses and Long-Term Productivity

Under all of the alternatives, most of Ross Lake NRA would be protected in a natural state and would continue to be used by the public. Under all the alternatives, the National Park Service would continue to manage Ross Lake NRA to maintain ecological processes and native and biological communities, and to provide for appropriate recreational activities consistent with the preservation of natural and cultural resources.

Some previously disturbed areas would be rehabilitated to return these areas to productivity. Any actions the National Park Service takes in Ross Lake NRA would be taken with consideration to ensure that uses do not adversely affect the productivity of biotic communities. Under the No Action Alternative, there would be no appreciable loss of ecological productivity because there would be little new development. Existing developed areas and infrastructure within Ross Lake NRA, including the Skagit Hydroelectric Project and the North Cascades Highway, would remain.

## Irreversible or Irrecoverable Commitments of Resources

Irreversible commitments of resources are actions that result in the loss of resources that cannot be reversed. Irrecoverable commitments are actions that result in the loss of resources, but only for a period of time.

No actions would be taken as a result of the No Action Alternative that would result in the consumption of nonrenewable resources that would preclude other uses for a period of time. Thus, there would be no irreversible or irrecoverable commitments of resources in Ross Lake NRA by the National Park Service.

No actions would be taken that would result in irreversible or irrecoverable effects on historic properties. NPS staff would continue to conduct appropriate cultural resource management in accordance with the *Secretary of the Interior's Standards and NPS policies*.

## IMPACTS FROM ALTERNATIVE B (PREFERRED ALTERNATIVE)

### Natural Resources

#### Air Resources

##### *Air Quality*

Air quality management under Alternative B and each of the other “action” alternatives would focus on sustaining air quality monitoring and pursuing additional research regarding atmospheric contaminants such as mercury and persistent organic pollutants. This alternative also seeks to reduce carbon dioxide and other greenhouse gas emissions whenever and wherever possible by (a) identifying and implementing emission mitigation actions; (b) adapting to current and future impacts of climate change; and (c) increasing climate change education and outreach efforts.

This alternative proposes redesignation of Ross Lake NRA to a Class I airshed, which would require legislation. If legislation were passed, then this redesignation would have limited practical effect given the intermingled geography of the North Cascades National Park and Ross Lake NRA. The airsheds are essentially comingled, so the Prevention of Significant Deterioration (PSD) provisions in the Clean Air Act, which afford the highest protection to the Class I airshed of North Cascades, would inadvertently afford a similar level of protection to Ross Lake NRA regardless of whether it remains as a Class II airshed or is converted to a Class I airshed. Therefore there would be a negligible beneficial impact to air quality and air quality related values such as visibility.

##### *Air Pollution*

This alternative proposes to sustain air quality monitoring for visibility, acid deposition, particulates, and criteria air pollutants (ozone, sulfur dioxide, lead, carbon monoxide, nitrogen oxides, and particulates). The NPS would also pursue research and monitoring to establish levels of atmospheric contaminants (such as mercury and persistent organic pollutants such as DDE [dichlorodiphenyldichloroethylene]) in Ross Lake NRA. These data would continue to provide quantitative and qualitative information on the status and trends of air quality within Ross Lake NRA and the surrounding area and help to inform and potentially improve air quality in the greater Puget

Sound area. In addition, this monitoring information could help to enhance visitor understanding of the trends in air quality, and could indirectly serve to enable protection by increasing public understanding of the impacts of air quality on park resources.

NPS management activities and visitor use activities would both result in releases of a wide spectrum of potential air pollutants. Primary sources of emissions would be from motor vehicles, wildfires, and campfires in campgrounds. The indirect impacts to air quality from these activities would generally be negligible to minor and short term. Impacts would generally be concentrated in high use areas, and along the SR20 corridor. Wildfires could occur anywhere, and vary in scale of area and release of pollutants, thus impacts to air pollution would range from negligible to major and adverse.

One specific proposal under Alternative B that would directly benefit air quality at the local scale is to require exclusive use of either four-stroke engines, or the new direct injection two-stroke engines (or equivalent lower emission technology), for all motorized vessels on all lakes in Ross Lake NRA by 2015. Compared to Alternative A, this management action would have locally beneficial impacts to air quality by reducing emissions of volatile organic carbon compounds (VOC's) and particulates. The impact would most likely be negligible because it would only affect motorboat use in the reservoirs, and the contribution to air pollution from motorboats is relatively negligible compared to automobile emission sources along the North Cascades Highway corridor.

### *Greenhouse Gas Emissions*

Through various methods and means, the NPS would potentially reduce greenhouse gas (GHG) emissions associated with park operations by approximately 35 percent below 2006 levels by 2016 (National Park Service, 2009). These reductions would have a negligible beneficial effect in terms of directly reducing the adverse impacts of human-forced climate change. However, by seriously addressing climate change impacts associated with park operations and reducing emissions, North Cascades NPS Complex would reduce its local contribution to the global problem of climate change. In addition, by demonstrating leadership through action and education, the NPS may help mitigate climate change far beyond the park's boundaries.

### *Visibility (Regional Haze)*

North Cascades is one of 30 western National Parks that have monitored visibility for at least 6 years that have stable or improving visibility on both the clear and hazy days. Whether this trend will continue is uncertain, given predicted increases in population throughout the Puget Trough and the likely increased levels of regional haze that would result (NPS, 2005). Increasing trends in atmospheric ozone concentration at North Cascades underscore the possibility of future cumulative impacts to haze, as elevated ozone concentration and visibility impairment are often related.

Alternative B calls for expanding coordination for fire management between the NPS, the U.S. Forest Service and if possible across the border into Canada. The goal is to foster increased natural (lightning-caused) wildfires to burn as opposed to being suppressed. The adverse impacts to air quality from fire would largely depend on both the size of the fire and the weather conditions that influence smoke production and dispersion conditions. A large fire could produce a lot of smoke, and stable air masses and temperature inversions could prevent the dispersion of smoke into the atmosphere, directly impacting local air quality and scenic visibility. Large natural wildfires would emit various pollutants including (but not limited to) particulate matter, nitrogen oxides, carbon monoxide, and myriad organic compounds. The duration of these impacts would generally be short term and depending on the duration and intensity of the wildfire event. The potential impacts to air quality from increased natural wildfires would range from negligible to major and adverse; the broad difference in scale of impacts represents the uncertainty associated with weather, prevailing winds, and many other factors that affect wildfire-related air pollution.

### *Cumulative Impacts*

Cumulative impacts to air quality would be expected generally to be similar to current conditions because Alternative B management actions would not substantially increase or decrease air pollution related emissions.

Urban growth is projected to continue throughout the region, including the urban centers of Victoria, Vancouver, and Seattle whose emissions can be transported to the park under westerly wind patterns. In the reasonably foreseeable future the potential for deterioration of air quality appears to be high because of the location of the Complex relative to the large urban/industrial areas of the Puget Sound

lowlands. This proposed alternative would be similar to Alternative A in terms of the potential cumulative impacts to air quality because air quality in Ross Lake NRA is profoundly affected by regional and in some cases global pollutant emissions, and the NPS has very limited management control over those impacts. Second, transportation-related emissions from visitation are not expected to differ among the alternatives because visitation is not expected to vary among the alternatives at a level that would noticeably affect air resources.

One reasonably foreseeable management action that could have short term adverse impacts to air quality, but long-term benefits, is the proposed construction of a second tunnel from Gorge Dam to Gorge powerhouse. If constructed, this tunnel would reduce frictional losses to turbulence and capture enough additional energy to power 5,420 homes in Seattle, and thus offset fossil fuel emissions from coal-fired power plants.

### *Conclusion*

Direct and indirect impacts to air quality under Alternative B would generally be similar to Alternative A, except for negligible beneficial impacts (reduced emissions) from prohibiting 2-stroke engines on Ross Lake. Cumulative impacts to air quality would generally be similar to Alternative A, because the air quality within Ross Lake NRA is predominately influenced by human activities outside of Ross Lake NRA, including regional and global sources of air pollution. These impacts would range from minor to possibly major, as there is a great deal of uncertainty over the planning horizon as to how air resource-related impacts will evolve in the face of rapidly changing technologies and increased awareness of the need to take aggressive measures to reduce fossil fuel consumption and human-caused sources of greenhouse gas emissions.

The management actions proposed under Alternative B would have short-term negligible to short-term major adverse impacts, primarily from wildfires, on air resources. There would be no impairment of air resources within Ross Lake NRA as a result of implementing this alternative.

### **Natural Soundscapes**

Under the preferred alternative, the soundscape monitoring program would expand to include a complete inventory of all acoustic zones within Ross Lake NRA. The NPS would use this data to actively manage soundscapes by identifying unacceptable

sounds and sound levels, and taking actions that might include increased education and interpretation about protecting natural sounds and enforcement of existing noise standards. These actions would result in a beneficial impact to the natural soundscape. Noise disturbance along the highway and in the air would still occur, however, resulting in minor to moderate adverse impacts.

Most actions that would be taken on the reservoirs and the Skagit River would have a beneficial impact on the natural soundscape by reducing noise caused by motorized boats and seaplanes. Actions on the reservoirs would include restrictions on motorboat use, establishing no wake zones or speed, size, and/or horsepower limits, and requirement of 4-stroke engines. Restricting seaplane landings to the frontcountry zone only and establishing permit requirements. Implementing seaplane noise abatement procedures and educating pilots about these procedures will also have beneficial impacts. However, the addition of boat transportation services, a second water taxi and/or a scheduled boat ferry around the lake, and additional boat rentals will have adverse impacts ranging from minor to moderate. On the Skagit River, a ban on prohibiting motorboats within Ross Lake NRA will have a beneficial impact to the natural soundscape by reducing motorized noise on the river.

Other actions that would benefit the natural soundscape include developing an air tour management plan, which would involve establishing use levels and designating tour locations; developing alternative transportation solutions, including shuttles, which could reduce highway traffic and noise; providing outreach and education about protection of natural sounds to motorcyclists and other drivers; limiting the use of explosives for avalanche control along the North Cascades Highway; and closure of the portion of Thornton Lakes Road that is in wilderness. These actions may help to counteract the impacts that growing visitation could have that would otherwise impact the natural soundscape.

Actions that would have an adverse impact on the natural soundscape generally involve expansion of activities or facilities. By providing a broader range of visitor activities such as day use trails and water recreation along the highway corridor and additional overnight experiences, natural soundscapes could be adversely impacted in localized areas by increasing and concentrating use. In addition, expanding visitor facilities or adaptively reusing current buildings could result in short-term adverse impacts to soundscapes from construction activities. Expanding or adding

facilities could also result in long-term impacts to soundscapes. The expansion of parking lots such as the Ross Dam Trailhead parking would not only allow for an increase in visitors, but an increase in the vehicles, both numbers and types (such as passenger vehicles, RVs, and oversized vehicles) that could result in greater impacts to soundscapes from increased noise. In addition, expanded or new construction could result in a new or larger noise footprint to an area, resulting in additional noise from increased people using a facility or the associated infrastructure such as HVAC systems and potential minor to moderate long-term impacts.

Likewise, the potential expansion of camping facilities at Newhalem and Goodell group sites could increase visitation in these areas and impact the surrounding natural soundscape. Conversely, reconfiguring camping at Hozomeen might improve the natural soundscape by providing a more traditional camping experience. The continued wintertime use of the closed portion of the North Cascades Highway by snowmobiles will continue to adversely impact the natural soundscape. Taken together, these actions would be localized and only a small increment above the natural ambient sound levels for any of the areas, so impacts would be minor.

#### *Cumulative Impacts*

Cumulative impacts would be similar to those identified in Alternative A, except that impacts on natural soundscapes due to ongoing public automobile traffic, motorboat use, and aircraft use may be reduced. Impacts from NPS administrative uses, Seattle City Light, and Ross Lake Resort would be the same as Alternative A. Depending on the action and time of year, these actions could result in minor to moderate adverse impacts. In combination with the Preferred Alternative, these cumulative impacts would result in minor to moderate impacts on the natural soundscape; however, many actions would be beneficial and would help to preserve the natural soundscape.

#### *Conclusion*

Under Alternative B, many actions would be taken that would result in further protection or improvement in the natural soundscape compared to current conditions. Impacts would vary based on the time of year and location and would range from minor to moderate. Minor impacts would occur along the highway during the wintertime and as a result of expansion of activities and facilities. Minor to moderate impacts would occur during peak use times along the highway and on the reservoirs due to an

increase in boating opportunities. Cumulative impacts would range from minor to moderate. Implementation of this alternative would not result in impairment.

## **Water Resources**

### *Water Quality*

Similar to Alternative A, threats to water quality in Ross Lake NRA under Alternative B would continue to include non-point source runoff from various developed and impermeable surfaces including roads, parking lots, and facilities. Diffuse pollution from sources such as these typically includes various heavy metals (such as zinc, lead), organic matter, excess nutrients, sediment, oils, and hydrocarbons (Novotny and Olem, 1994). Under Alternative B, the NPS would seek ways to upgrade or mitigate effluent from point and non-point source threats to water quality.

In general, this alternative proposes very little expansion of the park infrastructure. Instead, certain areas have been targeted for fixing deficiencies such as inadequate parking and facilities that may not be defensible from future severe weather events. Taken together, this alternative includes a modest net expansion of up to 4.5 acres of impermeable surfaces that could adversely affect water quality by collecting and transporting pollutants into the environment, including surface waters and groundwater (Table 6.1). This 4.5 acre estimate does not include impermeable surfaces that could be reduced if severe weather events prompt facility closure or relocation, because the possibility of relocation is uncertain at this time. At present there are approximately 1,115 acres of impermeable surfaces, so this action would increase the total acreage of impermeable surfaces by less than half of one percent.

Some facilities, such as the upper 1.25 mile stretch of Thornton Road, would be closed and rehabilitated. Compared with existing conditions, adverse impacts to water quality from increased non-point source runoff would have minor, long-term adverse impacts to surface water quality in areas proposed for expansion. In other areas, such as the upper Thornton Lakes road, impacts to water quality would be long-term, minor, and beneficial because shortening the road (which is currently in designated wilderness) would reduce diffuse pollutant runoff.

Erosion control would continue at priority areas on Ross and Diablo reservoirs. This management action would continue to result in long-term, negligible to minor beneficial impacts to water quality by reducing sediment input. Bank stabilization along the reservoir

shorelines would also indirectly benefit water quality by helping to promote growth of riparian vegetation.

### Hydrologic Processes

The hydrologic processes of the Skagit River watershed within Ross Lake NRA would generally be minimally affected by continued management activities proposed for Alternative B. As with Alternative A, the scale of potential management actions would simply be too small to have any measurable effect on the broad patterns and processes of weather, climate and precipitation that substantially govern the hydrology and hydrologic processes of the Skagit River Watershed in Ross Lake NRA.

In certain locations, such as Goodell and Colonial Creek Campgrounds, development on debris cones and alluvial fans has prompted the NPS to implement erosion control measures (bank hardening, site-specific dredging) to protect these facilities during flooding. These actions, which have locally adverse impacts on stream channel hydrology, are discussed in the following section on hydraulic processes.

### Hydraulic processes

Hydraulic processes are an impact topic that includes various dynamic physical processes and conditions that affect the surface and subsurface flow of water in the environment. The hydraulic processes of surface streams, creeks and the Skagit River could be affected to varying degrees by the management actions proposed for Alternative B. Broadly speaking, management actions intended to reduce erosion would continue to adversely impact the hydraulic processes of running waters to varying degrees as described in the following sections.

As with Alternative A, the NPS would continue to maintain and repair the transportation infrastructure, including roads, bridges, culverts, trails and transportation facilities. However, one substantive difference would involve a more holistic emphasis on responding to severe flood damage by placing a higher priority on relocating facilities (such as roads, structures, recreational sites) as opposed to protecting facilities via bank hardening and channelization. If relocation is not an option, the NPS would follow the Washington Department of Fish and Wildlife’s “integrated streambank protection guidelines” whenever possible, and avoid habitat-harmful

**Table 6.1 Approximate Area of Impermeable Surfaces for Recreational Use and Park Operations**

Facility Name	Potential Management Action	Approximate Area of Additional Disturbance (Acres)
<b>Newhalem Creek Campground drive in campsites</b>	Expansion of drive in camping capacity	2 acre increase (additional loop roads and drive-in parking)
<b>Upper and Lower Goodell Group Camps</b>	Possible expansion of group camping sites	1 acre increase (possible road lengthening and drive in parking)
<b>RV sites for volunteer staff at Newhalem, Colonial and Hozomeen Campgrounds</b>	Expand and upgrade the RV sites at Newhalem, Colonial and Hozomeen for Volunteer Staff	<= 1 acre increase
<b>North Cascades Environmental Learning Center</b>	Additional outdoor learning centers and new campsites at Buster Brown and Diablo Gorge	<=1 acre increase
<b>Thornton Lake Road</b>	Closure of Thornton Lake Road at Wilderness Boundary	2 acre decrease (14' wide roadbed would be foreshortened by 1.25 mile and rehabilitated. Several perennial creeks cross under this road section)
<b>Ross Dam Trailhead</b>	Proposed expansion of Ross Dam trailhead	1.5 acre increase in parking capacity
<b>Net impermeable surface expansion</b>		4.5 acres
This table focuses on proposals of known scope, and does not include estimates of impermeable surfaces that could be reduced if severe weather events prompt facility closure or relocation.		

practices such as bank armoring with rip-rap (WDFW, 2003). Bank protection techniques would include rock barbs, engineered log jams, and bioengineering; each measure would be tailored to the site. When possible, the NPS would seek to address the underlying causes of damage (such as undersized culverts) and seek improved engineering solutions to reduce the risk of further damage to facilities and the environment. Areas that would most likely be adversely affected by bank protection measures include Goodell Creek Campground, Colonial Creek Campground, and various stream crossings at Rhode Creek, Sourdough Creek, Damnation Creek, Thornton Creek and Pyramid Creek.

Colonial Creek Campground is constructed on the debris cones of Colonial and Rhode Creeks. Periodic debris flows from these creeks, especially Rhode Creek, block entrance roads and damage campground roads and facilities. Goodell Creek Campground is situated on an alluvial fan at the confluence of Goodell Creek and the Skagit River. The alluvial fan is aggrading, and the creek is now flooding certain campsites.

In response to these flood risks, management Alternative B proposes to consider facility relocation first before attempting to defend facilities via management actions such as bank stabilization and channelization. Under this scenario, portions of Goodell Creek and Colonial Creek campground could be closed, and/or a longer bridge across Goodell Creek could be constructed to enable better alluvial transport. These actions would have negligible to moderate benefits to stream channel hydraulic processes because the channels would be less adversely affected by channel stabilization and confinement. If closure and relocation is not feasible, then NPS would make repairs in a manner that seeks to minimize adverse impacts to natural hydraulic processes. These actions would continue to cause minor to moderate adverse impacts to the natural hydraulic processes, and could possibly encourage further problems in the future by encouraging a “negative feedback” cycle of head cut formation and further channel instability. These unintended consequences could require further management action in the future (Bolton and Shellberg, 2001). Should such action require the dredging of lacustrine wetlands, a Wetland Statement of Findings would be considered at that time.

Alternative B calls for continued erosion control measures in response to wave induced erosion on Ross

and Diablo reservoirs. Erosion control would prevent further shoreline loss, stabilize campsites and facilities such as docks, and encourage growth of shoreline vegetation. However, it would cause neither beneficial nor adverse impacts to natural hydraulic processes because wave-induced erosion of soils and landforms is an artificial consequence of reservoir inundation.

The North Cascades Highway would continue to adversely influence hydraulic processes in the vicinity of running waters along its alignment within Ross Lake NRA. Alternative B commits the NPS to working more proactively with WSDOT to encourage habitat-friendly streambank protection measures and other habitat-friendly techniques whenever possible. However, WSDOT has the legal jurisdiction and authority to operate and maintain SR20, so the NPS’s ability to proactively influence the manner in which WSDOT responds to flood damage would remain limited. In most circumstances, it is assumed that due to limitations on funding and higher priorities elsewhere in the state, WSDOT would continue to respond in a reactive (and most likely emergency) capacity to harden and dredge stream channels in the vicinity of bridge crossings and culverts. It is also assumed that WSDOT would also seek to dredge or otherwise modify the streambed to ensure waters continue to flow under—not around—bridges. These actions would continue to result in localized, long-term adverse impacts to hydraulic processes of running waters in Ross Lake NRA.

#### *Cumulative Impacts*

Within Washington State, between 50 and 90 percent of riparian habitat has been lost or extensively modified by human activities (WDFW, 2003). The cumulative impacts to the Skagit River riparian zone within Ross Lake NRA generally reflect the statewide trend of riparian degradation, but mainly via management actions other than those taken by the NPS. Alternative B would result in some expansion of facilities and cause varying degrees of cumulative adverse impacts to water quality and hydraulic processes. However, these impacts would generally be minor to moderate, and significantly smaller in magnitude when compared with the other cumulative and connected actions that are adversely affecting water resources within Ross Lake NRA.

Similar to Alternative A, the Skagit and Newhalem Creek Hydroelectric Projects would continue to cause cumulative adverse impacts to the quantity and quality of water resources within Ross Lake NRA. The reservoirs would continue to modify the hydrology of the Skagit River, reducing peak flows, increasing

base flows, and modifying the physical and chemical characteristics of the Skagit River.

Water quality impacts would continue to be associated with point and non-point source pollutants from the hydroelectric facilities. Point source pollutants would include contributions from the wastewater treatment plants in Newhalem and Diablo and from effluents inadvertently discharged from the hydroelectric facilities. These point source effluents would continue to release increased levels of nutrients, oils and greases, and trace levels of various toxins including metals. The reservoirs would continue to release water that has been thermally altered by dam storage, and physio-chemically modified by loss of suspended sediment. When added to the past releases of various pollutants, including highly toxic materials such as PCB's, the cumulative impacts to water quality and quantity and timing of flows would be long-term, moderate to major and adverse.

Seattle City Light proposes to drill a second tunnel from Gorge Dam to Gorge powerhouse to capture energy that is currently being lost to turbulence. If this project proceeds, it could have temporary adverse impacts to water quality in the Skagit River during and possibly following construction. However, data are currently lacking to determine the degree to which this project could adversely and cumulatively affect water resources within Ross Lake NRA.

Wet and dry atmospheric deposition of toxins including Persistent Organic Pollutants (POP's) such as PCB, DDT, and mercury would presumably continue to settle on the landscape of Ross Lake NRA (Moran et al., 2007). These pollutants enter the atmosphere as volatile contaminants and can be transported for long distances, then deposited through condensation and precipitation, with disproportionate amounts falling as snow. The highest amounts of contaminated snowfall are often deposited at high elevations in glaciers and snowfields. Meltwater washes these pollutants into mountain lakes and streams, where they can become absorbed and accumulated in the food chain. This process has been well documented in the Canadian Rockies where researchers there found that contaminant levels in fish tissues are well above the residue guidelines for piscivorous wildlife such as otters, bald eagles and ospreys (Blais et al 1998).

Certain tributaries to the Skagit, including Ruby Creek and Thunder Creek, have experienced fairly extensive mining activity since the late 1800's. Recreational

placer mining, in some cases at nearly an industrial scale, still occurs in Ruby Creek upstream and outside of Ross Lake NRA. Within Ross Lake NRA, monitoring data indicate benthic macroinvertebrate communities are experiencing adverse impacts from the mining runoff (Rawhouser, 2008). Other aquatic species may also be adversely affected, but there are no monitoring data. The lingering past impacts of mining, coupled with the present impacts of continued mining on Ruby Creek, would continue to cumulatively adversely affect the surface water resources within Ross Lake NRA, however, there are no data to quantify the magnitude of adverse impact to surface waters associated with past mining or current mining activities.

The high elevation snowpack sustains most of the running waters within Ross Lake NRA during the summer dry season. Climate change research indicates the volume of the April 1st snowpack in the low- and mid-elevations of the Cascades has a high sensitivity to surface temperatures. Projected warming in the future will substantially diminish springtime snowpack and cause large changes in the volume of stream flows. Peak flows are expected to shift from spring dominated flows caused by snowmelt, to fall and winter flows associated with increases in extreme precipitation during those times, including less snow at lower elevations (University of Washington, Climate Impacts Group. 2009).

Floodplains and wetlands within Ross Lake NRA have been cumulatively impacted by past construction of roads and other facilities. As with Alternative A, past, present, and future activities may include further bank armoring, replacement of culverts and bridges, and various channel modifications to protect facilities and bridges. These actions will continue to cause long-term, minor to moderate adverse impacts on hydrologic systems by affecting streambed composition, sediment transport, natural stream dynamics, flow regimes, lateral water infiltration, and other hydrologic components and processes.

#### *Conclusion*

Impacts to water quality would range from negligible to minor and adverse. Impacts would be associated with NPS operations and maintenance related activities, including road and facility maintenance, and boating operations. There would also be impacts stemming from the industrial uses associated with Seattle City Light, with motor vehicle use, and with maintenance of the SR20 corridor. There would be negligible impacts to hydrology. Impacts to hydraulics would be localized, long-term, adverse and of



negligible to moderate intensity. These impacts would be primarily associated with local manipulation of hydraulics to protect roads, campground and facilities from erosion. Cumulative impacts to water resources would be negligible to moderate, long-term and adverse because there would be no substantive changes to existing park operations or operations associated with the Skagit River Hydroelectric Project. Moreover, the impacts from climate change on water resources (water quantity, quality and hydrology) are expected to gradually increase within the 15-20 lifespan of this plan, but then accelerate rapidly beyond the planning horizon (University of Washington Climate Impacts Group, 2009).

Direct, indirect and cumulative adverse impacts to water resources would remain negligible to moderate because there would be no substantial changes to current management. Therefore, there would be no impairment of water resources under Alternative B.

### Geologic Resources, including Soils

Alternative B proposes various management actions that would affect geologic resources and soils. NPS management actions that would adversely impact surficial geology and soils would broadly include:

- maintenance of trails and associated facilities, including minor relocations
- flood-damage repairs to facilities and the transportation network
- construction of several new trails in various locations, mainly in frontcountry areas
- expansion and/or relocation of new trailhead facilities (such as expansion Ross Dam Trailhead)

Various best management practices would be employed to minimize soil erosion during construction and maintenance. New or relocated facilities would be sited when possible in areas that have been previously disturbed and/or are not located near geologically unstable areas.

Recreational activities would continue to cause impacts to soils as a result of social trail formation and expansion. These impacts would occur in a relatively small portion of Ross Lake NRA, primarily in areas of high recreational use such as popular frontcountry areas including trailheads, sport climbing areas, and campgrounds. Similar impacts would also continue to occur in backcountry camps and along informal trails such as mountaineering routes. These adverse impacts to soils would be long-term, negligible to minor and adverse.

