National Park Service
U.S. Department of the Interior

Mount Rainier National Park
Washington

Nisqually to Paradise Road Rehabilitation Environmental Assessment

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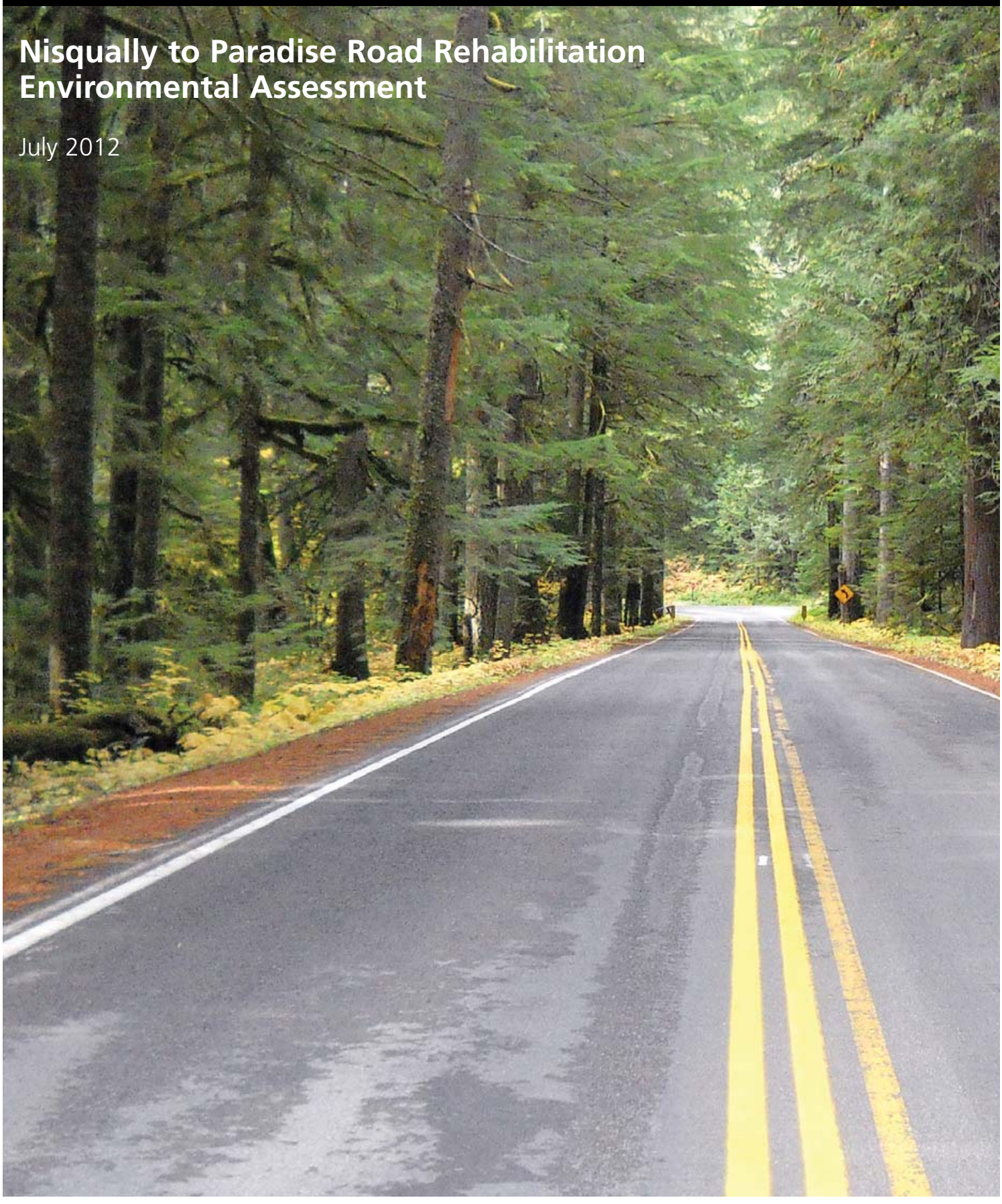

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Nisqually to Paradise Road Repair and Improvements
Environmental Assessment