Road management practices would continue to adversely impact surficial geologic processes and soils in the vicinity of road prisms, including NPS-managed roads and the SR20 corridor. Facility relocation and expansion would cause adverse impacts to geologic resources and soils in frontcountry, Skagit River, and the hydroelectric management zones. Expansion of Ross Dam trailhead would require blasting and removal of several thousand cubic yards of soil and bedrock over an approximately 2-acre area. The protection of some sites in the north loop of Colonial Creek Campground represent a long-term management issue due to the potential for flooding and the need to manipulate geology to protect those sites long-term. The adverse impacts to geologic resources and soils would be long-term, minor to moderate in scale.

Alternative B proposes some actions that when compared to existing conditions would have long-term negligible to minor beneficial impacts to soils, and indirect benefits to surficial geologic resources. For example, in certain areas such as Goodell Creek Campground and Colonial Creek Campground, roads could be realigned and/or foreshortened in response to flooding or geologically unstable areas. Erosion control measures along Ross and Diablo reservoir shorelines would continue to protect the soils along the shorelines from motor boat wakes and wind-driven waves. Site rehabilitation in areas impacted by recreation would help to promote soil-forming processes.

### *Cumulative Impacts*

A variety of past, present, and reasonably foreseeable actions have affected and will continue to affect geologic resources and soils in Ross Lake NRA. The soils and geologic resources of Ross Lake NRA have been variously modified over the past century by human activities such as mining, dam construction, highway and railroad construction, and construction of various NPS facilities. The Skagit River Hydroelectric Project has permanently flooded approximately 13,000 acres, and additional approximately 1,000 acres have been converted to roads and various facilities. Taken together, these permanent modifications account for approximately 12 percent of the natural landscape of Ross Lake NRA. This estimate does not include previous manipulations to the landscape caused by mining, logging, and fire suppression activities, as quantifiable estimates for these past activities are difficult to compile. The cumulative effects of these activities have been moderate to major, long-term and adverse.

Seattle City Light has significantly and irreversibly modified the surficial geology within Ross Lake NRA to construct and maintain the Skagit River Hydroelectric project. Impacts include approximately one acre of lakeshore lost to erosion annually, sedimentation of reservoir, changes to the natural hydrologic period, and the cut-off of gravel and large woody debris to river. While no new above ground facilities are anticipated within the life of this plan, SCL does propose to construct an approximately 2-mile long tunnel from Gorge Dam to Newhalem powerhouse. Most of the construction-related impacts to surficial geologic resources would be limited to the immediate vicinity of the tunnel portals; however, this project has yet to be approved.

Regardless of the proposed tunnel, SCL would continue to operate and maintain the Skagit and Newhalem hydroelectric projects and cause adverse cumulative impacts to geologic resources. Operation and maintenance activities could include site-specific stabilization of steep, unstable slopes and related actions intended to mitigate the risks of rockfall. Additional activities are the maintenance of road network in Ross Lake NRA to microwave sites, powerline and towers, and Newhalem Creek hydroelectric station. Some of these actions would occur on NPS lands within Ross Lake NRA, causing minor to moderate, adverse, cumulative impacts to surficial geologic resources and soils.

The surficial geology of Ross Lake NRA was significantly and adversely modified to construct the North Cascades Highway. The maintenance of the North Cascades Highway, SCL infrastructure, and Colonial Creek Campground will continue to have long-term moderate adverse impacts to Skagit River and tributaries. The Washington Department of Transportation would continue to cause minor to moderate adverse impacts to surficial geologic resources in certain areas in order to safely maintain the highway. These adverse impacts would be associated with routine maintenance and repairs along the highway, and periodically, more intensive repairs associated with flood damage, rockfall and avalanches.

Other human-caused activities have cumulatively and adversely affected soils and geologic resources in less-perceptible but nonetheless substantial ways. Atmospheric deposition of various pollutants from regional and global sources has affected the natural chemical composition of soil such as by reducing soil pH and increasing nitrogen deposition. These impacts are likely to increase given population growth estimates both regionally and globally. The adverse

cumulative impacts to soils are poorly understood as data are limited. Additionally, suppression of fires creates situations where hot burn will have serious impacts to soils and hillslope stability.

Global climate change may increase the severity and frequency of storms, and trigger landslides, increase rockfall, and increase soil erosion in unstable areas. Although few statistically significant changes in extreme precipitation have been observed to date in the area, regional climate model simulations generally predict increases in extreme high precipitation over the next half-century, particularly around Puget Sound. Facility adaptations required to respond to these events, would have long-term, major and adverse impacts to soils and geologic resources in the future.

### *Conclusion*

Direct and indirect impacts to soils and geologic resources from recreation-related activities would be negligible to minor, long-term and adverse. Impacts from management of facilities and the transportation infrastructure would be minor to moderate, long-term and adverse. Cumulative impacts from past and reasonably foreseeable future management actions associated with hydroelectric projects and the North Cascades Highway primarily beyond the scope of NPS jurisdiction would be moderate to major and long-term.

Adverse impacts associated with the GMP would range from negligible to moderate in intensity. There would be no major, long-term adverse impacts from NPS management actions. There would be no impairment of soils and geologic resources as a result of implementing this alternative.

### **Vegetation (including special status species)**

Alternative B proposes to continue to maintain the existing infrastructure with the following limited facility expansions and improvements that may adversely affect vegetation: (a) replacement of the Hozomeen Ranger Station, (b) construction of east and west entrance portals along SR20, (c) widening of the single-lane bridge across the Skagit River in Newhalem, and (d) expansion of the Ross Dam Trailhead. Vegetation in most of these areas generally has been previously disturbed by development, so impacts from maintenance and limited new facility construction would be minor to moderate, generally long-term, and adverse.

New trails proposed in Alternative B would result in localized removal of vegetation along new trail alignments, however, some existing trails could be

closed and mitigation measures include avoiding sensitive vegetation and avoiding removal of mature trees. Overall, trail construction from Alternative B would result in long-term minor impacts to vegetation.

If Colonial and/or Goodell Creek Campgrounds are damaged by flooding, then affected portions of those campgrounds would be abandoned and rehabilitated. The Thornton Lake Road would be closed at the wilderness boundary and converted to a trail. Taken together, management of the transportation and facility infrastructure would have negligible adverse impacts on vegetation. In some areas, there would be long-term minor benefits to vegetation by closing facilities and restoring the abandoned areas.

Vegetation management actions proposed for Alternative B would emphasize more holistic approaches to ranking and prioritizing areas for restoration, including areas for control of invasive, non-native plants. In developed areas, such as campgrounds, the hazard tree management program would continue to have localized adverse impacts on vegetation, but these impacts would be localized to campgrounds and facilities.

Fire management activities would involve a mixture of strategies for managing and responding to wildfires. Allowing natural fires to occur will help to restore or maintain ecosystem processes, resulting in beneficial impacts to vegetation. Suppression of lightning caused fires would cause adverse impacts including direct harm from fire line construction, and indirect impacts caused by disrupting the natural processes and functions of fire on forest development and regeneration. Fuel build up could enhance the intensity of future fires, and lead to larger, more intense fires and stand replacing events. These impacts would generally be located in proximity to the international border and in developed areas where fire suppression takes priority. The intensity and severity of adverse impacts from fire suppression could range from minor to moderate or even major during the lifespan of the plan.

Various recreation and visitor uses could adversely affect vegetation via direct harm such as trampling and social trail development, and via indirect means such as importation and spread of invasive, non-native plants, or human caused wildfire. The NPS would continue to mitigate the adverse impacts of recreation on vegetation through education, permit systems, and enforcement of regulations. Certain emerging activities, such as sport climbing and bouldering, would be limited to existing areas and not allowed

to expand into new or undisturbed locations. Taken together, recreational impacts to vegetation would be localized in scale, adverse, and negligible to minor.

### *Special Status Species*

Alternative B may affect, but would not adversely affect special status plant species for several reasons. Prior to conducting and work involving potential impacts to vegetation (such as new facility construction, minor relocation of trails, fire management operations) plant surveys would be conducted to locate any special status species that may be found in the area. If species were identified, then projects would be modified to avoid harm to those species.

### *Cumulative Impacts*

Past and ongoing development within Ross Lake NRA has cumulatively and adversely affected vegetation in a variety of ways. The Skagit River Hydroelectric Project has permanently inundated approximately 13,000 acres of low elevation forest and riparian areas, and disrupted various natural ecological processes such as wildfire. Other human activities such as logging, mining, and development have impacted thousands more acres within Ross Lake NRA. The establishment of North Cascades NPS Complex prohibited many of these past adverse and cumulative impacts from continuing, but many of the lingering adverse impacts remain and are readily apparent across the landscape.

Outside the boundaries of the North Cascades Complex, various threats to vegetation continue to persist and expand. These threats include continued logging, forest conversion for development, habitat fragmentation, fire suppression and various other human uses of the land that are individually and cumulatively harmful to vegetation, and the ecosystem functions that enable vegetation to persist. Reasonably foreseeable threats include continued fire suppression, human caused wildfires, spread of forest pathogens and invasive, non-native plants, and global climate change. Human-forced climate change has the potential to exacerbate various cumulative impacts to vegetation by reducing soil moisture availability during the growing season, increasing the risk of severe storms, promoting conditions for forest insects and disease, and enhancing the risk of wildfire. The degree to which these external, adverse impacts may cumulatively threaten vegetation within the boundaries of Ross Lake NRA is uncertain, but likely to be adverse and to increase in severity in the future.

When considered against the backdrop of both internal and external threats to vegetation, Alternative

B proposes few additional impacts to vegetation that would cumulatively contribute to the past adverse impacts that have occurred, or may occur within the timeframe of this plan. In some instances, the past impacts to vegetation would be actively restored, thereby expediting the recovery of natural vegetation, albeit in very localized areas. Taken together, the cumulative impacts of Alternative B on vegetation posed by the management actions in this plan would be negligible to minor and both beneficial and adverse. By any measure, they would be very small compared to the widespread cumulative impacts that are occurring outside the boundaries of Ross Lake NRA.

### *Conclusion*

Alternative B would have negligible to moderate, adverse impacts on vegetation in regard to management of the transportation and administrative infrastructure. Recreation-related impacts would be adverse and negligible to minor. Suppression of natural wildfires would have long-term, adverse and moderate to major impacts on vegetation. This alternative may affect, but would not adversely affect special status plant species. Cumulative impacts to vegetation would be adverse for areas affected by continued development and visitor use, and beneficial for areas that would be restored and revegetated. Impacts to vegetation would generally be negligible to moderate. There would be no impairment of vegetation resources.

### **Fish and Wildlife (including special status species)**

#### *Impacts from Hunting and Fishing*

Hunting and fishing would continue at levels similar to that of Alternative A. Impacts to game populations would be negligible to minor and adverse. Impacts to fish populations from fishing-related activities would generally be negligible to minor and adverse.

#### *Human Disturbance*

Various forms of human disturbance would continue to occur under Alternative B. Recreation and visitor use would continue to have localized adverse impacts on various species of wildlife, primarily as a result of human presence in certain areas frequented by wildlife. Much of Ross Lake NRA, however, is untrailed backcountry or wilderness. Wildlife in these areas would be less adversely affected compared to areas readily used by visitors. However, in certain high use areas, certain wildlife would be habituated to human presence and this would continue to be a long-term negligible to minor adverse impact.

Along the SR20 corridor in particular, noise from vehicles, especially extremely loud vehicles such as motorcycles, would continue to cause disturbance to wildlife, prompting avoidance of certain areas and other behavioral effects such as flushing (such as noise can flush birds from nests). In contrast to current management, the NPS would seek to reduce noise from motor vehicles by taking action to enforce existing motor vehicle noise standards and educate visitors about the impacts of noise.

Some wildlife would continue to be harmed or killed by motor vehicles traveling along the highway corridor, although the quantity of wildlife potentially harmed would likely be minor (R. Kuntz, NPS Wildlife Biologist, pers. comm.). There is no indication that overall visitor use of the area would differ compared to Alternative A, so impacts from motor vehicle related activities would generally be negligible to minor adverse and long-term. Enforcement of Washington State motor vehicle noise standards would have a negligible to minor and beneficial impact on wildlife if it reduced the chronic noise-related impacts along the highway corridor.

Under Alternative B, the NPS would provide additional food storage options, such as food storage canisters or boxes, in order to prevent bears and other wildlife from gaining access to human food becoming habituated. Expansion of existing provisions for backcountry food storage would afford minor, beneficial impacts to wildlife, especially species such as bears.

#### *Park Operations*

The goal behind this alternative is to afford protection to park resources. To do this, the NPS would guard against habitat fragmentation by consolidating development and limiting new facility construction in undeveloped areas. Most facilities in Ross Lake NRA are located in frontcountry areas already affected, to varying degrees by habitat fragmentation, so this would likely have a negligible to minor beneficial impact to wildlife.

This Alternative would seek to improve interagency and trans-border coordination with respect to use of wildland fire. Increased coordination could result in minor to moderate, beneficial impacts to certain wildlife species whose habitat depends upon periodic wildland fire. Other species would potentially benefit from reduced impacts of fire suppression-related activities.

The NPS would seek to further protect and enhance spawning habitat on the Skagit River and its tributaries, including maintaining side channels for breeding and rearing habitat. The NPS would also coordinate more aggressively with WSDOT to mitigate emergency road-related repairs and replace use of rip-rap with habitat friendly erosion control techniques. These activities would have an indirect, beneficial impact to certain fish and riparian-dependent wildlife species, primarily along the Skagit River and its various tributary junctions.

### *Special Status Species*

Impacts to special status fish and wildlife species would be similar to Alternative A, although perhaps slightly less severe in magnitude given the emphasis on proactively managing certain activities such as reducing the impacts to the soundscape, consolidating development in previously disturbed areas, more stringently managing backcountry food storage, and proactively coordinating with Washington State Department of Transportation to mitigate impacts of road management activities on the Skagit River.

Special status species would continue to benefit from protection of largely unfragmented core habitat provided by the North Cascades NPS Complex. In addition, special status species such as grizzly bear would realize additional benefits from the NPS establishing quantifiable targets for maintaining core area and from adopting more formal policies for maintaining core area habitat. These policies could also stimulate action among other agencies and partners in the greater North Cascades ecosystem, resulting in additional long-term benefits.

### *Cumulative Impacts*

No new facilities, roads, major trail construction, or related changes in park infrastructure or operations are anticipated under Alternative B. In some instances, however, facilities could be closed and consolidated. This would result in a negligible cumulative benefit to fish and wildlife because the scale of beneficial effect would be very limited.

Similar to Alternative A, the impacts of human-forced climate change would be adverse but of uncertain magnitude.

Similar to Alternative A, the impacts of human development and associated habitat loss and modification outside the boundary of Ross Lake NRA would have adverse effects on populations of

terrestrial species with large home ranges, anadromous aquatic species such as salmon, and certain migratory bird species that rely on unprotected habitat outside the park boundary. The degree of impact to these species would be uncertain to predict as it would be substantially related to the relative success—or failure—of various large scale efforts currently underway to protect and restore the greater North Cascades ecosystem.

### *Conclusion*

Impacts to wildlife from hunting and fishing would continue to cause negligible to minor impacts to fish and wildlife. Recreational use and various park operations would continue to cause negligible to minor long-term impacts to wildlife. Facility closure and/or relocation would reduce habitat fragmentation and have a negligible to minor beneficial impact on fish and wildlife. There would be no impairment of fish and wildlife resources.

## **Cultural Resources**

### **Archeological Resources**

Under Alternative B, the actions and associated impacts would be the same as Alternative A. In addition, under Alternative B the NPS would a) develop a program for paleoecological investigations to expand understanding of past ecological processes and climate conditions, b) expand partnership opportunities for research related to paleoecological processes, and c) expand opportunities for qualified researchers to engage in existing and new archeological projects. Under Alternative B, the NPS would also increase opportunities for archeological site interpretation in the field.

These new programs and expanded partnership and public involvement opportunities would enhance understanding for paleoecological investigations and potentially increase future stewardship more than Alternative A, resulting in additional moderate long-term benefits to archeological resources.

Alternative B also includes a stronger connection between archeological investigations and research and public interpretation and education. Providing opportunities for archeological site interpretation in the field could be a powerful interpretive experience, providing context as well as personal experience with an archeological site investigation. New interpretive materials based on research results would increase

relevancy of research to the visiting public. The activities could contribute to building future support for archeological investigation and could result in additional minor to moderate long-term benefits.

Construction activities associated with Alternative B, including but not limited to new trails and the Ross Dam Trailhead parking lot, would have a greater adverse impact than Alternative A; however, mitigation measures would likely result in minor and localized adverse impacts.

#### *Cumulative Impacts*

Cumulative impacts would be the same as Alternative A. Implementation of Alternative B would not contribute to overall adverse impacts to archeological resources.

#### *Conclusion*

Increased emphasis on paleoecological investigations and expanded partnership opportunities for research would contribute to long-term archeological preservation objectives and have moderate long-term benefits. Adverse impacts associated with new construction would likely be minor and localized. Cumulative impacts would be the same as Alternative A and implementation of Alternative B would not contribute to cumulative adverse impacts. There would be no impairment to this resource or value as a result of implementing this alternative.

### **Historic Structures and Cultural Landscapes**

This alternative would involve the same activities and impacts as Alternative A. In addition, Alternative B would investigate the potential for adaptive reuse of historic structures where feasible, and develop preservation treatments that emphasize education or interpretive potential. These treatments would immerse more visitors in cultural resources in Ross Lake NRA, enriching their understanding of cultural resources and contributing to long-term support for preservation. These treatments that emphasize adaptive re-use of historic structures and integrate interpretive or educational opportunities would have moderate long-term benefits to the preservation of historic structures and cultural landscapes.

Should the NPS acquire Hollywood from Seattle City Light there could be additional benefits to historic structures and cultural landscapes given the NPS's preservation mission.

Under Alternative B, the NPS would actively work to acquire Hollywood from Seattle City Light through

either purchase or exchange for Reflector Bar. The NPS would strive to preserve the contributing elements and provide for a mix of future uses depending on the needs of the park and park partners. Specific recommendations for adaptive reuse would be informed by determinations of eligibility for the National Register, condition assessments of the buildings, and public input. The NPS and its partners have a need for additional infrastructure for operational purposes (e.g. housing, maintenance, research and educational facilities) as well as public recreation (e.g. public overnight opportunities). The NPS would seek opportunities to preserve contributing elements, maintain significant character-defining features of the area and interpret its history as appropriate, regardless of the mixture of new uses that are introduced to the site. These needs and the increased potential for adaptive reuse of National Register listed, eligible, and potentially eligible historic properties would have long-term benefits to these resources.

The NPS is an agency with a preservation mission and would adhere to the Secretary of the Interior's Standards for the Treatment of Historic Properties for actions taken in Hollywood, which would have long-term beneficial effects to historic properties. Any building determined not necessary for NPS or partner needs could be removed with mitigation to be determined through the NHPA 106 compliance process. Adverse impacts could range from minor to major depending on the level of significance for the individual property affected and the action taken.

Implementation of Alternative B could also enhance long-term preservation by enabling visitors to experience first-hand historic properties and the story they represent in the history of the Skagit Project. Providing overnight lodging and additional recreational experiences in Hollywood and Diablo could result in an educational opportunity with respect to historic preservation, increasing support for long-term preservation of these historic properties. Increased support for historic preservation through education and personal experiences in Hollywood could have long-term moderate benefits to historic properties.

#### *Cumulative Impacts*

Cumulative impacts would be the same as Alternative A. Alternative B would not contribute to the adverse cumulative effects described above.

### *Conclusion*

The implementation of Alternative B would result in long-term, beneficial effects to historic buildings and cultural landscapes through preservation treatments that emphasize adaptive reuse and education or interpretive potential. Acquisition of Hollywood could result in additional long-term benefits, and potential future uses that involve a mix of opportunities for the NPS, park partners and visitors could result in increased support for historic preservation through education and personal experiences and contribute long-term moderate benefits to historic properties. Adverse impacts to individual properties could range from minor to major depending on the level of significance for the individual property affected and the action taken. Alternative B would not contribute to the adverse cumulative effects. There would be no impairment to this resource or value as a result of implementing this alternative.

### **Tribal Issues and Ethnohistory**

Actions under Alternative B and associated moderate long-term benefits would be the same as under Alternative A. The additional of interpretive opportunities that communicate human use of the North Cascades would contribute additional minor to moderate long-term benefits through increasing awareness and engaging visitors in the history of human use in the North Cascades.

### *Cumulative Impacts*

Cumulative impacts would be the same as Alternative A. Alternative B would not contribute to adverse cumulative impacts.

### *Conclusion*

Actions under Alternative B would result in moderate long-term benefits similar to Alternative A. Cumulative impacts would be the same as Alternative A and Alternative B would not contribute to adverse cumulative impacts. There would be no impairment to this resource or value as a result of implementing this alternative.

### **Museum Collections**

Same as Alternative A plus develop: a) the capacity to preserve and protect paleoecological and emerging collections and archives, such as storage and staffing, b) provide additional access to collections items both online and on-site, and c) expand North Cascades Visitor Center exhibit areas to provide open display of museum collection objects.

Alternative A would result in similar long-term benefits as Alternative A, plus the additional capacity and improved access to museum collections could result in additional long-term benefits through greater preservation capacity, a more complete collection with new collections and archives, and greater appreciation for these resources through better displays in the North Cascades Visitor Center.

### *Cumulative Impacts*

Cumulative impacts are the same as Alternative A and would result in major beneficial long-term impacts on the museum collections. Alternative B would contribute additional long-term benefits to museum collections.

### *Conclusion*

The ongoing program has resulted in major beneficial long-term effects to the museum collections. Alternative B would have minor long-term beneficial impacts on museum collections by adding resources to the collections, making it more complete and more useful for interpretation and research. There would be no impairment to this resource or value as a result of implementing this alternative.

### **Wilderness Character**

Under the Preferred Alternative, a Minimum Requirement Analysis would still be used to determine if, when, and how actions would be implemented. The backcountry permit system would continue to be used to manage overnight use. Opportunities for visitors to experience wilderness character would still be abundant, and in some cases improved.

A number of actions under Alternative B would help to protect or improve wilderness character. Natural qualities would improve with implementation of a vegetation management plan, which would establish priorities for restoration and protect areas containing rare plant populations; with eradication of invasive non-native plants where feasible and collaboration with adjacent landowners in invasive plant management; and with allowing wildland fires to burn across the international boundary if conditions were appropriate.

One notable action would help to improve the natural quality of wilderness character but would impact other qualities. By providing additional food storage boxes and/or requiring the use of food storage canisters, bears would be less likely to obtain human food and become habituated. However, the presence

of food storage boxes at campsites would impact the undeveloped quality of wilderness character and requirements to use canisters would impact the quality of unconfined recreation, resulting in minor adverse impacts.

Other actions that would benefit wilderness character include the potential removal of certain trails and the removal of the Thornton Lakes Road in wilderness, both of which would reduce habitat fragmentation and improve naturalness. Actions taken to protect or improve the natural soundscape outside of wilderness would also benefit opportunities for solitude within wilderness, and would include education about natural sounds, enforcement of noise standards on the North Cascades Highway, boat restrictions, and seaplane restrictions implementing noise abatement procedures for seaplanes.

### *Cumulative Impacts*

Cumulative impacts on natural qualities would range from minor to moderate and include fire suppression (under more limited instances under Alternative B), invasive, non-native plant infestations that cannot be eradicated, fish stocking or removal, and climate change. Other impacts range from minor to moderate and are largely related to ongoing activities such as the existence and maintenance of infrastructure and facilities, installation of the Desolation Peak radio repeater, and other park administrative uses that might require helicopter use. In combination with the Preferred Alternative, these cumulative impacts would result in minor to moderate impacts.

### *Conclusion*

Although a number of actions would be taken that would benefit wilderness character, several past, present, or future activities will have cumulative impacts ranging from minor to moderate. Impacts would result from manipulation of wilderness by fish stocking or removal, fire suppression, other natural resource issues, development, motorized vehicle and equipment use, and management restrictions on unconfined recreation. Implementation of this alternative would not result in impairment.

## **Wild and Scenic River**

This alternative balances protecting resource values with providing visitor experiences. There would be minor to moderate beneficial impacts due to relocating facilities out of the floodplain. Banks would be hardened only after consideration of removing facilities. Fishery resources would also have moderate

beneficial impacts. However, beneficial impacts to river and fishery resources would be greater if the undersized bridges on the Skagit tributaries from the North Cascades Scenic Highway would be replaced. NPS would also encourage WSDOT to construct a longer bridge at Goodell Creek which could provide moderate beneficial impacts to free-flow and fishery values of Goodell Creek.

Use and preference for fish-friendly bank stabilization techniques would also limit any adverse impacts on free-flow and river resources resulting from bank stabilization projects. Salmon have been found to prefer natural bank habitat five times more than modified banks. Evaluation of the water resource projects would help ensure projects do not cause adverse effects. The proposed two-lane bridge over the Skagit River to the North Cascades Visitor Center could have negligible to minor effects on the river's free-flow character. Once a design is selected a detailed analysis relative to any effects on the free-flowing character, water quality, and Outstandingly Remarkable Values (ORVs) will be conducted. To avoid any adverse impacts, consideration could be given to modifying the bridge without adding to the existing footing and columns.

The creation of a vegetation management plan and continuation/improvement relative to invasive, non-native plant removal and native plant restoration will have a minor beneficial long-term impacts to scenic values. Under the preferred alternative, NPS would take protective actions to restore native fish populations. These actions could include managing and creating additional spawning habitat; establishing size limits and fishing moratoriums in the upper tributaries; and minimizing adverse impacts due to the North Cascades Scenic Highway. Depending on the actions taken, fishery resources would likely have minor to moderate long-term beneficial impacts. There would also be negligible to minor beneficial impacts to geologic, wildlife, and cultural resources for management plans and actions related to expanded monitoring, visitor use regulations, protection, and interpretation of these resources.

Long-term minor to moderate beneficial improvements to recreational boating experience on the Skagit River are anticipated due to the elimination of motor boat use and additional monitoring/regulations on private non-motorized boating use. There would also be minor improvements to the recreation experience and safety for some boaters and spectators through creation of a portage trail around the shovel spur rapids on the Skagit River. In addition,



minor beneficial impacts on recreation are anticipated due to the expanded trail opportunities potentially including additional trails along Goodell Creek and Newhalem Creek. Defined trail access along Goodell Creek is currently not available and this trail would allow visitors to see and experience the creek and provide interpretation opportunities. Likewise, a trail along Newhalem Creek could provide access to a good view of the scenic waterfall in the lower stretch, an outstandingly remarkable value for the creek. There could be temporary minor adverse impacts due to construction of these trails. However, in many cases the trail corridors are using existing impacted corridors. Plowing of pullouts and access areas could provide minor beneficial long-term recreation benefits.

If the Skagit River and key tributaries are designated as WSRs, as recommended in the GMP, then long-term beneficial impacts are expected for the river's free-flow character, water quality, and ORVs. Creation of a comprehensive river management plan will allow focus on the river and its values providing opportunities for access, restoration, interpretation, and management elements necessary to protect the river segments. Designation would also restrict further hydropower development from occurring on the Skagit River. Overall, WSR designation would have moderate beneficial impacts on eligible river segments.

#### *Cumulative Impacts*

Similar to Alternative A, impacts would continue from the hydroelectric projects, roads, facilities, visitor use, and air-borne pollutants. Use will continue to be focused in front-country areas. Actions related to increased coordination and management efforts with SCL and WSDOT and designation of the Skagit River, Newhalem Creek, and Goodell Creek will provide moderate beneficial long-term impacts and improvements to river values.

#### *Conclusion*

With more regulated river access, improved facilities, and water resource and floodplain protections, eligible wild and scenic river segments would be more protected, ensuring the preservation of ORVs. This would result in moderate beneficial impacts over the long-term.

In conjunction with past, present, and reasonably foreseeable actions, cumulative impacts to eligible wild and scenic river segments would generally be minor to moderate and beneficial over the long-term.

There would be no impairment of wild and scenic river resources and values.

## Visitation

As described in Alternative A, visitation would be expected to increase proportionate to regional population growth. Heaviest use would still occur along the North Cascades Highway, and since there are no proposed changes to roadway capacity, traffic congestion during peak summer weekends would continue. Improvements to waysides, pull-outs, and the Ross Dam Trailhead parking lot may attract additional visitors, but would have negligible impacts on visitation as a whole. Removal of the portion of Thornton Lakes Road in wilderness and relocation of the parking area might slightly increase visitation by making the hike more appealing or decrease visitation since the hike could be longer.

In developed areas, visitation would still be limited by the number of facilities, parking spaces, and campsites available. Additional group camping sites and campground services such as showers or electrical hookups could attract more visitors, but campgrounds would probably still be filled to capacity only a few weekends each summer. Reconfiguration of Winnebago Flats at Hozomeen could decrease visitation by limiting the number of campers that can stay in the campground. In the backcountry, overnight visitation would still be limited by the number of campsites available and permits issued. The addition of a reservation system for backcountry users could slightly increase visitation by making it easier to plan camping trips. These changes to camping opportunities would have negligible to minor impacts on overall visitation.

Potential expanded overnight opportunities near the Environmental Learning Center (additional camping), at Hollywood in Diablo, and at Ross Lake Resort would increase visitation in these areas, and the addition of stock-accessible front country camps could bring more stock users to Ross Lake NRA. The name change from Ross Lake NRA to North Cascades NRA could result in a small increase to visitation immediately following the name change and may result in a short-term change in visitation patterns. The addition of day use trails could also slightly increase visitation in the frontcountry by expanding hiking opportunities close to the North Cascades Highway. These slight increases in visitation would result in minor impacts.

Limitations on seaplane use and scenic overflights would have negligible impacts on visitation, and motorboat restrictions, which could potentially affect a larger group of users, would have minor impacts. As in Alternative A, wintertime and shoulder season use may slightly increase due to plowing selected overlooks and trailheads as well as orienting interpretation and education program to shoulder season visitors; however, little to no crowding or congestion would occur.

#### *Cumulative Impacts*

Cumulative impacts would be the same as those identified under Alternative A. Overall impacts to visitation due to these cumulative impacts would be negligible.

#### *Conclusion*

The impacts of the Preferred Alternative on visitation would range from negligible to minor during the peak summer season, and negligible during the rest of the year.

## Visitor Opportunities

### *General Recreational Opportunities*

Recreational activities would continue to be characterized by frontcountry experiences along scenic North Cascades Highway, backcountry and some frontcountry lake and river recreation, and the ability to experience wilderness and use Ross Lake NRA as a gateway to explore the greater North Cascades. In addition, the NPS would focus on providing a wider range of low-impact recreation opportunities for visitors of all abilities along defined high-use areas such as the North Cascades Highway corridor, as well as opportunities to learn about the wilderness and have hands on stewardship experiences. Backcountry recreation would continue to provide a remote wilderness experience, and Ross Lake would provide many of the same wilderness characteristics. Continuing to provide this range of recreational opportunities, with more intense use concentrated along the highway corridor and preserving backcountry and wilderness experiences, would have long-term moderate to major benefits to visitor opportunities.

### *North Cascades Highway based opportunities*

Along the North Cascades Highway, a wide variety of recreational activities would continue to be available and some opportunities would be expanded, including the potential for new overlooks or waysides, new and

group picnic sites, and improving opportunities for winter activities by improving snowplowing for better access. There will still be a variety of opportunities to view the wilderness and experience a natural setting while accessing numerous amenities and services. Car camping opportunities with a range of potentially expanded amenities would continue to be available. The NPS would strive to preserve camping opportunities in popular areas such as Colonial Creek, but if this is not possible due to flood events, sites would be rebuilt or other campgrounds expanded to provide no net loss of camping, resulting in minor to moderate beneficial impacts to visitor experiences. Efforts would also be made to improve the quality of corridor recreation by increasing education efforts or enforcing noise ordinances, contributing additional moderate beneficial impacts.

Camping opportunities could also expand, such as for car camping for stock parties. Camping at Hozomeen would be reorganized with a new site design, which would likely reduce capacity at Winnebago Flats, but would provide for a more tranquil and traditional camping experience. There would be some minor adverse impacts to visitors at Hozomeen if camping capacity was reduced from a new site design, however, improvements would likely lead to a higher quality experience for visitors in the long-term.

Should the NPS acquire Hollywood there could be additional long-term benefits if additional public opportunities were provided at the site.

There could be new opportunities for overnight lodging for visitors if Diablo were re-developed for public and staff use following a land exchange with Seattle City Light. The potential for year-round lodging within Ross Lake NRA at Diablo Townsite would have a major beneficial impact on visitor experiences and opportunities by providing a new experience otherwise unavailable, and also on a flat, pre-disturbed piece of land adjacent to the river, which is difficult to find in Ross Lake NRA.

There would be moderate beneficial impacts from improving the Sourdough and Stetattle Creek trailheads in Diablo in partnership with Seattle City Light.

### *Land/trail-based opportunities*

Opportunities would continue to allow visitors to move beyond the road corridor for short or long distances and times for a variety of activities. There would also be opportunities to launch deeper

wilderness explorations via existing short walks and access to longer day hikes, backpacks, stock trails, and mountaineering routes. Day hiking and recreation opportunities within the North Cascades Highway corridor could be expanded via new short or loop hikes, a new portage trail for boaters along the Skagit, or new links with trails in Canada in the Hozomeen area, creating long-term moderate benefits to visitors. Some sections of trails in Ross Lake NRA could be lost if their adjoining trail segment in the national park is closed or abandoned, slightly reducing hiking opportunities, a minor long-term adverse impact.

Hunting would be allowed within most existing permitted areas, but under Alternative B the NPS would seek to consult with WDFW to expand safety zones for hunting, and reduce potential conflicts during peak visitation months between hunters and other recreationists, as well as expanding educational efforts to make non-hunters more aware of hunting activities. Negligible to minor adverse impacts would result from additional hunting restrictions that would affect a small number of people, offset by beneficial impacts to larger numbers of non-hunting recreationists.

Sport climbing in the Newhalem Gorge would continue, but would be formalized under “Climbing Management Areas” with a resource plan and defined boundaries. Impacts on the sport climbing community would be negligible, beneficial, and long-term because activities would continue with additional oversight to protect the resource and visitor experience.

Additional hiking opportunities and providing new trails in the future could be constrained by formal policies for maintaining core habitat for special status species such as grizzly bear, resulting in a negligible to minor long-term impact given the extent of the land base and likelihood of expanding trails beyond the highway corridor and into core area habitat.

Overall, impacts under Alternative B would be both beneficial and adverse, and long-term as a result of some potential losses in little-used trails, offset by additional opportunities for larger numbers of people in more popular locations.

### *Water-based opportunities*

Visitors would continue to have access to a range of water-based recreation in both front and backcountry, as well as numerous associated day and overnight activities similar to Alternative A. Unlimited day use opportunities would also be available on all

three reservoirs for motorized and non-motorized boats. Motor boat use would be managed to protect water quality, soundscape, and visitor experience by maintaining existing access points and numbers of campsites on Ross Lake, applying limits to size, horsepower, or speed limits, as well as establishing a no-wake zone near other boaters or sensitive shorelines and prohibiting recreational towing on all reservoirs. Under Alternative B, impacts on water-based recreation activities would also be affected by the requirement for motorboats to meet the four-stroke engine requirement for all boats on Ross Lake by 2015. Paddle craft would be encouraged, possibly via a boat rental option on Diablo Lake. Personal watercraft would remain prohibited.

Overnight boat-in camping on Ross and Diablo lakes would remain accessible by motorized and non-motorized boats, with use limits set by the capacity of the current docks and campsites, as administered by the backcountry permit system.

Impacts from these and other management actions would range from negligible to moderate, be both beneficial and adverse, and largely long-term as a result of improved experiences for a majority of boaters, characterized by paddlers and boaters with small motors. There would be some short-term negative impacts to motorboaters who would need to conform with the elimination of two stroke engines, but there would be long-term benefits as most motorboating uses would continue and the character and quality of the boating experience would be preserved.

Seaplane use would be restricted to designated frontcountry zones. Zones where seaplanes would be allowed would include almost all of Diablo Lake, and the north and south ends of Ross Lake (from Ross Resort to Cougar Island in the south, and from Hozomeen to Silver Creek Camp in the north). Seaplane use would be regulated under a permit system to protect the soundscape and other visitors' experiences. In addition the NPS would work with the FAA to establish use levels and patterns for scenic overflights. Management of seaplane use would have an overall minor adverse impact, though impacts to individual users may be moderate, because of the relatively small numbers of seaplanes that would be affected and numerous other seaplane opportunities exist within the region.

Seaplanes would continue to have access to Diablo and Ross lakes and the NPS would work with the

seaplane pilot community to gather data on seaplane use and establish noise abatement procedures. Management actions would have long-term benefits to pilots by preserving access and working to maintain a high quality and uncongested experience in Ross Lake NRA, though there could be some negligible to minor impacts from the inconvenience associated with providing data to the NPS to better understand seaplane use.

On the Skagit River, regulations to limit party size or number of boats would be considered. Motor boats would be banned on the section of the Skagit River within Ross Lake, approximately ten river miles out of 93 total river miles. Fishing opportunities would remain unchanged, with the exception of prohibiting lead tackle. Impacts on Skagit River users would be mostly beneficial due to maintaining a quality experience and some increased opportunities. Adverse impacts would be negligible because demand does not yet exceed capacity, and motor boaters would still have the vast majority of the Skagit available to boat on.

### *Visitor and Information Centers*

A range of facilities and services would continue to meet a variety of visitor needs similar to Alternative A. Within Ross Lake NRA, information centers at Marblemount and Hozomeen—as well as the North Cascades Visitor Center in Newhalem—would provide orientation, information and trip-planning services to park visitors. There would be no visitor centers open in Ross Lake NRA during the winter and spring months, generally from November to May. Outside Ross Lake NRA, visitors could still access the information station in Sedro-Woolley year-round. The park would seek to partner with the USFS to provide NPS staffing at east side locations to provide basic services throughout the visitor season for visitors entering Ross Lake NRA from the east, a moderate to major benefit to visitor access to information.

The Wilderness Information Center in Marblemount was recently upgraded to include expanded staff work areas, including wilderness equipment and search and rescue storage and a staging area, and under Alternative B the public side of this building would also be rehabilitated, to provide additional and improved services in its current location. The NPS would also seek to partner with BC Parks to build a small new joint visitor and information center ranger station at Hozomeen in order to expand basic visitor services and provide interpretative programs. Both these actions would have long-term moderate to major benefits to visitors.

Maintaining or increasing staffing levels and adding staff locations would provide long-term moderate to major beneficial impacts to most visitors. During certain seasons or at certain stations, where staffing or services are limited, there would be a minor short-term adverse impact to visitors seeking orientation and information to Ross Lake NRA.

### *Permits, Reservations, and Fees*

Primary backcountry permitting services would continue to be available at the Wilderness Information Center in Marblemount, with ancillary services available at Newhalem, Sedro-Woolley, and Hozomeen similar to Alternative A. Backcountry permits would still be required for all overnight backcountry stays in Ross Lake NRA, including all boat-in and hike-in camps. The NPS would develop or expand web-based reservations for backcountry or additional frontcountry camps. An advance permit system for frequent backcountry users would be evaluated, and a range of fees for reservations and other specialized visitor services could be considered. A portion of both frontcountry and backcountry sites would be held for walk-ins. Fees would be evaluated for special services, reservations, and permits.

Under Alternative B, impacts would be negligible to major, both beneficial and adverse, and mostly long-term. A streamlined permit process would benefit some frequent users. Expanded permit availability would result in a moderate to major benefit to users in obtaining permits but could reduce resource protection due to the lack of personal contact with rangers and thus diminish the quality of experience. Reservations would benefit those users seeking permits well in advance or for high-use areas, especially larger public groups, but could negatively impact people planning spontaneous, weather dependent trips. Popular sites could also be booked well in advance, adversely affecting some spontaneous walk-in users. Permits provide for opportunities for solitude and a quality recreational experience but also limit opportunities for unconfined recreation. Increased fees could potentially dissuade some visitors from using these services, especially lower income households.

### *Campground facilities*

Under Alternative B, similar to Alternative A, maintenance would continue on the five campground facilities and three group camps, some of which are very susceptible to damage from storm events—particularly Colonial Creek and parts of Lower

Goodell Group and Goodell Creek Campgrounds. The NPS would strive to preserve camping facilities in popular areas such as Colonial Creek, but if this is not possible due to flood events, sites would be rebuilt or other campgrounds expanded to limit net loss of campground capacity, a moderate long-term benefit. However, due to the potential loss of some favorite camping facilities, moderate long-term adverse impacts are also possible.

~~The addition of the Hollywood district would have moderate to major long-term benefit to visitor experience by providing an already impacted or developed site along the river for possible public overnight opportunities.~~

The NPS would also evaluate additional services such as showers and electrical hookups at some or portions of campgrounds, as well as developing new group camps or new Diablo Lake camps. Some visitors would enjoy expanded services such as showers and RV hookups while some may view these services as diminishing a primitive camping experience.

The NPS would also rehabilitate Hozomeen Campground and Winnebago Flats to provide a more traditional and organized camping experience, the same as Alternative A.

Overnight stock camping and other facilities would be considered for some areas with trail riding opportunities nearby. Stock users would experience a long-term, minor benefit from having car camping facilities that would benefit the small number of stock parties.

### *Trails, Boat Launches, Picnic Facilities, etc.*

Under Alternative B, the NPS would maintain the majority of the current trail system at current levels. New trails could be developed under Alternative B, primarily within the North Cascades Highway corridor or near Hozomeen, including short or loop trails, a portage trail along the Skagit S curves, or links to trails in Canada resulting in moderate long-term benefits. Some sections of trails could be lost if their adjoining trail segment in the national park is closed or abandoned. There would be a negligible adverse impact on a small number of visitors who highly value solitude due to the impact of some new trails.

A variety of small recreation facilities primarily along the North Cascades Highway could be developed under Alternative B including: improved or new boat launches on Diablo Lake or at river access points,

facilities for bicyclists, group or new picnic areas that could accommodate additional visitors including large groups, improved signage at the Ross Lake NRA entrance points on the North Cascades Highway as well as at overlooks or waysides, and improved snow plowing to allow better access in wintertime. These improvements could have a moderate long-term beneficial impact on visitors, enhancing enjoyment of opportunities along the highway corridor that is traveled by a majority of visitors.

Parking for climbers in the Newhalem Gorge would be also evaluated and could be formalized to provide safer access to climbing routes, a moderate long-term benefit.

### *Commercial Services and Facilities*

The NPS would develop a commercial services plan to determine the optimal level of commercial services and facilities, and could consider establishing a carrying capacity or use limits which would have a moderate long-term beneficial impact by ensuring preservation of the experience desired by most visitors. Commercial use guiding services would continue, but could be limited under the commercial services plan, which could have both beneficial and adverse impacts depending on the user group. Some concessions services could be expanded, such as boat rentals, a second water taxi or boat ferry on Ross Lake, or a concession-operated store in Newhalem if SCL ceased store operations, which would also contribute moderate long-term benefits.

Ross Lake Resort could be expanded up to 10 percent, guided by NPS design standards, a moderate long-term benefit. ~~The NPS would seek to acquire the Hollywood District of Diablo Townsite from SCL, and would re-develop this area for NPS or public use, such as new camping and overnight lodging facilities, potentially concession-run, contributing a major long-term beneficial impact.~~

~~The addition of the Hollywood district could provide another venue for exploring commercial services and facilities in an already developed area, a potential moderate to major long-term benefit given the limited areas in the NRA that are already developed and potentially compatible with these activities.~~

Impacts under Alternative B would be minor to moderate major, beneficial and adverse, and long-term. Benefits would include the continuation or expansion of most facilities and services that are used by the majority of visitors, with potentially

enhanced visitor experience due to use limits, and new opportunities available for some. Some commercial operators, and the visitors who use their services, could be adversely affected if their use was restricted, but most visitors would benefit.

Some users could also be adversely affected by the presence of additional facilities that could detract from a sense of peace and tranquility.

#### *Cumulative Impacts*

Cumulative impacts would be similar to Alternative A. Alternative B would have a greater long-term contribution to moderate to major benefits with enhancements along the highway corridor and the potential to convert the Hollywood District to public use.

#### *Conclusion*

The full spectrum of visitor opportunities would continue to provide for visitor enjoyment and recreation activities. Under Alternative B, there would be moderate to major beneficial impacts to most users from potential expansion, improvements, and new opportunities along the highway corridor and at Hozomeen. There would also be moderate to major benefits from limiting net loss of camping opportunities and possibility of public overnight lodging at Hollywood. Cumulative effects would be similar to Alternative A. Adverse impacts could occur from reservations and fees, conflicting uses, and possible loss of campsites due to reorganization of Hozomeen, reduction in areas where seaplanes can land. Alternative B would have a greater long-term contribution to moderate to major benefits with enhancements along the highway corridor, and the addition of overnight stock camping facilities, and the potential to convert Hollywood to public use.

## **Information, Interpretation and Education Opportunities**

Under Alternative B, Ross Lake NRA is used as a platform and classroom for interpretation and education about the North Cascades, its history and resources, as well as civic engagement, stewardship, and public leadership. There would be numerous opportunities for both structured and unstructured activities, including self-exploration and discovery. The NPS would consult and collaborate with partners when appropriate, and partners would assist the NPS in delivering educational messages and programs.

Use of the most current and dynamic methods to generate curiosity, passion, enthusiasm and respect for park resources to build a sense of stewardship would have a major, long-term beneficial impact on visitor experience. The improvement of traditional interpretive programming within existing facilities, possible new facilities in select areas of Ross Lake NRA and the development, delivery, and evaluation of the programs so that they convey the full spectrum of interpretive themes will also have a major, long-term beneficial impact on visitor experience. Curriculum-based programs that focus on the full spectrum of interpretive and educational themes and objectives, and which emphasize low impact practices for hands-on activities that make learning relevant to students' lives will have a major benefit by engaging learners directly with the resource.

Expanded participation in outreach programs as one of many mechanisms to deliver Ross Lake NRA's full spectrum of interpretive themes and build local and regional stewardship of the North Cascades ecosystem will have a moderate beneficial impact to visitor experience.

The enhancement of visitor orientation and informal education through improved signage, multi-media, and exhibits at existing waysides, contact stations, and along interpretive trails would provide major beneficial impacts to visitor experience. Improved signage would provide visitors a sense of approach and arrival as well as better orientation to the services and resources within Ross Lake NRA. NPS information centers within the Ross Lake NRA boundary along the North Cascades Highway would continue to be located a short drive off the main road, which could result in a minor to moderate adverse impact to those visitors who miss turn-offs to obtain information.

The expansion of partnerships to attract a broader audience of visitors would have a major beneficial impact on visitor experience by connecting an increased number of people to the outdoors and the North Cascades in meaningful ways. Interpretive rangers co-located at other visitor contact stations, such as the Skagit Tours Information Center, the Environmental Learning Center, and at eastside entry points will have a major beneficial impact to visitor experience by making park staff more available to foster such connections.

Working with Seattle City Light to develop a more collaborative relationship that could involve additional programming and exhibits that tell the history and operations of the Skagit Hydroelectric Project and

enhanced collaboration with concessionaires and the U.S. Forest Service in order to share best practices and standards in order to disseminate information have a major beneficial impact on visitor experience by reaching a broader audience.

### *Newhalem*

Updated exhibits, multi-media programs, and activities at the North Cascades Visitor Center would have a major beneficial impact on visitor experience as visitors would be provided with more active and interactive opportunities for fun and engaging educational activities that communicate the full spectrum of interpretive and educational messages and cultivate stewards of the North Cascades ecosystem. The North Cascades Visitor Center would serve as a hub of activity and provide the starting point to a network of ranger-led and self-directed resource immersion activities. Partners would also be encouraged to use the North Cascades Visitor Center as a point of origin for their programs and activities. Focusing activity around a hub such as the North Cascades Visitor Center would have a moderate long-term benefit to visitors by enhancing their orientation.

### *Environmental Learning Center*

The devotion of a moderate level of resources to Environmental Learning Center (ELC) programs and operations would have a moderate to major beneficial impact on visitor experience. The NPS would develop and evaluate the interpretive and educational messages with North Cascades Institute (NCI), setting a standard of excellence, and increasingly collaborate with NCI at the ELC to distribute and deliver relevant interpretive and educational messages, a moderate long-term beneficial impact.

### *Hozomeen*

An increased partnership with British Columbia Parks to provide joint NPS/Canadian land- and water-based interpretive programs would have a moderate beneficial impact to visitor experience by enhancing learning opportunities related to preservation of the greater North Cascades ecosystem.

### *Cumulative Impacts*

Cumulative impacts would be the same as Alternative A. Alternative B would contribute greater long-term benefits to cumulative impacts by focusing on the North Cascades Visitor Center as a hub of activity for visitors. Increased partnerships, collaboration and outreach would also contribute to long-term cumulative benefits by increasing the availability and

quality of information delivery to visitors and the public.

### *Conclusion*

Overall, implementation of Alternative B would result in moderate to major long-term beneficial impacts to visitor experiences in the area of information, interpretation, and education. Expansion of partnerships with Seattle City Light, North Cascades Institute and British Columbia Parks would all contribute to beneficial impacts. Focusing the North Cascades Visitor Center in Newhalem as a hub of information, and updating exhibits and programming would also contribute long-term benefits. NPS information centers within Ross Lake NRA boundary along the North Cascades Highway would continue to be located a short drive off the main road, which could result in a minor to moderate adverse impact to those visitors who miss turn-offs to obtain information.

Cumulative impacts would be the same as Alternative A. Alternative B would contribute greater long-term benefits to cumulative impacts by focusing on the North Cascades Visitor Center as a hub of activity for visitors. Increased partnerships, collaboration and outreach would also contribute to long-term cumulative benefits by increasing the availability and quality of information delivery to visitors and the public.

## **Access and Transportation**

Under the Preferred Alternative, several small changes would occur that would impact access. Improvements to waysides, pull-outs, and several parking areas will have a beneficial impact on access. However, as in Alternative A, visitation would be expected to increase proportionate to regional population growth. Heaviest use would still occur along the North Cascades Highway, and since there are no proposed changes to roadway capacity, traffic congestion during peak summer weekends would continue, resulting in minor to moderate adverse impacts. If implemented, however, a shuttle system could potentially help to alleviate some of the congestion.

Access will be improved at the Ross Dam Trailhead parking lot by constructing a turn lane at the entrance and redesigning the parking lot. Although parking lot capacity will not increase under Alternative B, clearly defined parking spaces will reduce confusion and some of the congestion related to drivers trying to find an adequate parking space. Other parking areas, such as Diablo Ferry dock, Upper Goodell group

campsite, Goodell Creek raft area, and the Sourdough, Stetattle Creek, and Thunder Knob trailhead parking areas will be reconfigured, formalized, or developed. Parking and access to climbing routes in the Gorge could be formalized. Some overlooks and trailheads could be plowed to provide wintertime access. ~~The existing one-way bridge that provides access to the North Cascades Visitor Center, Newhalem Creek Campground, and several trails, would be replaced with a two-lane bridge that accommodates two-way traffic, pedestrian access, and interpretive platforms.~~ Impacts to access would be beneficial and minor to moderate.

Removal of the portion of Thornton Lakes Road in wilderness would still allow access to the trailhead, and depending on the new trail location, the access route to the lakes could either be shortened or lengthened. The new parking area could potentially accommodate a larger number of vehicles than the current parking lot, thus improving access.

Other changes in access include the potential expanded overnight opportunities near the Environmental Learning Center (additional camping), ~~at Hollywood~~, and at Ross Lake Resort, which would increase access for more people in these areas; the addition of stock-accessible front country camps, which could bring more stock users to Ross Lake NRA; the addition of day use trails; and improvements to river access and take-out at the Portage. These slight increases in access would result in beneficial impacts.

Restrictions on access would be imposed on ~~seaplanes, which would be allowed to land and take off only in the frontcountry management zone;~~ and motorboats along the Skagit, which would be prohibited. The impacts from ~~these~~ **this** proposed actions would vary among individuals and could range from negligible to major depending upon personal preferences. Overall impacts to Ross Lake NRA access would be negligible given the small percentage of the visiting population that accesses Ross Lake NRA ~~exclusively~~ via ~~these~~ **this** modes of transportation. There could also be beneficial impacts for user groups who are seeking non-motorized experiences.

#### *Cumulative Impacts*

Cumulative impacts would be the same as those identified under Alternative A. Other potential future actions, including general road, trail, or parking lot maintenance, and various types of work on the North Cascades Highway by WSDOT, could impact access; although delays may occur, visitors would not likely alter their travel destinations. Occasional road or trail

closures also occur due to fire, avalanches, rockfalls, etc. Overall impacts to access due to these cumulative impacts would be negligible.

#### *Conclusion*

The impacts of the Preferred Alternative on access and transportation would result in adverse, minor to moderate impacts during the peak season as well as beneficial impacts due to improvements in access and during non-peak times.