SUMMARY

The National Park Service, in cooperation with the Federal Highway Administration Western Federal Lands Highway Division, proposes resurfacing, restoration, and repairing 17.6 miles of the road between the Nisqually Entrance and the developed area at Paradise in Mount Rainier National Park. The Nisqually – Paradise Road (road) was originally constructed between 1904 and 1915 and has periodically needed repairs to address deficiencies and normal wear that have led to deterioration of the road. Deficiencies include inadequate drainage, surface slumps, soft spots, pavement warping and cracking, slope instability, and other structural problems that require attention. The proposed project includes paving the 1.0-mile Ricksecker Point spur loop and the 2.2-mile Paradise Valley Road. Also included is the installation of in-road buried conduits and junction vaults for future electrical power and telecommunication upgrades. The proposed repairs would improve the efficiency of park operations by correcting structural deficiencies in the road and reducing maintenance requirements, such as pothole repair and pavement patching, as well as providing for improved visitor enjoyment and safety while protecting park scenic, natural, and cultural resources.

This Environmental Assessment (EA) evaluates two alternatives: a no action alternative and a preferred action alternative. Under the no action alternative, substantial road repairs would not be made. The road pavement and structural integrity would continue to deteriorate and drainage problems would persist. Park staff would continue routine road maintenance and repairs as it has in the past. The preferred alternative includes a number of measures to repair and improve the condition of the road, including correcting structural deficiencies, paving, drainage improvements, bridge maintenance, embankment stabilization, utility upgrades, and other improvements.

This EA has been prepared in compliance with the National Environmental Policy Act to provide the decision-making framework that 1) analyzes a reasonable range of alternatives to meet objectives of the proposal, 2) evaluates potential issues and impacts to the park's resources and values, and 3) identifies mitigation measures to lessen the degree or extent of these impacts. Resource topics evaluated in detail in this document are air quality and greenhouse gases; vegetation and special status plant species; wetlands; water resources; floodplains; fish, wildlife, and special status wildlife species; cultural landscape; archeological resources; visitor use and experience; visual resources; public health and safety; and park operations. All other resource topics were dismissed because the project would result in less than minor effects. No major effects were identified as a result of this project. The proposed project would not adversely affect the road's designation as a contributing structure in the Mount Rainier National Historic Landmark District. Proposed road repairs may affect, but are not likely to adversely affect the federally listed threatened northern spotted owl and may affect, and are likely to adversely affect the federally listed threatened marbled murrelet. The U.S. Fish and Wildlife Service is reviewing the biological assessment for these species and will determine whether additional conservation measures are needed. Public scoping was conducted to assist with the development of this document and comments were received and considered in the evaluation of effects.

Public Comment

If you wish to comment on this EA, you may post comments online using the National Park Service Planning, Environment and Public Comment (PEPC) website at: http://parkplanning.nps.gov/mora or mail comments to: Superintendent; Mount Rainier National Park, 55210 238th Ave. E., Ashford, Washington 98304.

This EA will be on public review for 30 days. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. Although you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

CONTENTS

FIGURES

TABLES

APPENDIXES

Acronyms and Abbreviations

AQRV	air quality related values
APE	area of potential effect
BA	biological assessment
BMP	best management practice
CCC	Civilian Conservation Corps
cfs	cubic feet per second
CLIP	Climate Leadership in Parks
CO	Contracting Officer
Corps	U.S. Army Corps of Engineers
CMP	corrugated metal pipe
DBH	diameter at breast height
DO	Director's Order
DOE	Washington State Department of Ecology
EA	Environmental Assessment/Assessment of Effect
EFH	essential fish habitat
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
GHG	greenhouse gases
GMP	General Management Plan
GWP	global warming potential
MTCO2E	metric tons carbon dioxide equivalent
MSE walls	mechanically stabilized earth
MORA	Mount Rainier National Park
MP	milepost
NEPA	National Environmental Policy Act
NHLD	National Historic Landmark District
NHPA	National Historic Preservation Act
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
PAC	Protected Activity Center (northern spotted owl)
Park	Mount Rainier National Park
PEPC	Planning, Environment and Public Comment
Road	Nisqually – Paradise Road
SHPO	State Historic Preservation Officer
SOC	species of concern
SWPPP	storm water pollution prevention plan
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
WFLHD	Western Federal Lands Highway Division
WSDOT	Washington State Department of Transportation

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ENVIRONMENTAL ASSESSMENT
NISQUALLY TO PARADISE ROAD REPAIR
MOUNT RAINIER NATIONAL PARK

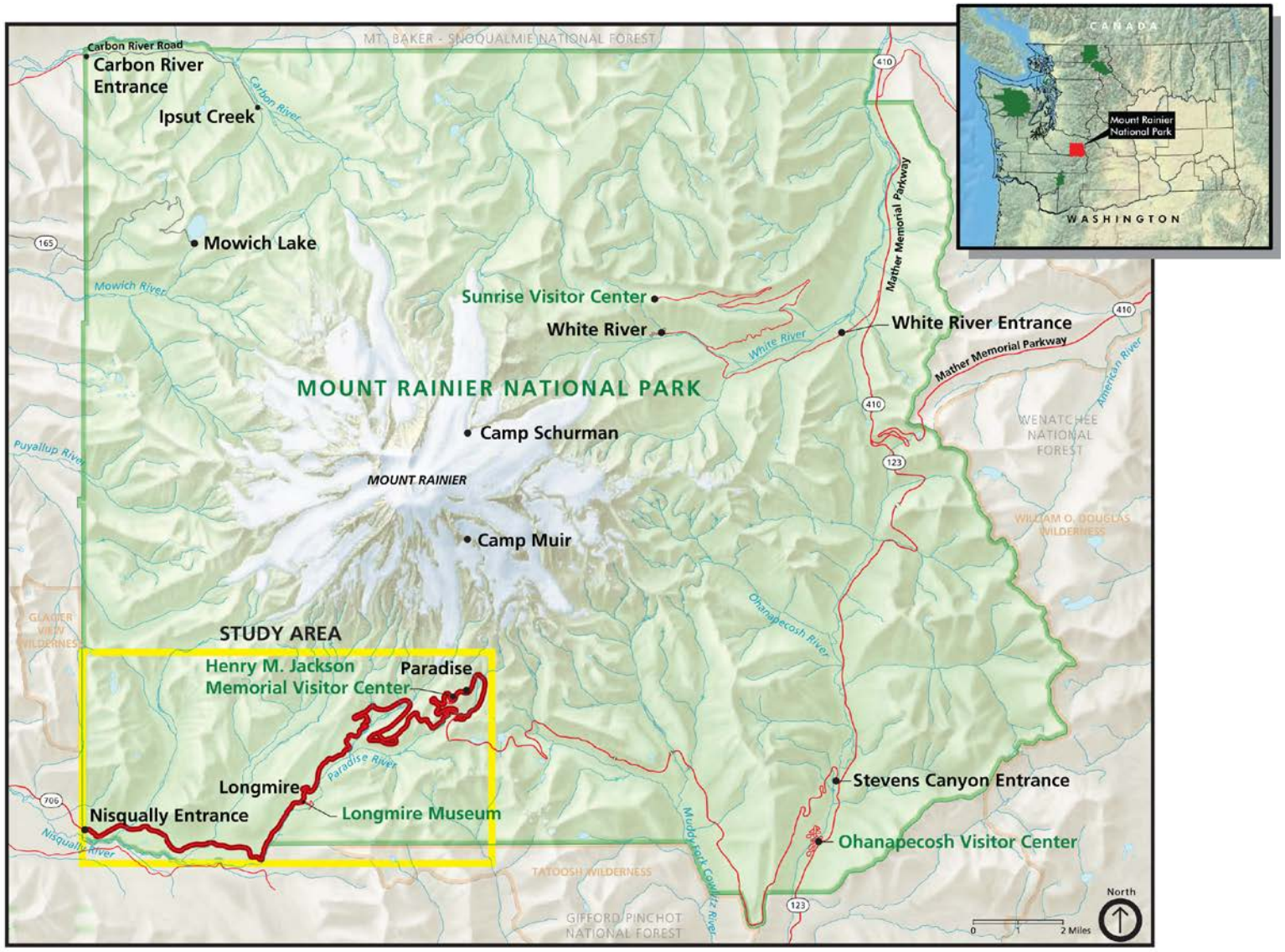
INTRODUCTION

The National Park Service (NPS), in cooperation with Western Federal Lands Highway Division (WFLHD) of the Federal Highway Administration (FHWA), is considering resurfacing, restoration, and repairing of 17.6 miles of the road between the Nisqually Entrance and the developed area at Paradise in Mount Rainier National Park. The Nisqually – Paradise Road (road) was originally constructed between 1904 and 1915 and has periodically needed repairs to address structural deficiencies and normal wear that have led to deterioration of the road. Deficiencies include inadequate drainage, surface slumps, soft spots, pavement warping and cracking, fillslope instability, and other structural problems that require attention. The proposed project also includes paving the 1.0-mile Ricksecker Point spur loop and the 2.2-mile Paradise Valley Road. If approved, the work would be conducted in two phases. The first phase of work is scheduled for 2013-2014 depending on available funding. The second phase of construction is planned for 2015-2016 and also depends on available funding. The Nisqually – Paradise Road project is located in Pierce and Lewis counties, Washington on the southwest side of the park (Figure 1).