## Socioeconomic Environment

In Alternative B, impacts to the socioeconomic environment would result from changes in operational spending, changes in visitor spending, and changes in visitor patterns. The impact of Alternative B is evaluated in comparison with the No Action Alternative.

Implementation of Alternative B would occur against the same backdrop of economic, demographic, and social changes across the influence area described under the No Action Alternative. The economic and social effects of Alternative B would add to those changes, but would not fundamentally change the area's economic and demographic outlook.

#### *Impacts to Demographics*

Alternative B would have little direct impact on the influence area's population growth. It is likely that individuals already residing in the area would fill many of the construction and related jobs. However, new staff proposed in Alternative B likely would come from outside as well as from within the influence area. Additional employees proposed in Alternative B include 22 permanent full time equivalent positions (FTEs). Beneficial and adverse impacts associated with population increases are similar to Alternative A.

Population increases due to Alternative B and its associated impacts would be minute compared with the total population of the influence area, which is about half a million people; therefore the impact would be negligible, long-term, and of indeterminate effect since there are both adverse and beneficial impacts to population growth. The addition of 22 new employees and their families would represent a small but detectible number. The impact of hiring all proposed new employees would be long-term, minor, and of indeterminate effect.



## *Economic Impacts to Influence Area*

Increases in National Park Service spending during construction of new facilities would result in short-term impacts; long-term impacts may also occur due to the resulting increases in annual budgets (for costs such as new facility maintenance and new employee wages). Prominent proposed construction projects could include a new Wilderness Information Center, and rehabilitation or rebuilding of the Hollywood district for housing, research, visitor and educational purposes, and replacement of the bridge to Newhalem. Companies in the construction industry would see increased business if contracted to provide services. This in turn would strengthen construction employment and incomes. Construction workers frequenting the area would spend income on food and materials, increasing service business revenues and government tax revenues. While construction spending would strengthen these areas of the economy, it would be to a small degree in relation to the influence area's total economy. Short-term construction spending is estimated at \$11.2-17.3 million (\$11.1-17.2 million above that of the No Action Alternative). Construction spending would result in negligible, short-term, beneficial impacts to the economy of the influence area, since this amount likely would be spread over the 20-year planning timeframe.

Increases in the recreation area's annual spending also would have long-term effects. Employment of new staff would add jobs to the influence area and generate personal income. New staff would spend a percentage of income on housing, food, entertainment, and other services; this would increase incomes and government tax revenues, and strengthen the housing sector. However, new staff would put demand on local government services such as schools. Maintenance and operational spending at the recreation area would also have long-term positive impacts on employment and incomes. Annual operations spending is estimated at \$8.5 million (\$1.4 million more than the No Action Alternative) resulting in minor, long-term, beneficial impacts to the influence area economies.

Alternative B would provide a broader range of visitor activities and accessible recreation opportunities, including development of new interpretive programs, establishment of partnerships to attract broader audiences, and additional day-use opportunities. Opportunities to allow concessioners to expand services would be pursued, including water taxi, ferry, and rental services. Construction actions which might generate new interest from visitors and allow for greater visitor capacity include establishment

of a ranger station and orientation center near Hozomeen, construction of research and educational facilities in the Hollywood district, construction of new campgrounds and additional outdoor learning shelters, expansion of Ross Lake Resort, and the formalization of parking at climbing areas.

The following actions would possibly reduce visitation and visitor spending: restricting seaplane landings to frontcountry zones; setting use levels for scenic overflights of the recreation area; requiring special boat motors, prohibiting motor boats on the Skagit River, and limiting concession authorizations if user capacity is exceeded.

Overall, the actions proposed in Alternative B could result in small increases in the number of visitors and the length of visitor stays, and related visitor spending; however, some proposed actions could restrict visitation. Visitation would have the potential to increase in the shoulder and winter seasons as well as during off-peak summer days. Peak summer visitation would remain limited to some extent by available parking spaces and campsites. Increased visitation would increase employment, business sales, and incomes in the tourism industry, as well as government tax revenues. An increase in the number of visitors and in visitor spending would also reduce unemployment in the tourism industries. Because of the enhanced recreational opportunities proposed in Alternative B, implementation of the alternative might indirectly enhance the influence area's attractiveness for economic development. However, the expected changes would be small, and increased visitation would have negligible, long-term, beneficial impacts to the influence area's economy.

Partnering with Seattle City Light to use excess housing at the Hollywood site for recreation area staff would make more housing available, perhaps resulting in slightly higher vacancy rates and lower rental rates in surrounding communities. Alternative B also proposes to build tent cabins temporary seasonal housing for housing-employees at Marblemount. The impacts would be minor, long-term, and beneficial to renters and employees, but minor, long-term, and adverse to individuals leasing room space in the adjacent community.

## *Economic Impacts to Local Commercial Services and Neighboring Businesses*

Park Service spending related to new construction would strengthen those businesses providing construction services. In turn, construction worker

spending on food and materials would strengthen local services. Government revenues would also see increases due to increased sales and associated taxes. Increases in construction spending would result in minor to moderate, short-term, beneficial impacts to commercial service providers and neighboring businesses.

The impact of wages for new staff and annual operational spending by the recreation area would be greater on the local area than in the entire influence area. Impacts to employment, incomes, and government revenues would be long-term, minor to moderate, and beneficial to the local communities.

With small increases in visitation, visitor spending, and the length of visitor stays, local businesses providing services to tourists would benefit through increased business. An increase in the number of visitors might allow for businesses to provide expanded services. However, the small increases in visitation that could occur would result in negligible to minor, long-term, beneficial impacts to commercial service providers and outfitters.

Alternative B calls for a transportation study that would look at the feasibility of a shuttle system to provide service to the recreation area. If a shuttle system were implemented, a concessioner would have the opportunity to provide the service. This would increase a concessioner's business or provide a new business opportunity. A shuttle service would result in a minor to moderate, long-term, beneficial impact to the operator.

The NPS would limit seaplane landings to frontcountry zones, which may limit the frequency of seaplane use in Ross Lake NRA, and perhaps reduce business sales, employment, and incomes. This would have an adverse, long-term, minor impact to seaplane service providers.

The NPS also would request that the FAA establish tour routes and set use limits on scenic overflights of Ross Lake NRA. This would limit the number of customers that flight tour operators could take to Ross Lake NRA, and perhaps diminish business sales, employment, and incomes. This would result in a negligible to minor, long-term, adverse impact given the estimated numbers of providers using the NRA.

Prohibition of motor boats on the Skagit River would result in a negligible, long-term impact to outfitters, given the estimated number of outfitters using this

section of the Skagit River for motorized recreation; however, it would be of indeterminate effect since non-motorized boat rentals and tours might increase in place of motorized boat tours and rentals.

Alternative B proposes the placement of limits on commercial use authorizations (CUAs) if user capacity limits are exceeded. CUAs are used by the National Park Service to authorize individuals or businesses to provide commercial services to recreation area visitors in limited circumstances. These limitations would limit visitors to capacity levels and therefore would limit sales, incomes, and employment; this would result in a long-term, negligible to minor adverse impact to concessioners.

Alternative B also proposes exploring expanding concessioner opportunities, such as water taxi, ferry, lodging, and rentals. If found feasible, additional services would expand concessioner business and result in a minor, long-term, beneficial impact, if not, no impact would occur.

### *Impacts to Social Characteristics*

This alternative also proposes to acquire the Hollywood district from Seattle City Light through exchange or purchase. The recreation area would preserve structures eligible for listing in the National Register of Historic Places, and adaptively re-use or remove structures not eligible for listing. New structures would be built to suit the needs of the NPS and its partners. This land is within the recreation area boundaries, and the dam facilities would remain in operation by Seattle City Light. The result of this proposal would have beneficial impact to the social character of the influence area because the historic structures would be preserved, and additional park and partner uses would be accommodated. The impact to land use would be minor, long-term, and beneficial to the social character of the influence area.

Increases in the number of visitors and length of visitor stays would impact traffic in the local area, but since increases could be small, the impact would be negligible, long-term, and adverse. This impact would occur primarily in the gateway community of Marblemount, along the North Cascades Highway State Route 20, within and on either side of the recreation area, and in and around the district municipality of Hope.

Potential shuttle service in and around the recreation area would relieve some traffic in the service area. Local residents would have the opportunity to use this

service, and therefore, it would provide a negligible, long-term, beneficial impact to the social character of the local area.

Construction activities would affect traffic, as construction vehicles may be moving slowly and turning in and out of construction areas, and because there would be an increase in the amount of traffic due to workers coming to the area. Construction of a turn lane at Ross Dam Trailhead parking lot would also disrupt traffic temporarily, but would relieve some congestion once built. Construction activities would result in a minor, short-term, adverse impact to traffic and long-term, minor beneficial impacts to traffic.

While there is a mix of beneficial and adverse impacts, the overall impact of Alternative B to the influence area socioeconomics would be both short and long-term, minor, and beneficial.

#### *Cumulative Impacts*

Projects that are not associated with this general management plan can interact with projects proposed in the GMP alternatives, resulting in a cumulative impact on the influence area's social and economic environment. Cumulative Impacts are the same as Alternative A.

Impacts of Alternative B, in combination with short- and long-term minor beneficial effects on the influence area's economy described above would result in both short- and long-term, minor, beneficial cumulative impacts to the influence area's socioeconomic environment. Alternative B would have a modest contribution to the overall cumulative impact.

#### *Conclusion*

Alternative B would have a minor beneficial impact to the socioeconomic environment of the influence area. The impact would be greater in the immediate areas surrounding the recreation area. The impacts of the actions proposed in Alternative B and impacts of other projects in the area combine to have short- and long- term, minor, beneficial cumulative impacts to the influence area's social and economic environment.

## **Park Operations**

### *Facilities and Sustainability*

Under Alternative B, major visitor and operational buildings and infrastructure, including headquarters, staff offices, and visitor centers, would continue to be concentrated in the same general areas of Ross Lake NRA as Alternative A; however, some facilities

would be replaced, others would be expanded in size or services and utilities offered and new facilities could be added. The Wilderness Information Center in Marblemount would be remodeled in the current location, new seasonal housing would be constructed in Marblemount, a new ranger/orientation station would be constructed in Hozomeen, the parking area for the Ross Dam trailhead and the Thunder Knob trailhead parking area would be reconfigured and expanded, new campsites could be constructed and additional services could be added to existing campgrounds. In addition, the potential acquisition of the Hollywood District could add a substantial new operational and management responsibility for Ross Lake NRA. Activities associated with the construction and maintenance of these new facilities could result in short-term minor impacts by focusing staff efforts on these projects and potentially long-term minor to moderate adverse impacts by increasing the facilities that need to be maintained. If staffing (both numbers and areas of expertise) and funding to support the infrastructure changes was not fulfilled, negative impacts could be moderate to major.

Facilities that were not deemed to be sustainable could be relocated under Alternative B. Relocating facilities or portions of facilities that require substantial efforts to retain them in the event of severe weather such as flooding would have a moderate-long-term benefit by locating facilities in areas that require less intensive effort to sustain them.

While new trails could also be constructed under Alternative B, trails that are not used could also be decommissioned, resulting in minor long-term benefits by reducing the needs for trail maintenance in seldom used areas of Ross Lake NRA.

Incremental changes in green facility design would be similar to Alternative A; however, additional changes to reduce carbon emissions and increase energy and fuel efficiency whenever and wherever possible could result in long-term moderate benefits to park operations by creating a more sustainable infrastructure.

### *Operational Efficiency*

The replacement and reconstruction of facilities that are declining would have long-term minor to moderate benefits on operational efficiency by reducing the needs for maintenance. Creating opportunities for housing both in Marblemount and Hollywood would result in minor to moderate long-term benefits to operations by locating staff closer to their work

locations, and also creating housing opportunities for the often short seasons that can be limited to three months in the North Cascades and often preclude seasonal staff from finding private housing options in the vicinity. Making better use of the existing facilities along the North Cascades Highway, and increasing collaboration with partners in utilizing these facilities, would have moderate long-term benefits to operational efficiency.

### *Staffing*

In the short term, impacts from staffing are the same as Alternative A with funding for staffing levels continuing to be inadequate to meet the increased needs of Ross Lake NRA, resulting in long-term minor adverse impacts to NRA operations. In the long-term, staffing increases in resource management, interpretation, visitor protection, facilities and maintenance, and administration coupled with expanded emphasis on partnerships could have long-term moderate benefits to operations by increasing the capacity of Ross Lake NRA to meet the needs of the operation and visitors.

### *Cumulative Impacts*

Cumulative impacts are similar to those in Alternative A. Past and ongoing projects, including road, trail, and facility maintenance and repairs have had long-term moderate beneficial impacts on park operations. Aging facilities and infrastructure, including utilities and systems, would continue to be repaired, upgraded or replaced as needed on a case-by-case basis, subject to available funding. Over time, more sustainable and efficient facilities and infrastructure would replace those that are aging or no longer meet the needs of Ross Lake NRA, resulting in moderate, long-term benefits to the recreation area by reducing maintenance needs.

### *Conclusion*

Under Alternative B, there would be some noticeable changes to facilities as facilities like the Hozomeen contact station would be replaced, others like the Ross Dam trailhead parking would be expanded in size, and new facilities like trails could be added, resulting in both moderate benefits and adverse effects. Additional changes to improve the environmental sustainability in all aspects of facility and infrastructure management could have long-term moderate benefits to park operations. Changes in staffing and operational efficiency would have long-term moderate benefits to park operations. As more projects are completed that repair, upgrade, and replace aging facilities and infrastructure, and more sustainable

systems are installed, maintenance needs would be reduced, resulting in moderate, long-term benefits. However, until those facilities are replaced, periodic and extensive maintenance would be required. The overall effects of implementing Alternative B on park operations would be long-term, moderate and beneficial.

## **Unavoidable Adverse Impacts**

Unavoidable adverse impacts are defined as moderate to major impacts that cannot be fully mitigated or avoided.

Under Alternative B, there would be a negligible potential for unavoidable adverse impacts on natural resources because there would be little new development, although there could be some new or renovated facilities, such as the Ross Dam Trailhead parking lot, the potential relocation of some campsites from Colonial Creek in the event of a catastrophic flood event, and the changes to the Wilderness Information Center.

There would be little to no unavoidable adverse impacts on cultural resources because the NPS would strive to preserve and adaptively use buildings, structures, and landscape features that are eligible for the National Register, notably in the Hollywood District of Diablo Townsite should the land be acquired by the NPS.

Some existing conditions have resulted in unavoidable adverse impacts. The location of park facilities, the Skagit Hydroelectric Project, and roads, including the North Cascades Highway, in floodplains, and the maintenance of this infrastructure has resulted in adverse impacts to floodplains and riparian areas. Most of the infrastructure would remain in these locations. Additional unavoidable impacts would likely occur on vegetation and soils, primarily in the existing developed areas where visitor use is concentrated.

## **Relationship between Local Short-Term Uses and Long-Term Productivity**

Under all of the alternatives, most of Ross Lake NRA would be protected in a natural state and would continue to be used by the public. Under all the alternatives, the National Park Service would continue to manage Ross Lake NRA to maintain ecological processes and native and biological communities, and to provide for appropriate recreational activities

consistent with the preservation of natural and cultural resources.

Some previously disturbed areas would be rehabilitated to return these areas to productivity. Any actions the National Park Service takes in Ross Lake NRA would be taken with consideration to ensure that uses do not adversely affect the productivity of biotic communities. Under the Alternative B, there would be no appreciable loss of ecological productivity because there would be little new development. Existing developed areas and infrastructure within Ross Lake NRA, including the Skagit Hydroelectric Project and the North Cascades Highway, would remain.

## **Irreversible or Irrecoverable Commitments of Resources**

Irreversible commitments of resources are actions that result in the loss of resources that cannot be reversed. Irrecoverable commitments are actions that result in the loss of resources, but only for a period of time.

No actions would be taken as a result of the Alternative B that would result in the consumption of nonrenewable resources that would preclude other uses for a period of time. Thus, there would be no irreversible or irrecoverable commitments of resources in Ross Lake NRA by the National Park Service.

No actions would be taken that would result in irreversible or irrecoverable effects on historic properties. NPS staff would continue to conduct appropriate cultural resource management in accordance with the Secretary of the Interior's Standards and NPS policies.

## **IMPACTS FROM ALTERNATIVE C**

### **Natural Resources**

#### **Air Resources**

##### *Air Pollution*

Emissions of various air pollutants as a result of visitor use, and park operations including wild land fire management would be similar to Alternatives B. The impacts of these activities on air pollution would generally be negligible to minor, except for large wildfires which could be major and adverse.

##### *Greenhouse Gas Emissions*

Greenhouse gas emissions would generally be similar to Alternative B. The impact of these emissions on human-forced climate change would be adverse but negligible.

##### *Visibility (Regional Haze)*

Impacts to visibility would generally be similar to Alternative B. Impacts would primarily result from wildfires, and would be negligible to possibly major depending upon the severity and location of the fire in relation to Ross Lake NRA.

##### *Cumulative Impacts*

Cumulative Impacts to Air Resources would generally be similar to Alternatives A and B. These cumulative impacts would overwhelmingly result from various activities outside the boundaries of Ross Lake NRA

##### *Conclusion*

Similar to Alternatives B, direct and indirect impacts to air quality would generally be negligible to minor and adverse. Cumulative impacts to air quality would remain negligible to minor, because the air quality within Ross Lake NRA is predominately influenced by human activities outside of Ross Lake NRA, including regional and global sources of pollution. The management actions proposed under Alternative C would generally be negligible to minor and adverse. Impacts from wildland fire could be adverse and major, but would not endure. There would be no impairment of air resources within Ross Lake NRA.

#### **Natural Soundscapes**

Under Alternative C, several impacts would be the same as those identified under the Preferred

Alternative. Actions would include an expansion of the soundscape monitoring program, identification of unacceptable sounds and sound levels, and active management of soundscapes; enhanced visitor education and orientation; motorboat restrictions on reservoirs and on the Skagit River; reconfiguring camping at Hozomeen; alternative transportation opportunities; limited use of explosives to manage avalanches along the North Cascades Highway; and closure of the portion of Thornton Lakes Road that is in wilderness. All of these actions would result in a beneficial impact to the natural soundscape.

In addition to the actions described above, there are several actions unique to this alternative that would have a beneficial impact by further protecting the natural soundscape. These actions include keeping the range of visitor opportunities more traditional (hiking, backpacking, water recreation, and other self-powered activities that have a minimal impact on resources); instituting a ban on seaplane landings, development of an air tour management plan, and a request to ban scenic overflights throughout Ross Lake NRA; no net increase in trails; and regulating snowmobile use on the closed portion of the North Cascades Highway.

Although there are numerous actions that would be taken under Alternative C that would benefit the natural soundscape, several factors would still have adverse impacts. Short-term adverse impacts to soundscapes could still result from construction activities related to new facilities or adaptive reuse of existing buildings. However, Alternative C proposes modest construction and new facilities such as the Ross Dam Trailhead parking would be designed to accommodate their existing capacity as opposed to expanded capacity. Impacts from the noise footprint of these areas could still result in greater types of vehicles but likely not a substantial increase in numbers. Therefore, long-term adverse impacts from these activities would likely be minor.

The largest impact would continue to be noise generated along the North Cascades Highway. Although education and enforcement would help to mitigate the highest levels of noise, impacts would still be moderate during the peak summer season due to high traffic volumes. Impacts along the reservoirs due to boat noise would be minor.

#### *Cumulative Impacts*

Cumulative impacts would be similar to those already identified in Alternatives A and B, except that impacts on natural soundscapes due to ongoing public automobile traffic, motorboat use, and aircraft use will

be further reduced. Impacts from NPS administrative uses, Seattle City Light, and Ross Lake Resort would be the same as Alternative A. Depending on the action and time of year, these actions could result in minor to moderate adverse impacts, and many beneficial impacts. In combination with the No Action Alternative, these cumulative impacts would result in minor to moderate impacts on the natural soundscape; however, many actions would be beneficial and would help to preserve the natural soundscape to a larger extent than Alternative B.

#### *Conclusion*

Under Alternative C, several more actions would be taken that would result in further protection or improvement in the natural soundscape compared to current conditions. Impacts would vary based on the time of year and location and would range from minor to moderate. Minor impacts would occur along the reservoirs, and moderate impacts would occur during peak use times along the highway. Cumulative impacts would range from minor to moderate. Implementation of this alternative would not result in impairment.

#### **Water Resources**

##### *Water Quality*

Impacts to water quality from primarily non-point sources of pollution would generally be similar to Alternative A. These impacts would primarily be associated with runoff from impermeable surfaces in Ross Lake NRA. Impacts would be minor to moderate, long-term and adverse.

##### *Hydrologic Processes*

The hydrologic processes of the Skagit River watershed within Ross Lake NRA would generally be minimally affected by continued management activities proposed for Alternative C. As with Alternative A, the scale of potential management actions would simply be too small to have any measurable effect on the broad patterns and processes of weather, climate and precipitation that substantially govern the hydrology and hydrologic processes of the Skagit River Watershed in Ross Lake NRA.

##### *Hydraulic processes*

The hydraulic processes of surface streams, creeks and the Skagit River could be affected to varying degrees by the management actions proposed for Alternative C. Broadly speaking, management actions intended to reduce erosion would continue to adversely impact

the hydraulic processes of running waters to varying degrees as described in the following sections.

As with Alternatives A and B, the NPS would continue to maintain and repair the transportation infrastructure, including roads, bridges, culverts, trails and transportation facilities. However, this alternative would be more like Alternative B in that facility relocation would be favored over bank hardening and channelization. Bank hardening and channelization would continue to cause minor to moderate adverse impacts to natural hydraulic processes at the local scale (i.e. individual stream reaches), and could possibly cause further problems in the future by encouraging a “negative feedback” cycle of head cut formation and further channel instability. These unintended consequences could require further management action in the future (Bolton and Shellberg, 2001). Should such action require the dredging of lacustrine wetlands, a Wetland Statement of Findings would be considered.

The North Cascades Highway would continue to adversely influence hydraulic processes in the vicinity of running waters along its alignment within Ross Lake NRA. Similar to Alternative B, Alternative C commits the NPS to working more proactively with WSDOT to encourage habitat-friendly streambank protection measures and other habitat-friendly techniques whenever possible. Continued bank armoring to protect the North Cascades Highway SR20 would cause long-term adverse impacts to hydraulic processes of running waters in Ross Lake NRA.

#### *Cumulative Impacts*

Management actions associated with Alternative C would have negligible to minor cumulative impacts because there would only be a modest expansion of some facilities and the slightly increased overall footprint of impermeable surfaces within Ross Lake NRA. Otherwise, most cumulative impacts to water resources would result from activities within Ross Lake NRA associated with management of the North Cascades Highway, and with hydroelectric operations. Outside of Ross Lake NRA, cumulative impacts to water resources would remain similar to Alternatives A and B.

#### *Conclusion*

Impacts to water quality would range from negligible to minor and adverse. Impacts would be associated with NPS operations and maintenance related activities, including road and facility maintenance, and boating operations. There would also be impacts stemming from the industrial uses associated with

Seattle City Light, with motor vehicle use, and with maintenance of the North Cascades Highway corridor. There would be negligible impacts to hydrology. Impacts to hydraulics would be localized, long-term, adverse and of negligible to moderate intensity. These impacts would be primarily associated with local manipulation of hydraulics to protect roads, campgrounds and facilities from erosion. Cumulative impacts to water resources would be negligible to minor, long-term and adverse because there would be no substantive changes to existing park operations or operations associated with the Skagit River Hydroelectric Project. Moreover, the impacts from climate change on water resources (water quantity, quality and hydrology) are expected to gradually increase within the 15-20 year lifespan of this plan, but then accelerate rapidly beyond the planning horizon (University of Washington Climate Impacts Group, 2009). Direct, indirect and cumulative adverse impacts to water resources would remain negligible to moderate because there would be no substantial changes to current management. Therefore, there would be no impairment of water resources under Alternative C.

#### **Geologic Resources, including Soils**

The impacts of Alternative C would generally be similar to Alternative B in regard to:

- maintenance of trails and associated facilities, including minor relocations
- flood-damage repairs to facilities and the transportation network
- construction of several new trails in various locations, mainly in frontcountry areas

Impacts from recreation-related management activities would be similar to Alternative B. Impacts would be associated with social trail formation, backcountry use, rock climbing and development of new routes, and various off trail activities such as mountaineering. The adverse impacts to surficial geologic resources and soils would be long-term, negligible to minor and adverse.

Impacts from road management practices would generally be similar to Alternatives B. Overall, the impacts to surficial geologic resources and soils would be long-term, negligible to moderate and adverse.

#### *Cumulative Impacts*

Cumulative impacts to geologic resources would generally be similar to Alternative B, although there would be slightly increased ground disturbance. Otherwise, cumulative impacts associated with non-

NPS management actions within Ross Lake NRA (such as hydroelectric operations, the North Cascades Highway SR20 maintenance) and outside Ross Lake NRA would be similar to Alternatives A and B.

### *Conclusion*

Direct and indirect impacts to soils and geologic resources from recreation-related activities would be negligible to minor, long-term and adverse. Impacts from management of facilities and the transportation infrastructure would be adverse, negligible to minor and long-term. Cumulative impacts from past and reasonably foreseeable management actions would range from negligible to moderate in intensity. There would be no major, long-term adverse impacts from NPS management actions. Impacts to special status plant species would be similar to Alternatives A and B. There would be no impairment of soils and geologic resources as a result of implementing this alternative.

### **Vegetation (including special status species)**

Impacts to vegetation under Alternative C would be generally similar to Alternative B with respect to vegetation management and fire management programs. These impacts would be minor to moderate, long-term and both beneficial and adverse. Adverse impacts would primarily be associated with fire suppression; impacts could range from minor or even major depending upon the extent of fire suppression. Beneficial impacts would be associated with restoration of previously disturbed areas, and with non-native plant management.

Various recreation and visitor uses could adversely affect vegetation via direct harm such as trampling and social trail development, and via indirect means such as importation and spread of invasive, non-native plants, or human caused wildfire. Certain emerging activities, such as sport climbing and bouldering, would be allowed to expand into new or undisturbed locations provided resource surveys indicated no special status plant species would be harmed. Taken together, recreational impacts to vegetation are localized in scale, adverse, and negligible to minor in intensity.