The Nisqually – Paradise Road provides the most direct access to the park's most popular features in the Paradise area and is the only park road that remains open year-round. The park hosted over one million visitors in 2011 (NPS 2012a). The road provides access to the main administrative hub at Longmire, main park visitor center, two historic inns, the Cougar Rock campground, the Westside Road, staging for the most popular Muir climbing route, and numerous day-use waysides, as well as various trailheads leading to the historically significant Wonderland Trail around the mountain. The road is vital to park operations and local economies, and contributes greatly to visitor use and enjoyment. In addition, the road is a structure contributing to the significance of the Mount Rainier National Historic Landmark District (NHLD) designated in 1997 as a 1,700-acre area encompassing most of the park's historic developed areas.

This Environmental Assessment (EA) was prepared to evaluate potential environmental, socioeconomic, and cultural resource effects from the preferred alternative to repair the road; and a no action alternative that does not repair or improve the road. The EA was prepared in compliance with the National Environmental Policy Act (NEPA) of 1969 and implementing regulations, 40 CFR Parts 1500-1508, and NPS Director's Order (DO)-12 and Handbook, *Conservation Planning, Environmental Impact Analysis, and Decision-making.* The EA will determine whether significant impacts would occur as a result of the proposed project and if an Environmental Impact Statement (EIS) or Finding of No Significant Impact (FONSI) would be required. The documents related to the National Historic Preservation

FIGURE 1. PROJECT LOCATION



Act (NHPA), in accordance with the Advisory Council on Historic Preservation's regulations implementing Section 106 (36 CFR Part 800) have been completed as a separate submittal to the Washington State Historic Preservation Office (SHPO). The NPS has found that the preferred alternative would have no adverse effect on historic properties and the SHPO has concurred with that determination in a letter dated April 26, 2012 (Appendix B).

PROJECT PURPOSE AND NEED

Project Purpose

The purpose of the proposed project is to restore, resurface, and repair about 17.6 miles of the Nisqually – Paradise Road from the western park entrance to the Paradise developed area (Figure 1). In addition, the project would provide an opportunity to place conduits and utility vaults beneath the road for future primary electrical power cable and fiber optics telecommunication improvements. Proposed repairs and improvements would provide a pleasant driving experience, improve traffic flow and visitor safety, and facilitate maintenance operations. The objectives of the proposed project are to:

Improve the Efficiency of Park Operations

- Repair damaged and deteriorating road pavement, and address drainage, slope instabilities, and other structural features that require rehabilitation and restoration
- Reduce maintenance costs
- Reduce the likelihood of catastrophic failure that could lead to road closure

Provide for Visitor Enjoyment and Safety

- Improve the condition of the road to more safely accommodate traffic
- Reduce the incidence and risk of traffic accidents
- Efficiently implement rehabilitation work while minimizing visitor impacts

Protect Park Resources

- Maintain the scenic quality of the road
- Protect park natural resources and values
- Protect park cultural resources, including the road's contribution to the NHLD

Project Need

The proposed project is being considered because of the need to address deficiencies in the condition of the road and safety concerns. Deteriorating road conditions are due to a number of factors including large volumes of traffic, abundant precipitation, structural, design deficiencies, and normal wear. Road deficiencies include inadequate drainage, surface slumps, soft spots, pavement warping and cracking, and the general deterioration in the condition of the pavement surface. Ongoing maintenance work and pavement repairs are only temporarily effective because of the underlying structural problems. Road failure is a

possibility at some locations if structural issues are not addressed. The condition of the road also may contribute to the elevated incident of accidents along portions of the road. The Ricksecker Point Road, Paradise Valley Road, and Paradise upper and lower parking lots are structurally sound, but need repaving because of general deterioration in the condition of the pavement.

In some locations, road fill slopes are experiencing stabilization problems due to erosion, slumping, and poor drainage. Construction of embankment stabilization mitigation measures may be needed to protect the road, stabilize sideslopes, and prevent resource damage. Reorienting the entrance/exit of the Kautz Creek parking area is needed to improve sight distance for vehicles entering and exiting the road. Additional drainage capacity is needed at New Tahoma Creek and Kautz Creek to convey flood flows. Additional needed repairs and improvements are needed for the guardrails and bridges at the Kautz Creek, Tahoma Creek, Kautz Creek twin culvert crossing, and Edith Creek. Multiple culverts require cleaning or replacement, historic stone curbing and masonry wall repairs also are needed.

PURPOSE AND SIGNIFICANCE OF MOUNT RAINIER NATIONAL PARK

Mount Rainier National Park was initially established as a national park in 1899 and currently encompasses 235,625 acres. The purposes, significance, and mission goals of the park, as outlined in the General Management Plan (GMP) (NPS 2001), underlie how the park is managed. The purposes tell why the park was set aside as a unit in the national park system. The significance of the park addresses why the area is unique—why it is important enough to our natural and/or cultural heritage to warrant national park designation, and how it differs from other parts of the country. Mount Rainier's mission goals articulate the ideal future conditions the NPS is striving to attain.

The purposes of Mount Rainier National Park are:

- To protect and preserve the park's natural and cultural resources, processes, and values, while recognizing their increasing importance in the region, the nation, and the world.
- To provide opportunities for visitors to experience and understand the park environment without impairing its resources to maintain wilderness values.
- To provide for wilderness experience.

Mount Rainier National Park is significant for a number of reasons, including the following:

- At a height of 14,410 feet, Mount Rainier is the highest volcanic peak in the contiguous United States with the largest alpine glacial system in the contiguous United States.
- The park contains outstanding examples of diverse vegetation communities, ranging from old-growth forest to subalpine meadows and ancient alpine heather.

- As urban development expands, the park continues to be a large island of protected open space where ecosystem processes dominate.
- The park's comprehensive Mount Rainier National Historic Landmark District – a cultural landscape district that includes buildings, roads, the Wonderland and Northern Loop trails, and other landscape structures – is the most significant and complete example of NPS master planning and park development in the first half of the 20th century.
- The developed areas of Mount Rainier contain some of the nation's best examples of NPS "rustic" style architecture of the 1920s and 1930s.

The mission goals of Mount Rainier National Park are:

- Resource Stewardship and Protection — protect park resources from internal and external impairment.
- Access and Enjoyment — provide access to and recreational and educational enjoyment, while maintaining unimpaired those unique attributes that are its contribution to the national park system.
- Education and Interpretation — interpret and convey the contributions of each park unit and the park system as a whole to the nation's values, character, and experience.
- Proactive Leadership — be a leader in local, national, and international park affairs, actively pursuing the NPS mission and assisting others in managing their park resources and values.
- Science and Research — engage in a sustained and integrated program of natural, cultural, and social science resource management and research aimed at acquiring and using the information needed to manage and protect park resources.
- Professionalism — create and maintain a highly professional organization and diverse workforce.
- Foster mutually supportive partnerships with private and public organizations and individuals to achieve visitor use and resource protection goals.

RELATED PLANNING DOCUMENTS

Mount Rainier National Park General Management Plan

The Mount Rainier National Park General Management Plan provides the overall guidance for management of the park (NPS 2001). The Nisqually – Paradise Road corridor is an integral part of park operations and a component of the National Historic Landmark District (NHLD). The existing road is consistent with the General Management Plan direction to maintain travel and access in the park, and protect valuable park features including attributes of the road that contribute to the NHLD.

Management Policies 2006

NPS *Management Policies 2006* provides guidance for management of all national park units. Road systems are addressed in Section 9.2.1, which states "park roads will be well constructed, sensitive to natural and cultural resources, reflect the highest principles of park design, and enhance the visitor experience."

The purpose of park roads is to enhance visitor experience by providing access to park facilities, resources, and recreational opportunities. Park roads are not intended to provide fast and convenient transportation, but rather to access areas of recreation while being sensitive to the natural and cultural resources in the area (Section 9.2.1.1 *Management Policies*). Park roads provide access for the protection, use, and enjoyment of the resources that constitute the park. The Nisqually – Paradise Road provides important entry into the park and access connections to other roads in the park, as well as regional connections to other state highways and communities.