### *Cumulative Impacts*

The cumulative impacts of activities within Ross Lake NRA including NPS operation and maintenance of Ross Lake NRA's administrative and visitor service infrastructure, and recreational uses would generally be negligible to moderate and adverse. Cumulative impacts to vegetation-related resources would be similar to Alternatives A and B, as most cumulative

impacts would result from activities outside of NPS control. The degree to which these external, adverse impacts may cumulatively threaten vegetation within the boundaries of Ross Lake NRA is uncertain, but likely to be adverse and to increase in severity in the future as development outside of Ross Lake NRA places greater pressure on park resources.

### *Conclusion*

Impacts to special status plant species would be similar to Alternatives A and B. Alternative C would have negligible to moderate, adverse impacts on vegetation in regard to management of the transportation and administrative infrastructure. Recreation-related impacts would be negligible to minor, and adverse. Suppression of natural wildfires would have long-term, adverse and moderate to major impacts on vegetation. Cumulative impacts to vegetation would be adverse for areas affected by continued development and visitor use, and beneficial for areas that would be restored and revegetated. Impacts to vegetation would generally remain negligible to moderate. There would be no impairment of vegetation resources.

### **Fish and Wildlife (including special status species)**

#### *Impacts from Hunting and Fishing*

Hunting and fishing would continue at levels similar to that of Alternatives A and B. Impacts to game populations would be negligible to minor and adverse. Impacts to fish populations from fishing-related activities would generally be negligible to minor and adverse.

#### *Human Disturbance*

Alternative C would continue to cause various forms of human disturbance as a result of recreation and visitor use. The impacts of these activities would be similar to Alternative A, and perhaps slightly less than Alternative B because this alternative could reduce certain visitor attractions such as closing affected portions of campgrounds in response to severe flooding. The difference would probably be negligible given the very limited area that would be affected by either the alternative.

Noise from vehicles traveling along the North Cascades Highway, especially extremely loud vehicles such as motorcycles, would continue to cause disturbance to wildlife, prompting avoidance of certain areas and other behavioral effects such as flushing (such as noise can flush birds from nests). In contrast to Alternative A, but similar to Alternative



B, the NPS would seek to reduce noise from motor vehicles by taking action to enforce existing motor vehicle noise standards and this could result in negligible to minor benefits to wildlife in the vicinity of highway.

Similar to Alternatives A and B, wildlife would continue to be harmed or killed by motor vehicles traveling along the highway corridor. There is no indication that overall visitor use of the area would differ compared to Alternative A, so impacts from motor vehicle related activities would generally be negligible to minor adverse and long-term.

Similar to Alternative B, Alternative C would provide additional food storage options, such as food storage canisters or boxes, in order to prevent bears and other wildlife from becoming habituated. Expansion of existing provisions for backcountry food storage would afford minor, beneficial impacts to wildlife, especially species such as bears.

### *Park Operations*

Impacts from park operations under Alternative C would generally be similar to Alternative B.

### *Special Status Species*

Impacts to Special Status fish and wildlife species would be similar to Alternatives A, B and D.

### *Cumulative Impacts*

Alternative C would result in cumulative impacts that would generally be similar to other alternatives: negligible to minor over the planning horizon.

The impacts of human-forced climate change would be cause adverse cumulative impacts of uncertain magnitude.

Similar to Alternatives A and B, the impacts of human development and associated habitat loss and modification outside the boundary of Ross Lake NRA would have adverse effects on populations of terrestrial species with large home ranges, anadromous aquatic species such as salmon, and certain migratory bird species that rely on unprotected habitat outside the park boundary. The degree of impact to these species would be uncertain to predict as it would be substantially related to the relative success—or failure—of various large scale efforts currently underway to protect and restore the greater North Cascades ecosystem.

### *Conclusion*

Direct and indirect impacts to fish and wildlife would be negligible to minor in regard to impacts from hunting and fishing (a consumptive use) and for general recreation use of the area. NPS management and operations would cause negligible to moderate impacts to fish and wildlife in limited areas, primarily those areas associated with the park's visitor service infrastructure. Cumulative impacts from NPS management actions would be negligible to minor. Most cumulative adverse impacts would result from management activities outside the boundary of Ross Lake NRA, or associated with the hydroelectric facilities. The cumulative effect of human-forced climate change would be uncertain, but likely to be adverse. Alternative C would cause generally negligible to minor impacts to fish and wildlife resources. Impacts to special status fish and wildlife species would be similar to Alternatives A and B. There would be no impairment to this resource or value as a result of implementing this alternative.

## **Cultural Resources**

### **Archeological Resources**

Actions under Alternative C would be the same as Alternative B, however the new program for paleoecological investigations would not include the full integration with interpretation and education programs. Implementation of Alternative B would still result in moderate long-term benefits to archeological resources through the new programs, partnerships, and opportunities that would enhance understanding of resources.

Alternative C calls for less development than Alternative B. Impacts to archeological resources from development or construction related activities would be similar to Alternative A.

### *Cumulative Impacts*

Cumulative impacts would be the same as Alternative A. Alternative C would not contribute to adverse cumulative impacts.

### *Conclusion*

Impacts from implementation of Alternative C would be similar to Alternative B and would result in moderate long-term benefits to archeological resource, even though this alternative does not include as extensive integration with interpretation and education opportunities. Cumulative impacts would be the same as Alternative A. Alternative C would

not contribute to adverse cumulative impacts. There would be no impairment to this resource or value as a result of implementing this alternative.

### Historic Structures and Cultural Landscapes

Activities under Alternative C would be the same as Alternative A and would have minor to moderate benefits to historic structures and cultural landscapes.

Under Alternative C, impacts associated with the NPS acquiring Hollywood would be the same through purchase or exchange would have similar benefits as well as potential adverse impacts as Alternative B.

~~Implementation of Alternative C would result in a greater commitment to preserve the entire infrastructure in Hollywood, regardless of the National Register eligibility listing, in order to preserve the broader historic character of the area. All National Register eligible or listed properties would be protected. The mix of uses in Hollywood could enhance the long-term protection of historic properties by introducing a wide array of partners who could collectively have enough need to adaptively reuse all the properties on the site. This commitment could result in greater protection of cultural resources and historic properties, resulting in long-term benefits to those resources.~~

Providing public overnight access and increased recreational opportunities under Alternative C could result in long-term benefits similar to Alternative B by increasing support for historic preservation.

#### *Cumulative Impacts*

Cumulative impacts are the same as Alternative A and would be long-term, minor to moderate, adverse, and beneficial. Implementation of Alternative C would not contribute to long-term adverse impacts.

#### *Conclusion*

Alternative C would result in minor to moderate benefits similar to Alternative A. ~~Impacts associated with the acquisition of Hollywood would be the same as Alternative B. Cumulative impacts are the same as Alternative A, with a commitment to long-term protection of historic properties for adaptive reuse could have additional moderate long-term benefits to historic preservation. The beneficial effects of Alternative C would contribute modestly to the overall beneficial cumulative effects. There would be no impairment to this resource or value as a result of implementing this alternative.~~

### Tribal Issues and Ethnohistory

Activities under Alternative C would be the same as Alternative A.

#### *Cumulative Impacts*

Cumulative impacts would be the same as Alternative A. Alternative C would also contribute a negligible to minor increment to the long-term adverse cumulative impacts.

#### *Conclusion*

Implementation of Alternative C would have moderate long-term benefits similar to Alternative A. Alternative C would also contribute a negligible to minor increment to the long-term adverse cumulative impacts. There would be no impairment to this resource or value as a result of implementing this alternative.

### Museum Collections

Activities under Alternative C would be the same as Alternative A with associated long-term benefits plus: a) develop capacity to preserve and protect paleoecological and emerging collections and archives, such as storage and staffing; and develop exhibits related to paleoecological findings and emerging collections.

Actions under Alternative C would result in increased capacity to preserve new and emerging collections, contributing additional minor to moderate long-term beneficial impacts.

#### *Cumulative Impacts*

Cumulative impacts are the same as Alternative A and would result in major beneficial long-term impacts on the museum collections

#### *Conclusion*

The ongoing program has resulted in major beneficial impacts to the museum's collections. There would be long-term minor beneficial impacts on the collections. The planned cumulative activities would result in major beneficial long-term impacts. This alternative would add a small component not add to these impacts. There would be no impairment to this resource or value as a result of implementing this alternative.

## Wilderness Character

Under Alternative C, a Minimum Requirement Analysis would still be used to determine if, when, and how actions would be implemented. The backcountry permit system would continue to be used to manage overnight use. Opportunities for visitors to experience wilderness character would still be abundant, and in some cases improved.

A number of actions that would help to protect or improve wilderness character under Alternative C are identical to those under the Preferred Alternative. These actions include implementation of a vegetation management plan, eradication of invasive non-native plants where feasible, allowing wildland fires to burn across the international boundary if conditions were appropriate, removal of the Thornton Lakes Road in wilderness, elimination of certain trails, and certain measures to protect natural soundscapes. These measures would include education about natural sounds, enforcement of noise standards on the North Cascades Highway, and boat restrictions.

As in the Preferred Alternative, the action of providing additional food storage boxes and/or requiring use of bear canisters would help to protect bears and people but would impact the undeveloped and unconfined aspects of wilderness character.

Several additional actions that would be taken to protect or improve natural soundscapes outside of wilderness would most benefit solitude in this alternative. Actions would include instituting a ban on seaplane landings, development of an air tour management plan, and a request to ban scenic overflights throughout Ross Lake NRA; no net increase in trails; and regulating snowmobile use on the closed portion of the North Cascades Highway.

### *Cumulative Impacts*

Cumulative impacts to wilderness character would be the same as those identified in the Preferred Alternative. Impacts would range from minor to moderate and include fire suppression (under more limited instances under Alternative C), invasive non-native plant infestations that cannot be eradicated, fish stocking or removal, and climate change. Other impacts range from minor to moderate and are largely related to ongoing activities such as the existence and maintenance of infrastructure and facilities, installation of the Desolation Peak radio repeater, and other park administrative uses that might require helicopter use. In combination with the Alternative

C, these cumulative impacts would result in minor to moderate impacts.

### *Conclusion*

Actions under Alternative C would best protect or improve wilderness character. Although many actions would be taken that would benefit wilderness character, several past, present, or future activities will have cumulative impacts ranging from minor to moderate. Impacts would result from manipulation of wilderness by fish stocking or removal, fire suppression, other natural resource issues, development, motorized vehicle and equipment use, and management restrictions on unconfined recreation. Implementation of this alternative would not result in impairment.

## Wild and Scenic River

This alternative focuses on resource protection and contains the most beneficial impacts related to natural and cultural resource protection and enhancement. This alternative has the same or similar actions affecting WSR segments related to the proposed two-lane bridge; motorized boating elimination; private non-motorized boating regulation; removal of facilities in floodplains; restoration of native fishery; creation of vegetation management plan; and recommendation to Congress to designate the Skagit River, Newhalem Creek, and Goodell Creek into the WSR system. In this alternative, the NPS would take additional protective actions and seek to lead restoration efforts, potentially providing additional beneficial impacts to river resources. Visitor experience efforts would focus on the wilderness experience. Actions related to bank protection would include removing facilities, implementing fish-friendly bank stabilization methods, and restoring banks that have been hardened.

~~The~~ As in the Preferred Alternative, NPS would also encourage WSDOT to construct a longer bridge at Goodell Creek which could provide moderate beneficial impacts to free-flow and fishery values of Goodell Creek. No net new trails would be constructed and so the beneficial recreation impacts associated with additional trail opportunities along Goodell and Newhalem Creeks described in Alternative B would not be realized.

### *Cumulative Impacts*

Similar to the No Action Alternative and Preferred Alternative, impacts would continue from the hydroelectric projects, roads, facilities, visitor use, and air borne pollutants. Resource protection will

dominate park managers' decisions and actions. NPS's leadership in natural resource protection and restoration of river banks would help mitigate any adverse impacts created by other entities. Actions related to increase in coordination and management efforts with SCL and WSDOT and designation of the Skagit River, Newhalem Creek, and Goodell Creek will provide moderate beneficial long-term impacts and improvements to river values.

### *Conclusion*

With more regulated river access and visitor use and protections for natural resources and floodplains, eligible WSR segments would be more protected, ensuring the preservation of Outstandingly Remarkable Values (ORVs). This would result in moderate beneficial impacts over the long-term.

In conjunction with past, present, and reasonably foreseeable actions, cumulative impacts to eligible WSR segments would generally be minor to moderate and beneficial over the long-term. NPS's leadership in natural resource protection and restoration of river banks would help mitigate any adverse impacts created by other entities.

There would be no impairment of WSR resources and values.

## Visitation

As described in the other alternatives, visitation would be expected to increase proportionate to regional population growth. ~~Under Alternative C, the capacity of front country facilities would either be maintained or reduced, except in Diablo Townsite where some parts of the Hollywood District could be used for public overnight lodging.~~ In the backcountry, overnight visitation would still be limited by the number of campsites available and permits issued. The addition of an online permit reservation system for backcountry camps could slightly increase visitation by making it easier to plan camping trips. Removal of the portion of Thornton Lakes Road that is in wilderness and turning the old road into trail might make it a less appealing destination, thus reducing visitation. Overall, impacts to visitation would be minor to moderate because of the potential reduction of facilities.

Bans on seaplane use and scenic overflights would have negligible minor impacts on overall visitation to Ross Lake NRA, and motorboat restrictions, which could potentially affect a larger group of users, would

have minor impacts. As in the other alternatives, wintertime and shoulder season use may slightly increase; however, little to no crowding or congestion would occur.

### *Cumulative Impacts*

Cumulative impacts would be the same as those identified under Alternative A. Overall impacts to visitation due to these cumulative impacts would be negligible.

### *Conclusion*

The impacts of Alternative C on visitation would range from negligible to moderate. Since there would be a potential reduction in facilities, crowding and congestion would be more likely to occur more often. Seasonal variations in visitation, as described in the other alternatives, would also occur under Alternative C.

## Visitor Opportunities

### *General Recreational Opportunities*

Recreational activities would continue to be characterized similar to Alternative B, with frontcountry experiences along scenic North Cascades Highway, lake and river recreation that includes both frontcountry and backcountry opportunities, and the ability to experience wilderness and use Ross Lake NRA as a gateway to explore the greater North Cascades. The NPS would seek to broaden connections between visitors and the greater North Cascades ecosystem and wilderness by providing opportunities that emphasized learning about wilderness values and interconnections while minimizing human impacts. Traditional, self-powered activities and learning would be emphasized, along with opportunities for solitude, challenge, and independent exploration. Additional moderate long-term benefits to the wilderness traveler and those visitors seeking independent exploration and solitude would result from this alternative.

### *Recreation along the North Cascades Highway and Hozomeen*

Along the North Cascades Highway, a wide variety of recreational activities would continue to be available, including scenic driving, enjoying overlooks and wayside exhibits, picnicking and road biking. There would be opportunities to view the wilderness and experience a natural setting while accessing numerous amenities and services with benefits similar to Alternative B. Car camping opportunities with a range

of amenities would continue to be available at five campgrounds and three group camps. Campgrounds that are especially susceptible to changing stream flows and storm events, such as Colonial Creek Campground and Goodell Creek Campground (lower group camp and main sites), could be rebuilt in place if possible, or if this were not possible some sites or parts of these campgrounds would be abandoned, resulting in some net loss of camping opportunities, similar to the impacts in Alternative A.

Hozomeen would be reorganized to formalize its capacity, with impacts similar to Alternative B.

There would continue to be no stock facilities at car-campgrounds with impacts similar to Alternative A.

**Should the NPS acquire Hollywood the effects would be the same as Alternative B.**

~~New overnight lodging opportunities could be created in the Hollywood District with impacts similar to Alternative B.~~

Efforts would be made to improve the quality of corridor recreation by educating or enforcing noise ordinances.

Limited winter activities such as skiing, snow-shoeing, and bird-watching would continue as weather, road access, and plowing allow, similar to Alternative B. Snowmobiling use would be regulated along the closed portion of the North Cascades Highway, benefitting those using cross-country skis or snowshoes, but adversely impacting those preferring snowmobiles due to the change from unlimited use.

### *Land and trail-based opportunities*

Impacts to land and trail-based opportunities would be similar to Alternative B. A number of short walks ranging in length from 100 yards to a few miles would continue to be available, as well as access to longer day hikes, backpacks, stock trails, and mountaineering routes in the wilderness and greater North Cascades. Some opportunities could be lost if a trail were closed for resource protection reasons, contributing minor short- or long-term adverse impacts depending on the duration of the closure. Hunting would be allowed within existing permitted areas. An effort would be made to improve visitor education about hunting and visitor safety, so as to reduce any potential conflicts between the small number of hunters and the majority of recreation visitors who are not hunting, and may be recreating (backpacking, camping, or hiking) in the

same areas, some of which have high concentrations of use, including the Ross Lake Camps. These increased efforts would result in a moderate long-term benefit. Sport climbing in the Newhalem Gorge would continue in four designated areas under an Adopt-a-Crag program similar to Alternative B, and new and emerging uses such as canyoneering would be managed as any resource or visitor experience issues arose.

Similar to Alternative B and D, additional hiking opportunities and providing new trails in the future could be constrained by formal policies for maintaining core habitat for special status species such as grizzly bear, resulting in a negligible to minor long-term impact given the extent of the land base and likelihood of expanding trails beyond the highway corridor and into core area habitat.

### *Water-based opportunities*

Visitors would continue to have access to a range of water-based recreation in both front and backcountry, as well as numerous associated day and overnight activities similar to Alternatives A and B. Impacts to water-based recreation opportunities for both motorized and non-motorized boats are similar to Alternative B.

Paddle craft would be encouraged; personal watercraft would continue to be banned.

Seaplanes would not be allowed on any lake or reservoir within Ross Lake NRA under Alternative C. Eliminating seaplane use would have minor to moderate adverse long-term impact on visitor experience because of the small overall numbers of current users that would be affected and numerous other seaplane opportunities that exist within the region. Impacts for those individual seaplane users who have historically visited Ross Lake via seaplane would be moderate to major and adverse.

Impacts from limiting motor boats on the Skagit River would be similar to Alternative B. On the Skagit River, regulations to limit party size or number of boats would also be considered, resulting in a moderate adverse impact to those who might be constrained by regulations but an overall long-term benefit to the majority of boaters on the Skagit by maintaining a quality experience. Fishing opportunities would remain unchanged, with the exception of prohibiting lead tackle, a minor adverse impact to fishermen who may need to acquire separate tackle.

### *Visitor and Information Centers*

A range of visitor and information centers would continue to meet a variety of visitor needs similar to Alternative B. Impacts from these facilities and services would be similar to Alternative B.

Upgrades to the Wilderness Information Center in Marblemount would be similar to Alternative A, with the addition under Alternative C of the rehabilitation of the public side of this building in order to provide improved visitor services, a long-term moderate beneficial effect to most visitors. Wilderness rangers would also be added to the Newhalem North Cascades Visitor Center to increase awareness of the park's wilderness and improve services at this center, resulting in a moderate long-term benefit to visitors. The NPS would also seek to partner with BC Parks to build a new joint visitor and information center at Hozomeen in order to expand basic visitor services with moderate long-term benefits.

Most NPS information centers, with the exception of the information desk in Sedro-Woolley, would continue to be located a short drive off the main road, which could result in a minor to moderate adverse impact to those visitors who miss turn-offs to obtain information. However, improved signage and site design under Alternative C could mitigate the adverse impacts.

Those stations with increased or maintained staffing or services would provide a long-term moderate to major beneficial impact to most visitors. During certain seasons or at certain stations, where staffing or services are limited, there would be a moderate long-term adverse impact, especially for east side visitors.

### *Permits, Reservations, and Fees*

Primary backcountry permitting services would continue similar to Alternative A and backcountry permits would still be required for all overnight backcountry stays in Ross Lake NRA, including all boat-in and hike-in camps. A backcountry reservation system could be developed and made available for a fee, with some sites held for walk-ins and fees would be evaluated for special services, reservations, and permits, creating impacts similar to Alternative B. The limited fee-based reservation service for commercial companies would continue.

Frontcountry reservations would be managed the same as Alternative A, while additional user fees

for special services including reservations may be developed similar to Alternative B.

### *Campground facilities*

Maintenance of campground facilities would continue similar to Alternative B. In the event that either Colonial Creek or Goodell Creek Campground is impacted by flooding, debris flow, or erosion, the campground would be repaired when possible and practicable, or if not then visitors would be re-directed to other existing campgrounds. An overall net loss of site could occur, creating adverse impacts to visitors similar to Alternative A.

The NPS would also rehabilitate Hozomeen Campground and Winnebago Flats to provide a more traditional camping experience with impacts similar to Alternative B.

There would be continue to be no hook-ups, showers, or overnight stock facilities at any campground and impacts would be similar to Alternative A.

### *Trails, Boat Launches, Picnic Facilities, etc.*

The current number of trails and trail uses would be largely maintained at current levels, but some trails could be closed for resource protection, particularly if wildlife concerns arose. There would be no net increase of trails within Ross Lake NRA, a minor adverse impact to those seeking new opportunities or loop hikes. Some sections of trails could be lost if their adjoining trail segment in the national park is closed or abandoned, a minor to moderate adverse impact.

Existing facilities such as overlooks, waysides, picnic areas, and others would be maintained in a variety of locations along the highway corridor, and some recreation facilities such as new group picnic sites could be developed, resulting in a minor to moderate long-term benefit. Improved signage along the highway corridor, and at entrance points to Ross Lake NRA and North Cascades NPS Complex, would have long-term moderate benefits.

Current lake and river boat launches and boater facilities would be maintained at existing locations similar to Alternative A. There would be some threat that the main boat launch at Colonial Creek Campground will slowly silt in as debris washes from Rhode Creek into Diablo Lake, making this launch more difficult to use over time, especially for larger boats. Limited facilities and services specifically for

bicyclists would be maintained, a minor to moderate adverse impact.

### *Commercial Services And Facilities*

The NPS would develop a commercial services plan to determine the optimal level of commercial services and facilities, and could consider establishing a user capacity or use limits with impacts similar to Alternative B. Commercial use guiding services would continue, but could be limited under a commercial services plan similar to Alternative B. Ross Lake Resort would be maintained at its existing capacity, with any replacement facilities following established NPS guidelines. The Resort would continue to operate portage service between Ross and Diablo lakes, as well as a single water taxi for shuttles on Ross Lake. Impacts would be similar to Alternative A.

The NPS would seek to acquire by exchange the Hollywood District of Diablo Townsite similar to Alternative B and would seek to preserve the area as a historical district, with appropriate public or NPS uses, including the potential for concession-run overnight lodging. Public overnight opportunities would be limited to those participating in specific programs; however, this action would still create an additional public overnight opportunity on an already developed site along the river, which is a rare opportunity. This action would have a moderate to major long-term benefit similar to Alternative B. Seattle City Light would continue to run additional facilities and services in Newhalem, creating similar benefits as Alternative B.

### *Cumulative Impacts*

Cumulative effects would be similar to Alternative A and B. The contribution of implementation to cumulative effects would be modest, resulting in overall long-term benefits to cumulative effects by increasing the potential for overnight lodging at Hollywood. The prohibition on seaplanes from landing and taking off on all lakes in Ross Lake NRA would have a minor contribution to adverse cumulative effects given the availability of similar experiences throughout the region.

### *Conclusion*

A range of visitor opportunities, facilities and services would continue to provide for visitor enjoyment and recreation activities, and new opportunities would result from the acquisition of Diablo Townsite, resulting in moderate to major long-term beneficial impacts on the visitor experiences; however, eliminating seaplane use throughout Ross Lake NRA

could have moderate long-term adverse impacts. There would be moderate long-term beneficial cumulative impacts on visitors in the broader North Cascades. Implementation of this alternative would have a modest contribution to these cumulative impacts.

There would be overall moderate long-term beneficial cumulative impacts on visitors in the broader North Cascades. Implementation of this alternative would have a modest contribution to these cumulative impacts.

## **Information, Interpretation, and Educational Opportunities**

Under Alternative C, Ross Lake NRA is used as a platform and classroom for education about the North Cascades, its history and resources, as well as civic engagement, stewardship, and public leadership. Opportunities in the park are primarily structured, but some opportunities for self-exploration and discovery could occur in the frontcountry zone primarily around existing centers of visitation. Enhanced off-site interpretation and education programs are provided through partners. NPS would develop and evaluate interpretive and educational messages and programs and increasingly rely on other partners to deliver the programming.

The improvement of traditional interpretive programming within existing facilities by developing, delivering, and evaluating priority resource management messages and the reaching of a broader audience through improved and more effective use of technology would have a major long-term beneficial impact to visitor experience.

Curriculum-based programs that focus on priority resource management messages related to preservation of the North Cascades ecosystem and that emphasize low-impact practices for hands-on activities that make learning relevant to students' lives would have a major long-term beneficial impact to visitor experience.

The expansion and emphasized participation in outreach programs to deliver Ross Lake NRA's priority resource management messages and build local and regional stewardship of the North Cascades ecosystem would have a major long-term beneficial impact to visitor experience.

Enhanced visitor orientation and informal education through improved signage, multi-media, and exhibits at existing waysides, contact stations, and along interpretive trails would have a major long-term beneficial impact to visitor experience. Improved signage would provide visitors a sense of approach and arrival as well as better orientation to the services and resources within Ross Lake NRA.

Partnerships programs that help enable visitors to have a lasting connection with the North Cascades and their park experience would have a major long-term beneficial impact to visitor experience.

Working with SCL to interpret the results of their research and how their research and operations connect with and influence NPS efforts to manage and preserve the North Cascades ecosystem would have a major long-term beneficial impact to visitor experience.

### *Newhalem*

Updated exhibits, multi-media programs, and activities to provide visitors with more active and interactive opportunities that effectively use technology to provide engaging, fun, and educational activities that communicate priority resource management messages and cultivate stewards of the North Cascades ecosystem would have a major long-term beneficial impact to visitor experience.

### *Environmental Learning Center*

The devotion of a moderate level of resources to Environmental Learning Center programs and operations, with the NPS developing and evaluating the interpretive and educational messages with NCI would have a major long-term beneficial impact to visitor experience.

### *Hozomeen*

Increased partnership with British Columbia Parks to provide joint NPS/Canadian land- and water-based interpretive programs and expand basic visitor services, including providing backcountry permits would have a major long-term beneficial impact to visitor experience.

### *Cumulative Impacts*

Cumulative impacts are the same as Alternatives A and B.

### *Conclusion*

Overall, implementation of Alternative C would result in moderate to major long-term beneficial impacts to visitor experiences in the area of information, interpretation, and education. Expansion of partnerships with Seattle City Light, North Cascades Institute and British Columbia Parks would all contribute to beneficial impacts. Improvements to signage, media, displays, and mechanisms for outreach would also contribute long-term benefits. Focusing on priority resource management messages, enhancing curriculum-based programming, and other actions could help engage visitors and youth in hands-on stewardship and contribute long-term benefits. NPS information centers within Ross Lake NRA boundary along the North Cascades Highway would continue to be located a short drive off the main road, which could result in a minor to moderate adverse impact to those visitors who miss turn-offs to obtain information. Cumulative impacts would be the same as Alternative A and B.

## **Access and Transportation**

Under Alternative C, access and capacity would either be maintained or reduced in most areas. As in the other alternatives, visitation would be expected to increase proportionate to regional population growth. Heaviest use would still occur along the North Cascades Highway, and since there are no proposed changes to roadway capacity, traffic congestion during peak summer weekends would continue, resulting in minor to moderate adverse impacts. If implemented, however, a shuttle system could potentially help to alleviate some of the congestion.

Access to the Ross Dam Trailhead parking lot will improve by constructing a turn lane at the entrance; however, the parking lot will be redesigned within its current footprint, resulting in a reduction of parking spaces and prohibition of the parking of RV and stock vehicles. Impacts to access would be adverse and moderate.

Removal of the portion of Thornton Lakes Road in wilderness would still allow access to the trailhead, and depending on the new trail location, the access route to the lakes could either be shortened or lengthened. The new parking area could potentially accommodate a larger number of vehicles than the current parking lot, thus improving access.

Other changes in access include potential expanded overnight opportunities in the Hollywood District



and reconfiguration of the Sourdough, Stetattle Creek, and Thunder Knob trailhead parking areas. ~~The existing one-way bridge that provides access to the North Cascades Visitor Center, Newhalem Creek Campground, and several trails, would be replaced with a two-lane bridge that accommodates two-way traffic, pedestrian access, and interpretive platforms. These slight increases in access would result in beneficial impacts.~~

Both seaplane landings throughout the NRA and motorboats along the Skagit would be restricted. Snowmobile use along the closed portion of the North Cascades Highway during the wintertime would be regulated. Although these restrictions would impact the visitor experience for these user groups, and impacts for individual users may be moderate to major and adverse, the overall impact to access and transportation would be negligible to minor based on numbers of users and beneficial for other forms of transportation, i.e., self-propelled boats on the Skagit and the reservoirs, motorboats on the reservoirs, and skiing and snowshoeing.

#### *Cumulative Impacts*

Cumulative impacts would be the same as those identified under Alternative A. Potential future actions, including general road, trail, or parking lot maintenance, and various types of work on the North Cascades Highway by WSDOT, could impact access; although delays may occur, visitors would not likely alter their travel destinations. Occasional road or trail closures also occur due to fire, avalanches, rockfalls, etc. Overall impacts to access due to these cumulative impacts would be negligible.

#### *Conclusion*

The impacts of the Alternative C on access and transportation would result in adverse, minor to moderate impacts during the peak season as well as beneficial impacts due to a few improvements in access and during non-peak times.

## **Socioeconomic Environment**

Impacts to the socioeconomic environment due to implementing the actions in Alternative C would result from changes in operational spending, changes in visitor spending, and changes in visitor patterns. The impact of Alternative C is evaluated in comparison with the No Action Alternative.

Implementation of Alternative C, Preservation of the North Cascades ecosystem, would occur against the

same backdrop of economic, demographic, and social changes across the influence area described under the No Action Alternative. The economic and social effects of Alternative C would add to those changes, but not fundamentally change the area's economic and demographic outlook.

#### *Impacts to Demographics*

Alternative C would have little direct impact on the influence area's population growth and impacts would be same as Alternative A. It is likely that many of the construction and related jobs would be filled by individuals already residing in the area. However, new staff proposed in Alternative C would likely come from outside as well as from within the influence area. Total increases in staff are proposed at 18 permanent full-time equivalent positions (FTEs). Beneficial and adverse impacts would be the same as Alternative A.

Population increases due to Alternative C would be minute compared with the total influence area population of about a half million people; therefore the impact would be negligible, long-term, and of indeterminate effect since there are both adverse and beneficial impacts to population growth. The addition of 18 new employees and their families would represent a small but detectable number. The impact of hiring all proposed new employees would be long-term, minor, and of indeterminate effect.

#### *Economic Impacts to Influence Area*

Increases in the recreation area's spending would have short-term impacts during construction of new facilities, and long-term impacts due to increases in annual budgets. Proposed construction projects include rehabilitation of the Hollywood district housing and replacement of the bridge to Newhalem. Companies in the construction industry would see increased business if contracted to provide services. This, in turn, would strengthen construction employment and incomes. Construction workers frequenting the area would spend income on food and materials; increasing service businesses and government tax revenues. While construction spending would strengthen these areas of the economy, it would do so to a small degree in relation to the influence area's total economy. Short-term construction spending is estimated at \$8.4 million (\$8.3 million above that for the No Action Alternative). Construction spending would result in negligible, short-term, beneficial impacts to the influence area economy, since this amount would be likely spread over the 20-year planning timeframe.

Increases in the recreation area's annual spending also would have long-term effects related to employment of new staff similar to Alternative A. Annual operations spending in Alternative C is estimated at \$8.5 million (\$1.4 million more than the No Action Alternative), resulting in minor, long-term, beneficial impacts to the influence area economies.

Proposed actions that might increase visitation include establishment of a ranger station and orientation center near Hozomeen, construction of visitor lodging in the Hollywood district. Gateway communities would also be encouraged to develop visitor lodging. Some actions might encourage increased visitor spending. If facilities such as the Colonial Creek or Goodell Creek campgrounds are not replaced if they become severely damaged by weather events, visitors might stay in local area motels instead of campgrounds.

The following actions would possibly reduce visitation and visitor spending: prohibiting seaplane landings on all lakes in the recreation area, prohibiting scenic air tours over the recreation area; requiring special boat motors, prohibiting motor boats on the Skagit River, limiting concession authorizations if user capacity is exceeded, and not replacing damaged visitor facilities. Reduction in facilities could also result in fewer visitors.

Overall, the actions proposed by Alternative C could result in small changes in the number of visitors, length of visitor stays, and related visitor spending. Changes in visitation could affect employment, business sales, and incomes in the tourism industry, as well as government tax revenues. Changes in visitation and visitor spending could also change the number of unemployed in the tourism industries. Implementation of Alternative C might indirectly enhance economic development in the influence area's attractiveness because of enhanced recreational opportunities in the area. However, because the expected changes would be small, increased visitation would have negligible and long-term impacts to the influence area's economy.

Partnering with Seattle City Light to use excess housing for recreation area staff would make more housing available, perhaps resulting in higher vacancy rates and lower rental rates in surrounding communities. The impacts would be minor, long-term, and beneficial to renters and employees, but minor, long-term, and adverse to individuals leasing room space in the adjacent community.

### *Economic Impacts to Local Commercial Services and Neighboring Businesses*

Operational spending related to new construction would strengthen those businesses providing food and materials, as construction workers would likely purchase these products. Businesses providing construction services would see increased business. Government revenues would also increase due to increased sales and associated taxes. Increases in construction spending would result in minor, short-term, beneficial impacts to commercial service providers and neighboring businesses.

The impact of wages for new staff and annual operational spending by the recreation area would be greater on the local area than in the entire influence area. Impacts to employment, incomes, and government revenues would be long-term, minor to moderate, and beneficial to the local communities.

Alternative C calls for a transportation study that would look at the feasibility of a shuttle system providing service to the recreation area. If a shuttle system were implemented, a concessioner would have the opportunity to provide the service. This would increase a concessioner's business or provide a new business opportunity. A shuttle service would result in a minor to moderate, long-term, beneficial impact to the operator.

The recreation area would prohibit seaplane landings on any lake within the recreation area; this would restrict seaplane operators to providing services elsewhere, and perhaps reduce business sales, employment, and incomes. This would have an adverse, long-term, negligible to minor impact to seaplane service providers given the estimated numbers using Ross Lake NRA.

The recreation area would request that the FAA prohibit scenic overflights of Ross Lake. This would restrict flight tour companies to areas other than Ross Lake, and perhaps diminish business sales, employment, and incomes. This would result in a negligible, long-term, adverse impact given the estimated numbers using Ross Lake NRA.

Prohibition of motor boats on the Skagit River would result in a negligible, long-term impact to outfitters given the estimated numbers using the Ross Lake NRA, however, it would be of indeterminate effect since nonmotorized boat rentals and tours might increase in place of motorized boat rentals and tours.

Changing the nature of the Hollywood district to concessioner-run lodging creates an opportunity for a concessioner to expand business, or for a new concessioner to start a business. This would have a minor, long-term, beneficial impact due to increased visitor spending and the resulting increase in incomes, as well as the potential increase in number of jobs.

Alternative C proposes the placement of limits on commercial use authorizations (CUAs) if user capacity limits are exceeded. CUAs are used by the National Park Service to authorize individuals or businesses to provide commercial services to recreation area visitors in limited circumstances. These limitations would limit visitors to capacity levels and therefore would limit sales, incomes, and employment; this would result in a long-term, negligible to minor adverse minor adverse impact to concessioners.

### *Impacts to Social Characteristics*

This alternative also proposes to acquire the Hollywood district from Seattle City Light through exchange or purchase. The recreation area would preserve the buildings, structure, and landscape to preserve the historic character of the area. This land is within the recreation area boundaries, and the dam facilities would remain in operation by Seattle City Light. The result of this proposal would have beneficial impact to the social character of the influence area because the historic structures and character would be preserved. The impact to land use would be minor, long-term, and beneficial to the social character of the influence area.

Potential shuttle service in and around the recreation area would relieve some traffic in the service area. Local residents would have the opportunity to use this service, and therefore, it would provide a negligible, long-term, beneficial impact to the social character of the local area.

Construction activities would affect traffic, as construction vehicles may be moving slowly and turning in and out of construction areas; there also would be an increase in the level of traffic due to workers coming to the area and the presence of construction vehicles. Construction of a turn lane on the North Cascades Highway at the Ross Dam Trailhead parking lot would also disrupt traffic temporarily, but would relieve some congestion once built. Construction activities would result in a minor, short-term, adverse impact to traffic and long-term, minor beneficial impacts to traffic.

While there is a mix of beneficial and adverse impacts, implementation of Alternative C overall would result in short- and long-term, negligible to minor, beneficial impacts to the influence area's socioeconomic environment.

### *Cumulative Impacts*

Projects that are not associated with this general management plan can interact with projects proposed in the GMP alternatives, resulting in a cumulative impact on the influence area's social and economic environment. Cumulative impacts are the same as Alternative A.

Impacts of Alternative C, in combination with short- and long-term minor beneficial effects on the influence area's economy described above would result in both short- and long-term, minor, beneficial cumulative impacts to the influence area's socioeconomic environment. Alternative C would have a modest contribution to the overall cumulative impact.

### *Conclusion*

Alternative C would result in a negligible to minor, beneficial, impact to the influence area socioeconomics. The impact would be greater in the immediate areas surrounding the recreation area. The impacts of the actions proposed in Alternative C and impacts of other projects combine to have short- and long-term, minor, beneficial cumulative impacts to the influence area's social and economic environment.

## **Park Operations**

### *Facilities and Sustainability*

Under Alternative C, major visitor and operational buildings and infrastructure, including headquarters, staff offices, and visitor centers, would continue to be concentrated in the same general areas of Ross Lake NRA as Alternative A. Similar to Alternative B, some facilities would be replaced, others would be expanded in size or services and utilities offered, and new facilities could be added. Alternative C proposes a smaller expansion of buildings and infrastructure than Alternative B, notably at Hozomeen ranger/orientation station and Ross Dam Trailhead parking. No additional housing facilities would be added in Marblemount, creating similar facility maintenance needs as Alternative A. The land exchange in Diablo Townsite and effort to preserve the structures regardless of National Register eligibility could result in an increase to the number of facilities NPS staff may need to maintain. Activities associated with the

construction and maintenance of these new facilities could result in short-term minor impacts by focusing staff efforts on these projects and potentially long-term minor to moderate adverse impacts by increasing the facilities that need to be maintained.

Facilities that were not deemed to be sustainable would actively be relocated under Alternative C. Relocating facilities or portions of facilities that require substantial efforts to retain them in the event of severe weather such as flooding would have a moderate to major long-term benefits by locating facilities in areas that require less intensive effort to sustain them.

While new trails could also be constructed under Alternative C, trails that are not used could also be decommissioned, resulting in minor long-term benefits by reducing the needs for trail maintenance in seldom used areas of Ross Lake NRA, similar to Alternative B.

Incremental changes in green facility design would be similar to Alternative A and additional changes to reduce carbon emissions and increase energy and fuel efficiency whenever and wherever possible would be the same as Alternative B and also result in long-term moderate benefits to park operations by creating a more sustainable infrastructure.

### *Operational Efficiency*

Impacts to operational efficiency are similar to Alternative B. The replacement and reconstruction of facilities that are declining would have long-term minor to moderate benefits on operational efficiency by reducing the needs for maintenance. Creating opportunities for housing in Hollywood would result in minor long-term benefits to operations by locating staff closer to their work locations, however, the lack of housing for short-term seasonal use in Marblemount would create minor to moderate long-term adverse impacts for some divisions whose work is centered in Marblemount.

Making better use of the existing facilities along the North Cascades Highway, and increasing collaboration with partners in utilizing these facilities, would have moderate long-term benefits to operational efficiency.

### *Staffing*

Impacts to staffing are similar to Alternative B, although the distribution of future staffing increases varies. In the short term, impacts from staffing are the

same as Alternative A with funding for staffing levels to continue to be inadequate to meet the increased needs of Ross Lake NRA, resulting in long-term minor adverse impacts to NRA operations. In the long-term, staffing increases in resource management, interpretation, visitor protection, facilities and maintenance, and administration coupled with expanded emphasis on partnerships could have long-term moderate benefits to operations by increasing the capacity of Ross Lake NRA to meet the needs of the operation and visitors.

### *Cumulative Impacts*

Cumulative impacts are similar to Alternative A. Past and ongoing projects, including road, trail, and facility maintenance and repairs have had long-term moderate beneficial impacts on park operations. Aging facilities and infrastructure, including utilities and systems, would continue to be repaired, upgraded or replaced as needed on a case-by-case basis, subject to available funding. Over time, more sustainable and efficient facilities and infrastructure would replace those that are aging or no longer meet the needs of Ross Lake NRA, resulting in moderate, long-term benefits to the recreation area by reducing maintenance needs.

### *Conclusion*

Under Alternative C, there would be noticeable changes to facilities as some facilities would be replaced, others would be expanded in size or services and utilities offered, and new facilities could be added, resulting in both moderate benefits and adverse effects. ~~However, greater effort would be taken to maintain the structures in the Hollywood District, resulting in an increase to the number of facilities that would need to be maintained but also greater flexibility for Ross Lake NRA in terms of housing staff and providing overnight accommodations for visitors.~~

Additional changes to improve the environmental sustainability in all aspects of facility and infrastructure management could have long-term moderate benefits to park operations. Changes in staffing and operational efficiency would have long-term moderate benefits to park operations. As more projects are completed that repair, upgrade, and replace aging facilities and infrastructure, and more sustainable systems are installed, maintenance needs would be reduced, resulting in moderate, long-term benefits. However, until those facilities are replaced, periodic and extensive maintenance would be required. The overall effects of implementing Alternative C on park operations would be long-term, moderate and beneficial.

## Unavoidable Adverse Impacts

Unavoidable adverse impacts are defined as moderate to major impacts that cannot be fully mitigated or avoided.

Under Alternative C, there would be a negligible potential for unavoidable adverse impacts on natural resources because there would be little new development, although there could be some new or renovated facilities, such as the Ross Dam Trailhead parking lot, the potential relocation of some campsites from Colonial Creek in the event of a catastrophic flood event, and the changes to the Wilderness Information Center.

There would be little to no unavoidable adverse impacts on cultural resources because the NPS would strive to preserve and adaptively use buildings, structures, and landscape features that are eligible for the National Register, notably in the Hollywood District should the land be acquired by the NPS.

Some existing conditions have resulted in unavoidable adverse impacts. The location of park facilities, the Skagit Hydroelectric Project, and roads, including the North Cascades Highway, in floodplains, and the maintenance of this infrastructure has resulted in adverse impacts to floodplains and riparian areas. Most of the infrastructure would remain in these locations. Additional unavoidable impacts would likely occur on vegetation and soils, primarily in the existing developed areas where visitor use is concentrated.

### *Relationship between Local Short-Term Uses and Long-Term Productivity*

Under all of the alternatives, most of Ross Lake NRA would be protected in a natural state and would continue to be used by the public. Under all the alternatives, the National Park Service would continue to manage Ross Lake NRA to maintain ecological processes and native and biological communities, and to provide for appropriate recreational activities consistent with the preservation of natural and cultural resources.

Some previously disturbed areas would be rehabilitated to return these areas to productivity. Any actions the National Park Service takes in Ross Lake NRA would be taken with consideration to ensure that uses do not adversely affect the productivity of biotic communities. Under Alternative C, there would be no appreciable loss of ecological productivity because

there would be little new development. Existing developed areas and infrastructure within Ross Lake NRA, including the Skagit Hydroelectric Project and the North Cascades Highway, would remain.

## Irreversible or Irrecoverable Commitments of Resources

Irreversible commitments of resources are actions that result in the loss of resources that cannot be reversed. Irrecoverable commitments are actions that result in the loss of resources, but only for a period of time.

No actions would be taken as a result of the Alternative C that would result in the consumption of nonrenewable resources that would preclude other uses for a period of time. Thus, there would be no irreversible or irrecoverable commitments of resources in Ross Lake NRA by the National Park Service.

No actions would be taken that would result in irreversible or irrecoverable effects on historic properties. NPS staff would continue to conduct appropriate cultural resource management in accordance with the Secretary of the Interior's Standards and NPS policies.

# IMPACTS FROM ALTERNATIVE D

## Natural Resources

### Air Resources

#### *Air Pollution*

Emissions of various air pollutants as a result of visitor use, and park operations including wild land fire management would be similar to Alternative B. The impacts of these activities on air pollution would generally be negligible to minor, except for large wildfires which could be major and adverse.

#### *Greenhouse Gas Emissions*

Greenhouse gas emissions would generally be similar to Alternative B. The impact of these emissions on human-forced climate change would be adverse but negligible.

#### *Visibility (Regional Haze)*

Impacts to visibility would generally be similar to Alternative B. Impacts would primarily result from wildfires, and would be negligible to possibly major depending upon the severity and location of the fire in relation to Ross Lake NRA.

#### *Cumulative Impacts*

Cumulative Impacts to Air Resources would generally be similar to Alternatives A and B. These cumulative impacts would overwhelmingly result from various activities outside the boundaries of Ross Lake NRA

#### *Conclusion*

Similar to Alternative B, direct and indirect impacts to air quality would generally be negligible to minor and adverse. Cumulative impacts to air quality would remain negligible to minor, because the air quality within Ross Lake NRA is predominately influenced by human activities outside of Ross Lake NRA, including regional and global sources of pollution. The management actions proposed under Alternative D would generally be negligible to minor and adverse. Impacts from wildland fire could be adverse and major, but would not endure. There would be no impairment of air resources within Ross Lake NRA.

### Natural Soundscapes

Under Alternative D, several impacts would be the same as those identified under the Preferred

Alternative. Actions would include an expansion of the soundscape monitoring program, identification of unacceptable sounds and sound levels, and active management of soundscapes; enhanced visitor education and orientation; reconfiguring camping at Hozomeen; potentially expanding camping facilities at Newhalem and Goodell group sites; alternative transportation opportunities; requiring four-stroke motorboat engines (or equivalent); additional boat transportation services; limited use of explosives to manage avalanches along the North Cascades Highway; and closure of the portion of Thornton Lakes Road that is in wilderness. All of these actions would result in a beneficial impact to the natural soundscape, except for the expansion of camping facilities at Newhalem and Goodell group sites and adding more boat transportation services, which would both result in minor adverse impacts.

Other actions that are similar to those found in the Preferred Alternative but have slight variation include providing a broad range of visitor activities (day use and overnight) throughout Ross Lake NRA; speed, size, and horsepower boat restrictions would only occur on Ross Lake and in Diablo Canyon; and development of an air tour management plan, establishment of use levels, and required permit to land seaplanes within the Frontcountry Zone designated landing zones. Although some of these actions would benefit the natural soundscape, they are more limited in their benefit than the Preferred Alternative. Providing a broad range of visitor opportunities would result in negligible to minor adverse impacts by increasing use in certain areas.

Two actions under Alternative D are the same as Alternative A and will continue to have minor adverse impacts on the natural soundscape: unlimited motorboat use on the Skagit River and unrestricted wintertime use of the closed portion of the North Cascades Highway by snowmobiles.

Although there are some actions under Alternative D that would benefit the natural soundscape, several factors would still have adverse impacts. In addition, expanding visitor facilities or adaptively reusing current buildings could result in short-term adverse impacts to soundscapes from construction activities, similar to the Preferred Alternative. Expanding or adding facilities could also result in long-term impacts to soundscapes. The expansion of parking lots such as the Ross Dam Trailhead parking would not only allow for an increase in visitors, but an increase in the vehicles, both numbers and types (such as passenger

vehicles, RVs, and oversized vehicles) that could result in greater impacts to soundscapes from increased noise. In addition, expanded or new construction, and increased services at existing facilities could result in a new or larger noise footprint to an area. Proposing new services such as electrical hookups and showers in campgrounds could result in additional noise from increased people using a facility or the associated infrastructure such as HVAC systems, water and electrical systems, and potential minor to moderate long-term impacts.

As in the other alternatives, the largest impact would continue to be noise generated along the North Cascades Highway. Although education and enforcement would help to mitigate the highest levels of noise, impacts would still be moderate during the peak summer season due to high traffic volumes. Impacts along the reservoirs due to boat noise would be minor to moderate.

#### *Cumulative Impacts*

Cumulative impacts would be similar to those already identified in the other alternatives, except that impacts on natural soundscapes due to ongoing public automobile traffic and motorboat use may be somewhat reduced. Impacts from NPS administrative uses, Seattle City Light, and Ross Lake Resort would be the same as Alternative A. Depending on the action and time of year, these actions could result in minor to moderate adverse impacts, and some beneficial impacts. In combination with Alternative D, these cumulative impacts would result in minor to moderate impacts on the natural soundscape; however, some actions would be beneficial and would help to preserve the natural soundscape.

#### *Conclusion*

Under Alternative D, some actions would be taken that would result in protection or improvement in the natural soundscape compared to current conditions. Impacts would vary based on the time of year and location and would range from minor to moderate. Minor impacts would occur along the highway during the wintertime, as a result of expansion of activities and facilities, and due to an expansion in boat transportation opportunities. Minor to moderate impacts would occur during peak use times along the highway. Cumulative impacts would range from minor to moderate. Implementation of this alternative would not result in impairment.

## **Water Resources**

### *Water Quality*

Impacts to water quality from primarily non-point sources of pollution would generally be similar to Alternative A. These impacts would primarily be associated with runoff from impermeable surfaces in Ross Lake NRA. Impacts would be minor to moderate, long-term and adverse.

### *Hydrologic Processes*

The hydrologic processes of the Skagit River watershed within Ross Lake NRA would generally be minimally affected by continued management activities proposed for Alternative D. As with Alternative A, the scale of potential management actions would simply be too small to have any measurable effect on the broad patterns and processes of weather, climate and precipitation that substantially govern the hydrology and hydrologic processes of the Skagit River Watershed in Ross Lake NRA.

### *Hydraulic processes*

The hydraulic processes of surface streams, creeks and the Skagit River could be affected to varying degrees by the management actions proposed for Alternative D. Broadly speaking, management actions intended to reduce erosion would continue to adversely impact the hydraulic processes of running waters to varying degrees as described in the following sections.

As with Alternative A, the NPS would continue to maintain and repair the transportation infrastructure, including roads, bridges, culverts, trails and transportation facilities. However, one substantive difference would involve a commitment to protect key facilities and recreational access points via bank hardening and channelization. The NPS would follow the Washington Department of Fish and Wildlife's "integrated streambank protection guidelines" whenever possible, and avoid habitat-harmful practices such as bank armoring with rip-rap (WDFW, 2003). Bank protection techniques would include rock barbs, engineered log jams, and bioengineering; each measure would be tailored to the site. When possible, the NPS would seek to address the underlying causes of damage (such as undersized culverts) and seek improved engineering solutions to reduce the risk of further damage to facilities and the environment. Areas that would most likely be adversely affected by bank protection measures include Goodell Creek Campground, Colonial Creek Campground, and

various bridge crossings at Rhode Creek, Sourdough Creek, Damnation Creek, Thornton Creek and Pyramid Creek.

The North Cascades Highway would continue to adversely influence hydraulic processes in the vicinity of running waters along its alignment within Ross Lake NRA. Similar to Alternative B, Management Alternative D commits the NPS to working more proactively with WSDOT to encourage habitat-friendly streambank protection measures and other habitat-friendly techniques whenever possible. However, WSDOT has the legal jurisdiction and authority to operate and maintain the North Cascades Highway SR20, so the NPS' ability to proactively influence the manner in which WSDOT responds to flood damage would remain limited. In most circumstances, it is assumed that due to limitations on funding and higher priorities elsewhere in the state, WSDOT would continue to respond in a reactive (and most likely emergency) capacity to harden and dredge stream channels in the vicinity of bridge crossings and culverts. It is also assumed that WSDOT would also seek to dredge or otherwise modify the streambed to ensure waters continue to flow under—not around—bridges. These actions would continue to result in localized, long-term adverse impacts to hydraulic processes of running waters in Ross Lake NRA. However, should such action require the dredging of lacustrine wetlands, a Wetland Statement of Findings would be considered at that time.

#### *Cumulative Impacts*

Management actions associated with Alternative D would have negligible cumulative impacts compared with Alternative A. These additional impacts would be associated with modest expansion of some facilities and the slightly increased overall footprint of impermeable surfaces within Ross Lake NRA. Otherwise, most cumulative impacts to water resources would result from activities within Ross Lake NRA associated with management of North Cascades Highway SR20, and with hydroelectric operations. Outside of Ross Lake NRA, cumulative impacts to water resources would remain similar to Alternatives A and B.