1984 NPS Park Roads Standards

The 1984 NPS Park Roads Standards state that roads in national parks serve a distinctly different purpose from most other road and highway systems. Among all public resources, those of the national park system are distinguished by their unique natural, cultural, scenic, and recreational qualities. Park roads are to be designed with extreme care and sensitivity to provide access for the protection, use, and enjoyment of the resources that constitute the national park system.

Director's Order-87A: Park Roads and Parkways

DO-87A states that park roads are constructed only where necessary to provide access for the protection, use, and enjoyment of the natural, historical, cultural, and recreation resources that constitute our national park system. Park roads should enhance the visitor experience while providing safe and efficient accommodation of park visitors and to serve essential management action needs. Park roads are designed with extreme care and sensitivity with respect to the terrain and environment through which they pass—they are laid lightly onto the land.

BACKGROUND

The road between the Nisqually Entrance and Paradise Road was constructed between 1904 and 1915 as a pleasure route for the enjoyment of people and to provide access into Mount Rainier National Park, which was established in 1899. The road was reconstructed in 1918 and further reconstruction and many of the notable features along the road were added between 1925 and 1941. Improvements since 1941 have included general maintenance and repairs, parking areas, and new bridges, including the steel girder bridge at the Nisqually Glacier. The west approach to the Paradise area from the intersection with Stevens Canyon Road (Canyon Wye) was constructed in the late 1950s. The road's status as an outstanding archetypal example of rustic style architecture and naturalistic landscape architecture led to its designation to an NHLD in 1997.

The Nisqually – Paradise Road still largely follows the original alignment constructed in 1915. Today it remains the busiest road in the park with about 544,305 vehicles traveling the road in 2011. Peak two-way travel on the road during a summer weekend may reach almost 5,000 vehicles per day (BRW 1995). The road serves as the most direct access from the Seattle/Tacoma/Olympia region to the park's most popular attractions in the Paradise Area. It is the only road in the park that remains open year-round. The road provides access to the Longmire developed area that houses park administrative facilities, National Park Inn, a museum, and other visitor services. The road also provides access to Christine Falls, Ricksecker Point, the Cougar Rock campground, Narada Falls, trailheads, and outstanding scenic features. The Paradise area includes the main park visitor center, Paradise Inn, Guidehouse, and the trailhead for the Muir climbing route, Wonderland Trail, and other popular trails and exhibits.

The road provides important connections to other park roads that allow access to other regions of the park and local communities during the summer months (Figure 1). From Paradise, the Stevens Canyon Road continues east where it intersects State Route (SR) 123 that exits the park south of the Ohanapecosh Visitor Center or travels north along the eastern side of the park. SR 123 provides connections with the Mather Memorial Highway (SR 410) and access to Sunrise and the northeast portion of the park. Many visitors enter the park from one direction and exit from a different direction. The road is a vital component of park operations that provides a destination for visitors and an important link with other portions of the park.

SCOPING

Scoping is an early and open process to determine the breadth of issues and alternatives to be addressed in an EA. Park staff, resource professionals of the NPS-Denver Service Center, and the FHWA conducted internal scoping. This interdisciplinary process defined the purpose and need, identified potential actions to address the need, determined likely issues and impact topics, and identified the relationship of the proposed action to other planning efforts at the park.

On November 5, 2009, the park initiated public scoping with a press release to provide the public and interested parties an opportunity to comment on the proposed project (Appendix A). The park also sent letters to more than 200 interested individuals; organizations; state, county, and local governments; federal agencies; local businesses; and media outlets describing the proposed action and asking for comments. Native American tribes (Muckleshoot Indian Tribe, Puyallup Tribe of Indians, Nisqually Indian Tribe, Confederated Tribes and Bands of the Yakama Nation, Squaxin Island Tribe, and Cowlitz Indian Tribe) also were sent an informational letter describing the project and asking for comments. Comments were solicited through December 5, 2009. The park received 12 written scoping comments, including seven from individuals, two from local businesses, one from a church, and comments from the National Park Conservation Association and Mount Rainier Visitor Association. In general, comments supported the proposed project, but several concerns were expressed, including:

- The extent of road work that would impact areas outside of the current road.