#### *Conclusion*

Impacts to water quality would range from negligible to minor and adverse. Impacts would be associated with NPS operations and maintenance related activities, including road and facility maintenance, and boating operations. There would also be impacts stemming from the industrial uses associated with

Seattle City Light, with motor vehicle use, and with maintenance of the North Cascades Highway SR20 corridor. There would be negligible impacts to hydrology. Impacts to hydraulics would be localized, long-term, adverse and of negligible to moderate intensity. These impacts would be primarily associated with local manipulation of hydraulics to protect roads, campground and facilities from erosion. Cumulative impacts to water resources would be negligible to minor, long-term and adverse because there would be no substantive changes to existing park operations or operations associated with the Skagit River Hydroelectric Project. Moreover, the impacts from climate change on water resources (water quantity, quality and hydrology) are expected to gradually increase within the 15-20 year lifespan of this plan, but then accelerate rapidly beyond the planning horizon (University of Washington Climate Impacts Group, 2009). Direct, indirect and cumulative adverse impacts to water resources would remain negligible to moderate because there would be no substantial changes to current management. Therefore, there would be no impairment of water resources under Alternative D.

#### **Geologic Resources, including Soils**

The impacts of Alternative D would be similar to Alternative B in regard to:

- maintenance of trails and associated facilities, including minor relocations
- flood-damage repairs to facilities and the transportation network
- construction of several new trails in various locations, mainly in frontcountry areas
- expansion and/or relocation of new trailhead facilities (such as expansion of Ross Dam Trailhead parking lot)

Alternative D, however, would have slightly increased adverse impacts in areas surrounding certain facilities and recreational access points because measures such as bank hardening and channelization would be taken to protect facilities. However, protecting some key facilities would reduce the need to relocate facilities elsewhere, and possibly offset some of the impacts of staying in place.

Impacts from recreation-related management activities would be similar to Alternative B. These impacts would locally affect soils and surficial geologic resources as a result of additional social trail formation and expansion. These impacts would occur in a relatively small portion of Ross Lake NRA, primarily in areas of high recreational use such as popular frontcountry areas such as trailheads, sport climbing



areas, and campgrounds. Similar impacts would also continue to occur in backcountry camps and along informal trails such as mountaineering routes. These adverse impacts to soils would be long-term, negligible to minor and adverse.

Impacts from road management practices associated with Alternative D would continue to adversely impact surficial geologic processes and soils in the vicinity of road prisms, including NPS-managed roads and the North Cascades Highway SR20-corridor. Expansion of Ross Dam trailhead would require blasting and removal of several thousand cubic yards of soil and bedrock over an approximately 2-acre area. The impacts to geologic resources and soils would be long-term, moderate to major and adverse.

#### *Cumulative Impacts*

Cumulative impacts to geologic resources would generally be similar to Alternative B, although there would be slightly increased ground disturbance from protecting key facilities, or relocating facilities, to ensure no net loss of visitor opportunities. Otherwise, cumulative impacts associated with non-NPS management actions within Ross Lake NRA (such as hydroelectric operations, North Cascades Highway SR20 maintenance) and outside Ross Lake NRA would be similar to Alternatives A and B.

#### *Conclusion*

Direct and indirect impacts to soils and geologic resources from recreation-related activities would be negligible to minor, long-term and adverse. Impacts from management of facilities and the transportation infrastructure associated with the North Cascades Highway and Skagit Hydroelectric Project would be long-term, moderate to major and adverse. Cumulative impacts from past and reasonably foreseeable management actions would be long-term and major. There would be no impairment of soils and geologic resources as a result of implementing this alternative.

#### **Vegetation (including special status species)**

Impacts to vegetation under Alternative D would be generally similar to Alternative B with respect to vegetation management and fire management programs. These impacts would be minor to moderate, long-term and both beneficial and adverse. Adverse impacts would primarily be associated with fire suppression; impacts could range from minor or even major depending upon the extent of fire suppression. Beneficial impacts would be associated with restoration of previously disturbed areas, and with non-native plant management.

The limit-net-loss provisions for maintenance of visitor facilities such as campgrounds would cause minor to moderate, adverse impacts to vegetation in order to protect and maintain facilities in response to threats such as hazard trees, flooding, or other natural events. These impacts would generally be similar to current management (Alternative A), but slightly greater in magnitude compared to management Alternative B because additional management actions would need to be taken.

Various recreation and visitor uses could adversely affect vegetation via direct harm such as trampling and social trail development, and via indirect means such as importation and spread of invasive, non-native weeds, or human caused wildfire. The NPS would continue to mitigate the adverse impacts of recreation on vegetation through visitor education (such as Leave No Trace principles), permit systems, and enforcement of regulations when necessary. Certain emerging activities, such as sport climbing and bouldering, would be limited to existing areas and not allowed to expand into new or undisturbed locations unless resource surveys indicated no sensitive species would be harmed. Taken together, recreational impacts to vegetation, including special status plant species, would be similar to Alternative B: localized in scale, adverse, and negligible to minor in intensity.

#### *Cumulative Impacts*

NPS Management activities such as operation and maintenance of Ross Lake NRA's administrative and visitor service infrastructure would result in slightly increased cumulative impacts compared to management Alternative B, but similar to Alternative A. These impacts would result from the limit-net-loss policy of facility replacement. Otherwise, cumulative impacts to vegetation-related resources would be similar to Alternatives A and B, as most cumulative impacts would result from activities outside of NPS control. The degree to which these external, adverse impacts may cumulatively threaten vegetation within the boundaries of Ross Lake NRA is uncertain, but likely to be adverse and to increase in severity in the future as development outside of Ross Lake NRA places greater pressure on park resources.

#### *Conclusion*

Alternative D would have negligible to moderate, adverse impacts on vegetation in regard to management of the transportation and administrative infrastructure. Recreation-related impacts would be negligible to minor, and adverse. Suppression of natural wildfires would have long-term, adverse and

moderate to major impacts on vegetation. Cumulative impacts to vegetation would be adverse for areas affected by continued development and visitor use, and beneficial for areas that would be restored and revegetated. Impacts to vegetation would generally remain negligible to moderate. Impacts to special status plant species would be similar to Alternative A, B, and C. There would be no impairment of vegetation resources as a result of implementing this alternative.

## **Fish and Wildlife (including special status species)**

### *Impacts from Hunting and Fishing*

Hunting and fishing would continue at levels similar to that of Alternatives A and B. Impacts to game populations would be negligible to minor and adverse. Impacts to fish populations from fishing-related activities would generally be negligible to minor and adverse.

### *Human Disturbance*

Alternative D would continue to cause various forms of human disturbance as a result of recreation and visitor use. This alternative would result in a greater number of trails and climbing routes compared to Alternatives A and B. Recreational use of these additional areas would cause a negligible to minor increase in adverse impacts to wildlife.

Noise from vehicles traveling along the North Cascades Highway, especially extremely loud vehicles such as motorcycles, would continue to cause disturbance to wildlife, prompting avoidance of certain areas and other behavioral effects such as flushing (such as noise can flush birds from nests). In contrast to Alternative A, but similar to Alternative B, the NPS would seek to reduce noise from motor vehicles by taking action to enforce existing motor vehicle noise standards and this could result in negligible to minor benefits to wildlife in the vicinity of the highway.

Similar to Alternatives A and B, wildlife would continue to be harmed or killed by motor vehicles traveling along the highway corridor. There is no indication that overall visitor use of the area would differ compared to Alternative A, so impacts from motor vehicle related activities would generally be negligible to minor adverse minor adverse and long-term.

Similar to Alternatives B and C, under Alternative D the NPS would provide additional food storage

options, such as food storage canisters or boxes, in order to prevent bears and other wildlife from becoming habituated. Expansion of existing provisions for backcountry food storage would afford minor, beneficial impacts to wildlife, especially species such as bears.

### *Park Operations*

Impacts from park operations under Alternative D would generally be similar to Alternative B, although there could be a slightly higher adverse impact to certain wildlife species as a result of maintaining and repairing facilities to adhere to a limit-net-loss policy for the visitor service infrastructure and there could be a slightly higher adverse impact to certain wildlife species as a result of several additional trails not contemplated under Alternatives A and B.

### *Special Status Species*

Impacts to Special Status fish and wildlife species would be similar to Alternatives A, B and C.

### *Cumulative Impacts*

Alternative D could result in slightly greater cumulative impacts to wildlife habitat compared with Alternative B in light of the limit-net-loss provision for the visitor service infrastructure. Nonetheless, there are no substantial expansions of roads, campgrounds or other facilities that could cumulatively and adversely affect fish and wildlife habitat. Therefore, cumulative impacts within Ross Lake NRA would be negligible to minor over the planning horizon.

Similar to Alternative A, the impacts of human-forced climate change would be cause adverse cumulative impacts of uncertain magnitude.

Similar to Alternative A, the impacts of human development and associated habitat loss and modification outside the boundary of Ross Lake NRA would have adverse effects on populations of terrestrial species with large home ranges, anadromous aquatic species such as salmon, and certain migratory bird species that rely on unprotected habitat outside the park boundary. The degree of impact to these species would be uncertain to predict as it would be substantially related to the relative success—or failure—of various large scale efforts currently underway to protect and restore the greater North Cascades ecosystem.

### *Conclusion*

Direct and indirect impacts to fish and wildlife would be negligible to moderate in regard to impacts from hunting and fishing (a consumptive uses) and for general recreation use of the area. NPS management and operations would cause negligible to moderate impacts to fish and wildlife in limited areas, primarily those areas associated with the park's visitor service infrastructure. Cumulative impacts from NPS management actions would be negligible to minor. Most cumulative adverse impacts would result from management activities outside the boundary of Ross Lake NRA, or associated with the hydroelectric facilities. The cumulative effect of human-forced climate change would be uncertain, but likely to be adverse. Impacts to Special Status fish and wildlife species would be similar to Alternatives A, B and C. There would be no impairment to this resource or value as a result of implementing this alternative.

## **Cultural Resources**

### **Archeological Resources**

Actions under Alternative D would be the same as Alternative A with similar impacts, but would include better integration of current archeological programs with interpretation and education programs through development of additional interpretive materials and additional opportunities for visitors to participate in archeological excavations. These actions would contribute moderate long-term benefits to archeological resource preservation through increased awareness and understanding.

Alternative D has the greatest amount of construction and ground disturbing activity associated primarily with new trails and the expansion of the Ross Dam trailhead parking lot. Known archeological resources would be avoided to the greatest extent possible whenever ground disturbing activities such as road and trail maintenance or construction of new facilities was needed and archeological surveys and/or monitoring would precede any federal undertaking, consistent with the mitigation measures outlined in this plan. If National Register-eligible or listed archeological resources could not be avoided, impacts on such resources could be minor to major and adverse, and an appropriate mitigation strategy would be developed in consultation with affiliated tribes and the Washington State Historic Preservation Officer.

### *Cumulative Impacts*

Cumulative impacts would be the same as Alternative A and implementation of Alternative D would have a negligible contribution to the overall adverse cumulative effects on archeological resources.

### *Conclusion*

Implementing Alternative D would result in moderate long-term benefits from enhanced preservation activities and increased understanding and awareness of resources. For the purposes of the National Historic Preservation Act section 106, the determination would be no adverse effect on archeological resources. Implementation of Alternative D would have a negligible contribution to overall adverse cumulative effects on archeological resources. There would be no impairment to this resource or value as a result of implementing this alternative.

### **Historic Structures and Cultural Landscapes**

Actions under Alternative D would be the same as under Alternative B.

Under Alternative D, impacts associated with the NPS acquiring Hollywood ~~through purchase or exchange~~ would have similar benefits as well as potential adverse impacts as Alternative B.

All National Register listed resources and properties would be preserved and adaptively used and/or interpreted for the public, providing long-term benefits to those historic properties. All other properties not listed on the National Register would be removed and new facilities could be constructed to provide for a range of public camping and overnight opportunities. Depending on the types of new recreation facilities that could be constructed, introducing a mix of new recreation facilities around the historic properties could alter the context surrounding the National Register listed properties. Impacts would vary depending on the setting; however it is likely that new construction would not be permitted without appropriate mitigation if it had an adverse impact on National Register properties. Removing elements including buildings in Hollywood that were not eligible for the National Register could be considered a long-term benefit by enhancing better planning and preservation to Register-eligible properties through improved site design.

Providing public overnight access and increased recreational opportunities under Alternative D could result in long-term benefits similar to Alternative B by increasing support for historic preservation.

### *Cumulative Impacts*

Cumulative impacts would be the same as Alternative A. Alternative D would not contribute to the overall adverse cumulative effects.

### *Conclusion*

The implementation of Alternative D would result in long-term moderate benefits to historic buildings and cultural landscapes. Alternative D would have no adverse effects and would not contribute to the adverse cumulative effects. There would be no impairment to this resource or value as a result of implementing this alternative.

## **Tribal Issues and Ethnohistory**

Actions under Alternative D would be the same as under Alternative A and B and would result in moderate long-term benefits from ongoing consultation with Skagit Tribes and any adverse effects to ethnographic resources would be mitigated to negligible through a cooperative agreement.

### *Cumulative Impacts*

Cumulative impacts would be the same as Alternative A. Implementation of Alternative D would have a negligible contribution to cumulative adverse impacts.

### *Conclusion*

Implementing Alternative D would have moderate long-term benefits from ongoing consultation with Skagit Tribes and mitigation of any adverse effects to ethnographic resources. Cumulative impacts would be the same as Alternative A and implementation of Alternative D would have a negligible contribution to cumulative adverse impacts. There would be no impairment to this resource or value as a result of implementing this alternative.

## **Museum Collections**

Actions under Alternative D would be the same as under Alternative A plus provide additional public access to collections items both online and on-site and increase the number and scope of exhibits, exhibit areas, and travelling exhibits to provide open display of collection objects and archives.

Impacts would be similar to Alternative A with long-term benefits to museum collections from ongoing preservation. Additional moderate long-term benefits would be similar to Alternative B from greater awareness, access to and public understanding of museum collections through new exhibits and displays

### *Cumulative Impacts*

Cumulative impacts are the same as Alternative A and would result in major beneficial long-term impacts on the museum collections. Alternative D would contribute additional minor long-term benefits.

### *Conclusion*

Impacts would be similar to Alternative A, with major beneficial impacts to the museum collections from ongoing management programs, facilities, and increased public appreciation from better access to museum collections in visitor center displays. Cumulative impacts are the same as Alternative A and would result in major beneficial long-term impacts on the museum collections. Alternative D would contribute additional minor long-term benefits. There would be no impairment to this resource or value as a result of implementing this alternative.

## **Wilderness Character**

Under Alternative D, a Minimum Requirement Analysis would still be used to determine if, when, and how actions would be implemented. The backcountry permit system would continue to be used to manage overnight use. Opportunities for visitors to experience wilderness character would still be abundant, and in some cases improved.

Most actions under Alternative D are identical to those under the Preferred Alternative. Impacts to wilderness character under Alternative D differ from the Preferred Alternative in the following cases: existing invasive non-native species would be contained and eradication efforts would focus on new populations, and habitat fragmentation would only be considered when planning for new developments. Both of these actions provide weaker protection for wilderness character than the Preferred Alternative, and could result in minor adverse impacts.

### *Cumulative Impacts*

Cumulative impacts on natural qualities would range from minor to moderate and include fire suppression (under more limited instances under Alternative D), invasive non-native plant infestations that cannot be eradicated, fish stocking or removal, and climate change. Other impacts range from minor to moderate and are largely related to ongoing activities such as the existence and maintenance of infrastructure and facilities, installation of the Desolation Peak radio repeater, and other park administrative uses that might require helicopter use. In combination with Alternative D, these cumulative impacts would result in minor to moderate impacts.

### *Conclusion*

Under Alternative D, very few actions that would impact wilderness character differ from those under the Preferred Alternative. Those few actions, identified above, would have minor adverse impacts. As in the Preferred Alternative, a number of actions would be taken that would benefit wilderness character, but several past, present, or future activities will have cumulative impacts ranging from minor to moderate. Impacts would result from manipulation of wilderness by fish stocking or removal, fire suppression, other natural resource issues, development, motorized vehicle and equipment use, and management restrictions on unconfined recreation. Implementation of this alternative would not result in impairment.

## **Wild and Scenic River**

This alternative focuses on expanding visitor recreation opportunities and experiences while also protecting natural and cultural resources. In terms of actions that would impact WSR values, this alternative is very similar to the Preferred Alternative. The three main different actions in terms of effects to eligible WSRs are (1) motorized boating would be allowed on the Skagit River (2) bank hardening and channelization would also be allowed to protect key facilities in response to flood events, and (3) wildlife habitat fragmentation would be allowed in certain situations to optimize recreation facility development. All of these measures would provide minor to moderate adverse impacts on WSR values and free-flowing characteristics. However, other measures as described in the Preferred Alternative analysis would provide minor to moderate beneficial impacts on WSR values. Overall, this alternative would provide minor beneficial impacts to eligible WSR segments.

### *Cumulative Impacts*

Similar to the other alternatives, some adverse impacts would continue from the hydroelectric projects, roads, facilities, visitor use, and air-borne pollutants. Actions related to increase in coordination and management efforts with Seattle City Light and the Washington State Department of Transportation and designation of the Skagit River, Newhalem Creek, and Goodell Creek will provide moderate beneficial long-term impacts and improvements to river values.

### *Conclusion*

With more regulated river access, improved facilities, and water resource protections; eligible WSR segments would be more protected, ensuring the preservation of Outstandingly Remarkable Values

(ORVs). This would result in minor beneficial impacts over the long-term.

In conjunction with past, present, and reasonably foreseeable actions, cumulative impacts to eligible WSR segments would generally be minor and beneficial over the long-term.

There would be no impairment of WSR resources and values.

## **Visitation**

As described in the other alternatives, visitation would be expected to increase proportionate to regional population growth. The capacity of front country facilities would either be maintained or expanded. In addition to those actions identified in the Preferred Alternative, there could be additional trails designated for stock use, and the Ross Dam Trailhead parking lot would be expanded to accommodate more vehicles. These additional actions would result in a negligible change in visitation. Thus, the impacts of Alternative D would be similar to those identified under the Preferred Alternative, ranging from negligible to minor during the peak summer season and negligible during the winter and shoulder seasons.

### *Cumulative Impacts*

Cumulative impacts would be the same as those identified under Alternative A. Overall impacts to visitation due to these cumulative impacts would be negligible.

### *Conclusion*

The impacts of Alternative D on visitation would range from negligible to minor during the peak summer season, and negligible during the rest of the year. Maintenance or expansion of facilities would help to mitigate the impacts of growing visitation.

## **Visitor Opportunities**

### *General Recreational Opportunities*

Recreational activities would continue to be characterized similar to Alternatives A. It would be a high priority for the NPS to develop or improve a variety of recreational activities for a wide range of abilities and interests, including guided or group activities, increased day and overnight opportunities, and the chance to become hands-on stewards of the park. A remote wilderness experience would still be available.

### *North Cascades Highway based opportunities*

Along the North Cascades Highway, a wide variety of recreational activities would continue to be available and some opportunities would be expanded, including the potential for new overlooks or waysides, new and group picnic sites, and improved opportunities for winter activities via improved snowplowing and access providing a moderate long-term benefit. There would still be a variety of opportunities to view the wilderness and experience a natural setting while accessing numerous amenities and services.

Car camping opportunities with a range of potentially expanded amenities would be available resulting in a moderate beneficial impact. The NPS would strive to preserve camping opportunities in popular areas such as Colonial Creek, but if this were not possible due to flood events, sites would be rebuilt or other campgrounds expanded to limit net loss of camping, a moderate long-term beneficial impact. Camping opportunities could be expanded, and new opportunities such tent cabins or yurts, additional RV camping sites, and car camping for stock parties could be provided. These actions could result in a moderate to major beneficial impact by limiting net loss of opportunity as well as creating new opportunities that could attract visitors of new or changing demographics.

Hozomeen would be reorganized with impacts similar to Alternative B.

The Hollywood District, once acquired, would be redesigned and geared towards providing new camping and a range of overnight options for the public resulting in moderate to major long-term benefits by creating new overnight opportunities within Ross Lake NRA at a desirable location along the river.

Efforts would be made to improve the quality of corridor recreation through education or enforcing noise ordinances.

### *Land/trail-based opportunities*

Opportunities would continue to allow visitors to move beyond the road corridor for short or long distances and times for a variety of activities, and to launch deeper wilderness explorations via existing short walks and access to longer day hikes, backpacks, stock trails, and mountaineering routes. Additional day hiking opportunities within Ross Lake NRA would be provided, including new short or loop hikes, a new

portage trail for boaters along the Skagit, or new links with trails in Canada in the Hozomeen area resulting in a moderate long-term benefit. Some sections of trails in Ross Lake NRA could be lost if their adjoining trail segment in the national park were closed or abandoned, slightly reducing hiking opportunities and creating a minor adverse impact.

Hunting would be allowed within most existing permitted areas, but under Alternative D the NPS would seek to work with WDFW to expand safety zones for hunting, and reduce potential conflicts during peak visitation months between hunters and other recreationists, as well as expanding educational efforts to make non-hunters more aware of hunting activities. Sport climbing in the Newhalem Gorge would continue, but would be formalized under “Climbing Management Areas” with a resource plan and defined boundaries.

Similar to Alternative B and C, additional hiking opportunities and providing new trails in the future could be constrained by formal policies for maintaining core habitat for special status species such as grizzly bear, resulting in a negligible to minor long-term impact given the extent of the land base and likelihood of expanding trails beyond the highway corridor and into core area habitat.

Overall, impacts under Alternative D would be negligible to moderate, beneficial and adverse, and largely long-term. There would be a moderate benefit for some from increased day hiking opportunities, and spreading the use to more trails could reduce crowding, but there would be a negligible to minor negative impact on those who feel the intrusion of more trails in Ross Lake NRA, with fewer opportunities for solitude. There would be a negligible adverse impact from closing a small number of lesser used trails or segments, but this effect would be outweighed by the benefits of new trails in more attractive locations. Climbing use continues and the quality of experience is protected. There would be a negligible loss of hunting opportunities but most would be maintained and the majority of non-hunters would benefit.

### *Water-based opportunities*

Overnight boat-in camping on Ross and Diablo lakes would remain accessible by all watercraft (motorboat, seaplane, non-motorized craft), with use limits set by the capacity of the current docks and campsites, as administered by the backcountry permit system. Day use opportunities would also be available on all

three reservoirs for all boat types, and on Ross and Diablo lakes for seaplanes. Motor boat use would be managed to protect water quality, soundscape, and visitor experience by establishing a no-wake zone near other boaters or sensitive shorelines on all lakes, and applying limits to size, horsepower, or speed limits on Ross Lake and in Diablo Canyon. Four-stroke or direct injection 2-stroke would be required for all motor boats on Ross Lake, by 2015.

Recreational towing would be allowed on Diablo and Gorge lakes, and on the northern and southern ends of Ross Lake. Paddle craft would be encouraged, possibly via a boat rental option on Diablo Lake. Personal watercraft would remain prohibited. Seaplane use would be regulated under a permit system to protect the soundscape and other visitors' experiences. Seaplane use would also be restricted to designated frontcountry zones. In addition the NPS would work with the FAA to establish use levels and patterns for scenic overflights.

On the Skagit River, regulations to limit party size or number of boats would be considered. Self-powered watercraft (and motor boats, where feasible) would continue to have day use opportunities on the Skagit River, with the potential for occasional conflict between user groups. Fishing opportunities would remain unchanged, with the exception of prohibiting lead tackle.

Most impacts would be minor to moderate and beneficial as most uses continue, there would be better quality of boating experience for most boaters due to limits on seaplanes and motorboats, and increased opportunities for boating via rentals. Adverse impacts would be negligible to minor, and short term to motor boaters to upgrade gear and change use patterns at times, negligible long-term adverse impact on seaplanes as use is limited and would stay low but would still be allowed, and some adverse impact if boat rentals increase demand and crowding at backcountry sites. Management of seaplane use would have an overall minor adverse impact because of the relatively small numbers of seaplanes that would be affected and other seaplane opportunities exist within the region; however, impacts to individual users would be moderate and may be major.

Impacts on Skagit River users would be negligible to minor, and mostly beneficial due to maintaining opportunities, and setting use limits to maintain a quality experience, but some negligible adverse impacts due to potential user conflicts and some reduced quality.

### *Visitor and Information Centers*

A range of facilities and services would continue to meet a variety of visitor needs similar to Alternative B. The park would also seek to increase partnerships with the USFS to provide NPS staffing at east side locations to provide basic services throughout the visitor season for visitors entering Ross Lake NRA from the east. Adding information capacity on the east side could result in moderate long-term benefits to visitors seeking information.

The Wilderness Information Center in Marblemount was recently upgraded to include expanded staff work areas, including wilderness equipment and search and rescue storage and a staging area. Under Alternative D, the public contact station would be moved to a location in Marblemount along the North Cascades Highway, to provide easier public access or a moderate-long-term benefit by locating information along the highway. The NPS would also seek to partner with BC Parks to build a new joint visitor contact and ranger station and information center at Hozomeen in order to expand basic visitor services and provide interpretative programs similar to Alternative B.

Maintaining or increasing staffing levels and adding staff locations would provide a long-term moderate to major beneficial impact because most visitors would benefit. During certain seasons or at certain stations, where staffing or services are limited, there would be a moderate long-term adverse impact to visitors seeking orientation and information to Ross Lake NRA. Moving the Wilderness Information Center would have a negligible, beneficial and adverse, long-term impact as access would slightly improve but there would be fewer available resources at an isolated station and thus a reduction in quality of service.

### *Permits, Reservations, and Fees*

Management of permits, reservations and fees and associated benefits and adverse impacts would be the same as Alternative B.

### *Campground facilities*

Under Alternative D, maintenance would continue on the five campground facilities and three group camps, some of which are very susceptible to damage from storm events—particularly Colonial Creek and parts of Goodell group and main sites. The NPS would strive to preserve camping facilities in popular areas such as Colonial Creek, but if this is not possible due to flood events, sites would be rebuilt or other

campgrounds expanded to ensure no net loss of campground capacity, a long-term moderate benefit. Some new lodging types could be developed within some campgrounds, such as tent cabins or yurts. These additions could attract a wider range of visitors and provide additional overnight options for those visitors who want to stay within Ross Lake NRA, but who have neither the desire nor the equipment for overnight tent or car camping.

The NPS would also consider providing additional services such as showers and electrical hookups at some or portions of campgrounds, as well as developing new group camps or new Diablo Lake camps. Overnight stock camping and other facilities would be considered for some areas with trail riding opportunities nearby. These actions could contribute long-term moderate benefits to visitor opportunities related to campground facilities.

The NPS would also reconfigure the campground at Hozomeen similar to Alternative B with similar impacts. Under Alternative D, the NPS would also partner with BC Parks to provide a joint campground host to provide additional visitor services, a moderate benefit.