- Potential habitat fragmentation and weed invasion.
- Actions needed to address stream crossings and prevent future erosion of the reconstructed road.
- The project should consider opportunities with culvert replacement and bridge work to improve conditions for aquatic life and fish passage. Appropriate measures should also be taken to protect aquatic life near fish bearing water bodies.
- Stormwater collection, conveyance, and treatment should be considered as part of drainage work.
- Potential impacts to floodplain utilization and hydrologic function of Kautz Creek and the Nisqually River.
- Potential impacts to the viewshed, soundscape, and traffic safety from truck traffic during construction.
- The need for improved repairs at Kautz Creek.
- Measures that will be used to improve safety.

A number of the comments also were concerned about the flood risk associated with Tahoma Creek and the Nisqually River that resulted in the closure of the Nisqually – Paradise Road in 2006. Concern was expressed about the need for improvements to the Pierce County constructed and maintained levee and protection of the Nisqually Road at Tahoma Creek near the Westside Road. The NPS is currently evaluating measures to address flooding and protection of the road at Sunshine Point and other locations. The steps needed to address flood issues on the Nisqually River are beyond the scope of the proposed road repairs and improvements and are being addressed in a separate action and environmental review.

Internal and external scoping comments were considered in the choice of impact topics and the development and evaluation of alternatives discussed in this EA. Scoping issues or impact topics that were considered, but not evaluated further, are discussed below in "Impact Topics Dismissed from Further Analysis."

The public, agencies, and Native American tribes traditionally associated with park lands also will have an opportunity to review and comment on this EA.

ISSUES AND IMPACT TOPICS

The NPS defines "measurable" impacts as moderate or greater effects. It equates "no measurable effects" to minor or less effects. "No measurable effect" is used by the NPS in determining if a categorical exclusion applies or if impact topics may be dismissed from further evaluation in an EA or EIS. The use of "no measurable effects" in this EA pertains to whether the NPS dismisses an impact topic from further detailed evaluation in the EA. The reason the NPS uses "no measurable effects" to determine whether impact topics are dismissed from further evaluation is to concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail in accordance with Council of Environmental Quality regulations at 1500.1(b).

In this section of the EA, the NPS provides a limited evaluation and explanation as to why some impact topics are not evaluated in more detail. Impact topics are dismissed from further evaluation in this EA if:

- they do not exist in the analysis area, or
- they would not be affected by the proposal, or the likelihood of impacts are not reasonably expected, or
- through the application of mitigation measures, there would be minor or less effects (i.e., no measurable effects) from the proposal, and there is little controversy on the subject or reasons to otherwise include the topic.

For issues or impact topics with no effect or no measurable effect, there would either be no contribution toward cumulative effects or the contribution would be low. For each issue or topic presented below, if the resource is found in the analysis area or the issue is applicable to the proposal, then a limited analysis of direct, indirect, and cumulative effects is presented.

Impact Topics Retained for Further Evaluation

Issues and impact topics for this project have been identified on the basis of federal laws, regulations, and orders; NPS *Management Policies 2006*; and NPS knowledge of resources at the park, as well as the questions and comments brought forth during internal and external scoping. Impact topics that were carried forward for further analysis in this EA are those where the proposed project is expected to have a measurable effect. Identified topics for evaluation in the EA are air quality and greenhouse gases; vegetation and special status plant species; wetlands; water resources; floodplains; fish, wildlife, and special status fish and wildlife species; cultural landscape; archeological resources; visitor use and experience; visual resources; public health and safety; and park operations. Table 1 discusses the impact topics; the reasons for retaining the topic; and the relevant laws, regulations, and policies.