### *Trails, Boat Launches, Picnic Facilities, etc.*

Under Alternative D, the NPS would maintain the majority of the current trail system at current levels similar to Alternative A. New trails could be developed throughout Ross Lake NRA under Alternative D, including short or loop trails, a portage trail along the Skagit S curves, interpretative and historical trails, or links to trails in Canada. Some sections of trails could be lost if their adjoining trail segment in the national park is closed or abandoned. A variety of recreation facilities could be developed under Alternative D: improved or new boat launches on Diablo Lake or river access points, facilities for bicyclists, group or new picnic areas, improved signage and interpretative opportunities at the North Cascades Highway entrance points as well as at overlooks or waysides, and improved snow plowing to allow better access in wintertime.

Impacts from this alternative would be minor to moderate, beneficial and adverse, and long-term. Benefits would come from increased and improved facilities for popular activities for a majority of visitors. There would be a negligible adverse impact on some of visitors who highly value solitude due to the impact of new trails and other new facilities, or from increases in users drawn in by new facilities.

Parking for climbers in the Newhalem Gorge would be evaluated and could be formalized to provide safe access to climbing routes.

### *Commercial Services And Facilities*

Commercial services and facilities would be managed similar to Alternative B and would have similar associated impacts. The NPS would develop a commercial services plan to determine the optimal level of commercial services and facilities, and could consider establishing a user capacity or use limits. Commercial use guiding services would continue, but could be limited under a commercial services plan. Some concessions services could be expanded, such as boat rentals, a second water taxi or boat ferry on Ross Lake, or a concession-operated store in Newhalem (if SCL ceased store operations).

Ross Lake Resort could be expanded up to 10 percent, guided by NPS design standards, with impacts similar to Alternative B.

~~The NPS would seek a land exchange for the Hollywood District of Diablo Townsite from Seattle City Light, and would re-develop this area for new camping and overnight lodging facilities, potentially concession-run. Providing public overnight lodging facilities in Hollywood would have similar long-term benefits as Alternative B.~~

### *Cumulative Impacts*

Cumulative effects would be the same as Alternatives B and C. This alternative would contribute additional long-term benefits to cumulative effects by providing increased opportunities for visitors seeking information with the location of a Wilderness Information Center on the main road in Marblemount as well as partnering with the Forest Service to increase staffing on the east side. ~~New overnight opportunities in both existing campgrounds and in the Hollywood District would also contribute to cumulative long-term benefits to the visitor experience.~~

### *Conclusion*

The full spectrum of visitor opportunities would continue to provide for visitor enjoyment and recreation activities. The full array of recreational opportunities would continue to be available under Alternative D. Impacts would be negligible to moderate, long-term, and both beneficial and adverse. Beneficial impacts would be moderate to major from the contributions related to sustaining the full range of recreation opportunities, assuring no net



loss in camping opportunities, increasing access to information through both staff and permitting systems; ~~and providing new overnight camping and lodging opportunities in both in existing campgrounds and in Hollywood.~~ Adverse impacts could occur from those associated with reservations and fees, some conflicting uses.

There would be moderate long-term beneficial cumulative impacts on visitors in the broader North Cascades. Implementation of this alternative would have a modest contribution to these cumulative impacts

## Information, Interpretation and Education Opportunities

Under Alternative D, Ross Lake NRA is used as a platform and classroom for education about the North Cascades, its history and resources, as well as civic engagement, stewardship, and public leadership. There would be opportunities for both structured and unstructured activities, including self-exploration and discovery. Activities would focus in the frontcountry zone and some would expand into the parts of the backcountry zone. Some activities could also be appropriate in limited areas of the wilderness zone. The NPS would lead efforts to develop, conduct and evaluate interpretive and educational programs. The NPS would consult and collaborate with partners when appropriate, and partners would assist the NPS in delivering educational messages and programs.

Interpretive programs and materials that use the most current and dynamic methods to generate curiosity, passion, enthusiasm and respect for park resources to build a sense of stewardship, and provide extensive opportunities for immersion and contact with park staff and resources would have a major beneficial impact to visitor experience. The improvement of traditional interpretive programming within existing facilities, possible new facilities, and throughout Ross Lake NRA and the development, delivery, and evaluation of programs so that they convey the full spectrum of interpretive themes would have a major beneficial impact to visitor experience.

Curriculum-based programs that focus on the full spectrum of interpretive and educational themes and objectives, and which emphasize low impact practices for hands-on activities that make learning relevant to students' lives will have a major benefit to visitor experience by engaging learners directly with the resource.

Expanded participation in outreach programs as one of many mechanisms to deliver Ross Lake NRA's full spectrum of interpretive themes and build local and regional stewardship of the North Cascades ecosystem will have a moderate beneficial impact to visitor experience.

The enhancement of visitor orientation and informal education through improved signage, multi-media, and exhibits at existing waysides, contact stations, and along interpretive trails would provide major beneficial impacts to visitor experience. Improved signage would provide visitors a sense of approach and arrival as well as better orientation to the services and resources within Ross Lake NRA.

The expansion of partnerships to attract a broader audience of visitors would have a major beneficial impact on visitor experience by connecting an increased number of people to the outdoors and the North Cascades in meaningful ways. Interpretive rangers co-located at other visitor contact stations, such as the Skagit Tours Information Center, the Environmental Learning Center, and at eastside entry points will have a major beneficial impact to visitor experience by making park staff more available to foster such connections.

Working with Seattle City Light to develop a more collaborative relationship that could involve additional programming and exhibits that tell the history and operations of the Skagit Hydroelectric Project and enhanced collaboration with concessionaires and the U.S. Forest Service in order to share best practices and standards in order to disseminate information have a major beneficial impact on visitor experience by reaching a broader audience.

### *Newhalem*

Updated exhibits, multi-media programs, and activities at the North Cascades Visitor Center would have a major beneficial impact on visitor experience as visitors would be provided with more active and interactive opportunities for fun and engaging educational activities that communicate the full spectrum of interpretive and educational messages and cultivate stewards of the North Cascades ecosystem. The North Cascades Visitor Center would serve as a hub of activity and provide the starting point to a network of ranger-led and self-directed resource immersion activities. Partners would also be encouraged to use the North Cascades Visitor Center as a point of origin for their programs and activities.

## *Environmental Learning Center*

The devotion of additional interpretive staffing to Environmental Learning Center programs and operations with the NPS developing and evaluating the interpretive and educational messages with NCI, setting a standard of excellence, and increasingly collaborating with NCI at the ELC to distribute and deliver relevant interpretive and educational messages would have a major beneficial impact to visitor experience.

### *Hozomeen*

An increased partnership with British Columbia Parks to provide joint NPS/Canadian land- and water-based interpretive programs would have a moderate beneficial impact to visitor experience by enhancing learning opportunities related to preservation of the greater North Cascades ecosystem.

### *Cumulative Impacts*

Cumulative impacts are the same as Alternatives A, B, and C. Actions proposed in Alternative D would have a modest contribution to long-term benefits.

### *Conclusion*

Overall, implementation of Alternative D would result in moderate to major long-term beneficial impacts to visitor experiences in the area of information, interpretation, and education. Using Ross Lake NRA as a platform and classroom for education about the North Cascades, its history and resources, as well as civic engagement, stewardship, and public leadership providing additional opportunities for both structured and unstructured activities that focus in the frontcountry zone but extend into the parts of the backcountry zone would have major long-term benefits.

Interpretive programs and materials that use the most current and dynamic methods to generate curiosity, passion, enthusiasm and respect for park resources to build a sense of stewardship, and provide extensive opportunities for immersion and contact with park staff and resources would have a major beneficial impact to visitor experience. New facilities, increased staff at existing facilities and expanded partnerships would all contribute moderate to major long-term benefits. Cumulative impacts would be the same as Alternatives A, B and C and Alternative D would have a modest contribution to long-term cumulative benefits.

## **Access and Transportation**

Under Alternative D, several small changes similar to those found under the Preferred Alternative would occur that would impact access. Improvements to waysides, pull-outs and several parking areas will have a beneficial impact on access. However, as in the other alternatives, visitation would be expected to increase proportionate to regional population growth. Heaviest use would still occur along the North Cascades Highway, and since there are no proposed changes to roadway capacity, traffic congestion during peak summer weekends would continue, resulting in minor to moderate adverse impacts. If implemented, however, a shuttle system could potentially help to alleviate some of the congestion.

Access will be improved at the Ross Dam Trailhead parking lot by constructing a turn lane at the entrance and redesigning the parking lot. Parking lot capacity will increase under Alternative D to accommodate more passenger and oversized vehicles. Clearly defined parking spaces will reduce confusion and some of the congestion related to drivers trying to find an adequate parking space. Other parking areas, such as Diablo Ferry dock, Upper Goodell group campsite, Goodell Creek raft area, and the Sourdough, Stetattle Creek, and Thunder Knob trailhead parking areas will be reconfigured, formalized, or developed. Parking and access to climbing routes in the Gorge could be formalized. Some overlooks and trailheads could be plowed to provide wintertime access. The existing one-way bridge that provides access to the North Cascades Visitor Center, Newhalem Creek Campground, and several trails, would be replaced with a two-lane bridge that accommodates two-way traffic, pedestrian access, and interpretive platforms. Impacts to access would be beneficial and minor to moderate.

Removal of the portion of Thornton Lakes Road in wilderness would still allow access to the trailhead, and depending on the new trail location, the access route to the lakes could either be shortened or lengthened. The new parking area could potentially accommodate a larger number of vehicles than the current parking lot, thus improving access.

Other changes in access include the potential expanded overnight opportunities near the Environmental Learning Center (additional camping), at Hollywood, and at Ross Lake Resort, which would increase access to more people in these areas; the addition of stock-accessible front country camps,

which could bring more stock users to Ross Lake NRA; the addition of day use trails; and improvements to river access and take-out at the Portage. These slight increases in access would result in beneficial impacts.

The relocation of the Colonial Creek Campground boat launch to the north side of the North Cascades Highway could decrease access by creating more congestion at the Thunder Knob Trailhead parking lot, resulting in minor adverse impacts.

#### *Cumulative Impacts*

Cumulative impacts would be the same as those identified under the other alternatives. Potential future actions, including general road, trail, or parking lot maintenance, and various types of work on the North Cascades Highway by WSDOT, could impact access; although delays may occur, visitors would not likely alter their travel destinations. Occasional road or trail closures also occur due to fire, avalanches, rockfalls, etc. Overall impacts to access due to these cumulative impacts would be negligible.

#### *Conclusion*

The impacts of the Alternative D on access and transportation would result in adverse, minor to moderate impacts during the peak season as well as minor to moderate beneficial impacts due to improvements in access and during non-peak times.

## **Socioeconomic Environment**

Impacts to the socioeconomic environment due to implementing the actions in Alternative D would be caused by changes in operational spending, changes in visitor spending, and changes in visitor patterns. The impact of Alternative D is evaluated in comparison with the No Action Alternative.

Implementation of Alternative D would occur against the same backdrop of economic, demographic, and social changes across the influence area described under the No Action Alternative. The economic and social effects of Alternative D would add to those changes, but not fundamentally change the area's economic and demographic outlook.

#### *Impacts to Demographics*

Alternative D would have little direct impact on the influence area's population growth. It is likely that many of the construction and related jobs would be filled by individuals already residing in the area. However, new staff proposed in Alternative D would

likely come from outside as well as from within the influence area. Total staff increases are expected to be 22 permanent FTEs. Beneficial impacts of population increases include increased demand for housing, which can cause an increase in home values and rental rates; and increased government tax revenues. Adverse socioeconomic impacts of population increases include potential for more crowding on roads and in public areas and greater demands on government services, including schools, sanitation, and water.

The population increase due to Alternative D would be minute compared with the total influence area population of about a half million people; therefore the impact would be negligible, long-term, and of indeterminate effect since there are both adverse and beneficial impacts to population growth. The local area has a much smaller population. The combined population of Sedro-Woolley, Concrete, Rockport, and Marblemount is approximately 12,000, with the majority of those living in Sedro-Woolley (US Census 2007). Even so, the addition of 22 new employees and their families would represent a small but detectible number. The impact of hiring all proposed new employees would be long-term, minor, and of indeterminate effect.

#### *Economic Impacts to Influence Area*

Increases in the recreation area's spending would have short-term impacts during construction of new facilities, and long-term impacts due to increases in yearly budgets. Proposed construction projects include rebuilding of the Wilderness Information Center in Marblemount and replacement of the bridge to Newhalem.

Companies in the construction industry would see increased business if contracted to provide services. This in turn would strengthen construction employment and incomes. Construction workers frequenting the area would spend income on food and materials, thus increasing service businesses and government tax revenues. While construction spending would strengthen these areas of the economy, it would occur to only a small degree in relation to the influence area's total economy. Short-term construction spending in this alternative is estimated at \$18.3 million (\$18.2 million above that for the No Action Alternative). Construction spending would result in negligible, short-term, beneficial impacts to the influence area economy, since this amount likely would be spread over the 20-year planning timeframe.

Increases in the recreation area's annual spending also would have long-term effects. The addition of new NPS staff would add jobs to the influence area and generate more personal income. New staff would spend a percentage of income on housing, food, entertainment, and other services; this would increase influence area incomes and government tax revenues, and reduce housing vacancy. However, new staff would put additional demand on local government services such as schools. Operations spending by the National Park Service would have long-term, positive impacts on employment and incomes. Annual NPS operations spending in this alternative is estimated at \$8.5 million (\$1.4 million more than the No Action Alternative). Once again, this amount is very small in terms of the total influence area economy. Annual operations spending would result in minor, long-term, beneficial impacts to the influence area economies.

Actions proposed in Alternative D might encourage increased visitation, longer visitor stays, or higher visitor spending. Alternative D proposes to provide a broader range of visitor activities and to expand accessible recreation opportunities, including development of new interpretive programs and establishment of partnerships to attract broader audiences. Opportunities to allow concessioners to expand services would be pursued, including water taxi, ferry, and rental services.

Construction actions that would generate new interest from visitors and allow for greater visitor capacity include establishment of a ranger station and orientation center near Hozomeen, new campgrounds, and additional outdoor learning shelters.

The following actions would possibly reduce visitation and visitor spending: developing a permit system for seaplane use, setting use limits on scenic overflights of the national recreation area, requiring special boat motors, not replacing damaged visitor facilities, and limiting concession authorizations if user capacity is exceeded.

Overall, the actions proposed by Alternative D could result in small increases in the number of visitors, length of visitor stays, and related visitor spending. Increased visitation would increase employment, business sales, and incomes in the tourism industry, as well as government tax revenues. Increased visitation and visitor spending could also reduce unemployment in the tourism industries. Implementation of Alternative D might indirectly enhance the influence

area's attractiveness for economic development because of enhanced recreational opportunities. However, the possible changes would be small; increased visitation would have negligible, long-term, beneficial impacts to the influence area's economy.

Partnering with Seattle City Light to use excess housing at the Hollywood site to house recreation area staff would make more housing available, perhaps resulting in slightly higher vacancy rates and lower rental rates in surrounding communities. Additionally, Alternative D proposes to look for opportunities to develop more employee housing in Newhalem and Marblemount. This would slightly increase housing availability and vacancy, and reduce rents; therefore, impacts would be minor, long-term, and beneficial to renters and employees, but minor, long-term, and adverse to lessors.

### *Economic Impacts to Local Commercial Services and Neighboring Businesses*

NPS spending on new construction would strengthen businesses that provide construction services. In turn, construction worker spending on food and materials would strengthen local services. Government revenues would also see increases due to increased sales and associated taxes. Increases in construction spending would result in minor to moderate, short-term, beneficial impacts to commercial service providers and neighboring businesses.

The impact of wages for new staff and annual operational spending by the recreation area would be greater on the local area than in the entire influence area. Impacts to employment, incomes, and government revenues would be long-term, minor to moderate, and beneficial to the local communities.

With small increases in visitation, visitor spending, and the length of visitor stays, local businesses providing services to tourists would benefit from increased business. More visitors might allow for businesses to provide expanded visitor services. However, the expected increases in visitation would be small, resulting in negligible to minor, long-term, beneficial impacts to commercial service providers and outfitters.

Alternative D calls for a transportation study that would look at the feasibility of a shuttle system providing service to the recreation area. If a shuttle system were implemented, a concessioner would have the opportunity to provide the service. This would increase a concessioner's business or provide a new

business opportunity. A shuttle service would result in a minor to moderate, long-term, beneficial impact to the operator.

The recreation area would establish a permit system to establish use levels for seaplanes, which may limit the frequency of seaplane service to the recreation area, and perhaps reduce business sales, employment, and incomes. This would have an adverse, long-term, negligible to minor impact to seaplane service providers.

The recreation area would request that the FAA set use limits on scenic overflights of Ross Lake. This would limit the number of customers that flight tour operators could take to Ross Lake, and could perhaps diminish business sales, employment, and incomes. This would result in a negligible to minor, long-term, adverse impact.

Alternative D proposes that limits on commercial use authorizations (CUAs) may be enacted if user capacity limits are exceeded. CUAs are used by the National Park Service to authorize individuals or businesses to provide commercial services to recreation area visitors in limited circumstances. This would limit visitors and therefore limit sales, incomes, and employment, resulting in a long-term, negligible to minor adverse impact to concessioners.

Alternative D also proposes exploring expanding concessioner opportunities, such as water taxi, ferry, lodging, and rentals. If found feasible, additional services would expand concessioner business and result in a minor, long-term, beneficial impact, if not, no impact would occur.

### *Impacts to Social Characteristics*

This alternative also proposes to acquire the Hollywood district from Seattle City Light through exchange or purchase, demolish existing vacant buildings, rehabilitate some buildings, and build new camping and overnight facilities. This land is within the recreation area boundaries, and the dam facilities would remain in operation by Seattle City Light. The result of this proposal would have beneficial impact to the social character of the influence area because buildings in poor condition would be demolished or rehabilitated and new visitor camping facilities would be constructed. The impact to land use would be minor, long-term, and beneficial to the social character of the influence area.

Increases in number of visitors and length of visitor stays would affect traffic in the local area. The placement of the Marblemount Wilderness Information Center near the North Cascades Highway State Route 20 would also change traffic patterns; these changes would result in a negligible, long-term, adverse impact.

Potential shuttle service in and around the recreation area would relieve some traffic in the service area. Local residents would have the opportunity to use this service, and therefore, it would provide a negligible, long-term, beneficial impact to the social character of the local area.

Construction activities would affect traffic, as construction vehicles may be moving slowly and turning in and out of construction areas. There also would be an increase in the level of traffic due to workers coming to the area. Construction of the Wilderness Information Center in Marblemount near the highway would disrupt the flow of traffic temporarily, as would construction of a turn lane on the North Cascades Highway at the Ross Dam Trailhead parking lot. However the turn lane would relieve some congestion once built. Construction activities would result in a minor, short-term, adverse impact to traffic and long-term, minor beneficial impacts to traffic.

While there is a mix of beneficial and adverse impacts, the overall impact of Alternative D to the influence area socioeconomics would be both short- and long-term, negligible to minor, and beneficial.

### *Cumulative Impacts*

Projects that are not associated with this general management plan can interact with projects proposed in the GMP alternatives, resulting in a cumulative impact on the influence area's social and economic environment. Cumulative impacts would be the same as Alternative A.

Impacts of Alternative D, in combination with short- and long-term minor beneficial effects on the influence area's economy described above would result in both short- and long-term, minor, beneficial cumulative impacts to the influence area's socioeconomic environment. Alternative D would have a modest contribution to the overall cumulative impact.

### *Conclusion*

Alternative D would result in a negligible to minor, beneficial impact to the influence area

socioeconomics. The impact would be greater in the immediate areas surrounding the recreation area. The impacts of the actions proposed in Alternative D and impacts of other projects combine to have short- and long-term, minor, beneficial cumulative impacts to the influence area's social and economic environment.

## Park Operations

### *Facilities and Sustainability*

Under Alternative D, major visitor and operational buildings and infrastructure, including headquarters, staff offices, and visitor centers, would continue to be concentrated in the same general areas of Ross Lake NRA as Alternative A. Similar to Alternative B, some facilities would be replaced, others would be expanded in size or services and utilities offered, and new facilities could be added. Alternative D proposes to relocate the public function of the Wilderness Information Center to a location in the town of Marblemount along the North Cascades Highway. Alternative D also proposes constructing housing for approximately 20-30 additional bed spaces on the Marblemount Ranger Station. ~~Alternative D also proposes a land exchange with Seattle City Light at Diablo Townsite similar to Alternative B. The Hollywood District would be geared to overnight opportunities for the public and some buildings and structures could be demolished and replaced with alternative overnight facilities. Activities associated with the construction and maintenance of these new facilities could result in short-term minor impacts by focusing staff efforts on these projects and potentially long-term minor to moderate adverse impacts by increasing the facilities that need to be maintained.~~

Facilities that were not deemed to be sustainable could be closed, abandoned, and sites rehabilitated under Alternative D. Closing facilities or portions of facilities that require substantial efforts to retain them in the event of severe weather such as flooding would have a moderate to major long-term benefits by locating facilities in areas that require less intensive effort to sustain them. While new trails could also be constructed under Alternative D, trails that are not used could also be decommissioned, resulting in minor long-term benefits by reducing the needs for trail maintenance in seldom used areas of Ross Lake NRA, similar to Alternative B.

Incremental changes in green facility design would be similar to Alternative A and additional changes to reduce carbon emissions and increase energy and fuel

efficiency whenever and wherever possible would be the same as Alternative B and also result in long-term moderate benefits to park operations by creating a more sustainable infrastructure.

### *Operational Efficiency*

Impacts to operational efficiency are similar to Alternative B. The replacement and reconstruction of facilities that are declining would have long-term minor to moderate benefits on operational efficiency by reducing the needs for maintenance. Creating opportunities for housing in Marblemount would give Ross Lake NRA housing options for seasonal staff. Given the short summer season for temporary employees, which can be as short as three months, locating housing in the surrounding community is frequently infeasible. In addition, many temporary hires do not have personal transportation to get to and from their duty locations. Providing housing in Marblemount could result in moderate to major long-term benefits to operations by locating staff closer to their work locations and having the flexibility to house seasonal staff for the length of season actually needed, benefitting the overall efficiency of park operations.

Relocating the public function of the Wilderness Information Center off the Marblemount Ranger Station area to Marblemount along the highway could result in some loss of operational efficiency. Separating the public function from the remainder of the operation could have a minor to moderate adverse effect to operational efficiency.

Making better use of the existing facilities along the North Cascades Highway, and increasing collaboration with partners in utilizing these facilities, would have moderate long-term benefits to operational efficiency.

### *Staffing*

Impacts to staffing are similar to Alternative B, although the distribution of future staffing increases varies. In the short term, impacts from staffing are the same as Alternative A with funding for staffing levels continuing to be inadequate to meet the increased needs of Ross Lake NRA, resulting in long-term minor adverse impacts to NRA operations. In the long-term, staffing increases in resource management, interpretation, visitor protection, facilities and maintenance, and administration coupled with expanded emphasis on partnerships could have long-term moderate benefits to operations by increasing the capacity of Ross Lake NRA to meet the needs of the operation and visitors.

### *Cumulative Impacts*

Cumulative impacts are similar to Alternative A. Past and ongoing projects, including road, trail, and facility maintenance and repairs have had long-term moderate beneficial impacts on park operations. Aging facilities and infrastructure, including utilities and systems, would continue to be repaired, upgraded or replaced as needed on a case-by-case basis, subject to available funding. Over time, more sustainable and efficient facilities and infrastructure would replace those that are aging or no longer meet the needs of Ross Lake NRA, resulting in moderate, long-term benefits to the recreation area by reducing maintenance needs.

### *Conclusion*

Under Alternative D, there would be noticeable changes to facilities as some facilities would be closed while others could be expanded in size or reconfigured for new uses such as the Hollywood District. New facilities could also be added, resulting in both moderate benefits and adverse effects to park operations.

Additional changes to improve the environmental sustainability in all aspects of facility and infrastructure management could have long-term moderate benefits to park operations. Changes in staffing and operational efficiency would have long-term moderate benefits to park operations. As more projects are completed that repair, upgrade, and replace aging facilities and infrastructure, and more sustainable systems are installed, maintenance needs would be reduced, resulting in moderate, long-term benefits. However, until those facilities are replaced, periodic and extensive maintenance would be required. The overall effects of implementing Alternative D on park operations would be long-term, moderate and beneficial.

## **Unavoidable Adverse Impacts**

Unavoidable adverse impacts are defined as moderate to major impacts that cannot be fully mitigated or avoided.

Under Alternative D, there would be a negligible potential for unavoidable adverse impacts on natural resources because there would be little new development, although there could be some new or renovated facilities, such as the Ross Dam Trailhead parking lot, the potential closure of some campsites from Colonial Creek in the event of a catastrophic flood event, and the changes to the Wilderness Information Center.

There would be little to no unavoidable adverse impacts on cultural resources because the NPS would strive to preserve and adaptively use buildings, structures, and landscape features that are eligible for the National Register, notably in the Hollywood District should the land be acquired by the NPS.

Some existing conditions have resulted in unavoidable adverse impacts. The location of park facilities, the Skagit Hydroelectric Project, and roads, including the North Cascades Highway, in floodplains, and the maintenance of this infrastructure has resulted in adverse impacts to floodplains and riparian areas. Most of the infrastructure would remain in these locations. Additional unavoidable impacts would likely occur on vegetation and soils, primarily in the existing developed areas where visitor use is concentrated.

## **Relationship between Local Short-Term Uses and Long-Term Productivity**

Under all of the alternatives, most of Ross Lake NRA would be protected in a natural state and would continue to be used by the public. Under all the alternatives, the National Park Service would continue to manage Ross Lake NRA to maintain ecological processes and native and biological communities, and to provide for appropriate recreational activities consistent with the preservation of natural and cultural resources.

Some previously disturbed areas would be rehabilitated to return these areas to productivity. Any actions the National Park Service takes in Ross Lake NRA would be taken with consideration to ensure that uses do not adversely affect the productivity of biotic communities. Under Alternative D, there would be no appreciable loss of ecological productivity because there would be little new development. Existing developed areas and infrastructure within Ross Lake NRA, including the Skagit Hydroelectric Project and the North Cascades Highway, would remain.

## **Irreversible or Irretrievable Commitments of Resources**

Irreversible commitments of resources are actions that result in the loss of resources that cannot be reversed. Irretrievable commitments are actions that result in the loss of resources, but only for a period of time.

No actions would be taken as a result of the Alternative D that would result in the consumption of nonrenewable resources that would preclude other

uses for a period of time. Thus, there would be no irreversible or irretrievable commitments of resources in Ross Lake NRA by the National Park Service.

No actions would be taken that would result in irreversible or irretrievable effects on historic properties. NPS staff would continue to conduct appropriate cultural resource management in accordance with the *Secretary of the Interior's Standards* and NPS policies.