TABLE 1. IMPACT TOPICS RETAINED FOR FURTHER EVALUATION AND RELEVANT LAWS, REGULATIONS, AND POLICIES

Impact Topic	Reasons for Retaining Impact Topic	Relevant Laws, Regulations, and Policies
Air Quality and Greenhouse Gas Emissions	Temporary increase in emissions from construction equipment, generation of fugitive dust, and contribution to greenhouse gas (GHG) emissions.	*Clean Air Act of 1963; 1916 Organic Act;* NPS *Management Policies 2006;* Executive Order (EO) 13514, "Sustainability and Reduction of GHG"; *NPS Climate Change Response Strategy 2010*
Vegetation and Special Status Plant Species	Roadside vegetation disturbance and the introduction of invasive nonnative species is possible from ground-disturbing activities during road rehabilitation and work on retaining walls and modified fill slopes. Small areas of tree removal may be necessary for wall construction and the roots for several large trees could be affected by excavation for deep patches. Drainage improvements and placement of riprap at Kautz Creek would stabilize slopes and protect trees. Protection of many of the large trees adjacent to the roadway is important because of their ecological and historic importance.	NPS Organic Act; NPS *Management Policies 2006*; Resource Management Guidelines (NPS-77); Federal Noxious Weed Control Act; EO 13112, "Invasive Species (1999)"*;* Endangered Species Act
Wetlands	Culvert replacement at New Tahoma Creek and fill placement at Kautz Creek may affect wetlands. Installation of replacement culverts to allow fish passage at several locations could also temporarily impacts wetlands. Road drainage ditches that support wetland vegetation would be graded to facilitate proper drainage.	EO 11990, "Protection of Wetlands"; NPS *Management Policies and Procedural Manual #77-1*; Clean Water Act
Water Resources — Quantity and Quality	The road crosses multiple large and small streams. Temporary effects on water quality are possible during construction from erosion and introduction of sediment to drainages, including multiple culvert replacements and drainage work. Proposed drainage improvements were designed to improve hydrologic conditions, prevent erosion, and protect water quality. Water for use during construction would require extraction from several streams.	Clean Water Act; Fish and Wildlife Coordination Act of 1934 (PL 85-624), as amended; EO 12088; NPS *Management Policies 2006;* NPS-77; Washington WACs: Chapter 173-201A and Chapter 222-110.
Floodplains	The road crosses the Tahoma Creek and Kautz Creek floodplain and is adjacent to the Nisqually River in several locations. Existing stream crossings at New Tahoma Creek and Kautz Creek have insufficient capacity to carry flood flows, which can damage the road during high flows. Project facilities also may affect the storage capacity of the floodplain. Proposed improvements would improve, but not eliminate, flooding issues.	EO 11988, "Floodplain Management"; DO-77-2: *Floodplain Management*

Impact Topic	Reasons for Retaining Impact Topic	Relevant Laws, Regulations, and Policies
Fish, Wildlife, and Special Status Fish and Wildlife Species	Federally threatened northern spotted owls and marbled murrelet are present in the park. Although minimal direct impact to endangered species habitat is anticipated, both bird species could potentially be affected by disturbance from noise and activities during construction. In addition, other wildlife, fish, amphibians, and insects could be affected by construction activities, tree removal, and habitat disturbance.	Endangered Species Act; NPS *Management Policies 2006*; (4.4.2.3 Management of Threatened or Endangered Plants and Animals, including state listed species; 16 USC 1535 Section 7(a)(2)
Cultural Landscape	The road is part of an NHLD. A number of the historic features along the road that contribute to its historic significance could be affected by the proposed project. There also is concern that any new structural features added should maintain the historic character of the road. Actions that affect the cultural landscape of the road also are possible.	Section 106 of the NHPA, NPS Management Policies 2006, and DO-28
Archeological Resources	Known archeological features are present near the road and could be affected by excavation for road work.	Section 106 of the NHPA as amended, DO-28, NPS Management Policies 2006; EO 13084 of May 14, 1998; EO 13007 of May 24,1996; American Indian Religious Freedom Act of 1978; the Native American Graves Protection and Repatriation Act of 1990; Indian Trust Resources: Secretarial Order 3175
Visitor Use and Experience	The quality of the visitor experience would be temporarily affected during construction from traffic delays short-term closures, closed parking areas and pullouts, increased noise, and a change in scenic quality from construction equipment and disturbances. The proposed improvements would provide long-term benefits to the visitor experience by ensuring access to the park and upgrades to deteriorating roadside facilities.	NPS *Management Policies 2006*
Visual Quality	The proposed project would result in visual changes from new pavement and striping, graded ditches, new embankment walls and modified fill slopes, drainage improvements, tree loss, reduction in native vegetation, an increase in exotic plant infestation, and other actions. Rehabilitation work would be designed to protect and preserve the visual quality of the road corridor.	NPS *Management Policies 2006*
Public Health and Safety	Deteriorating road conditions pose an increasing safety risk to vehicle travel and increase the potential for accidents. The proposed improvements are designed to improve road conditions and safety.	NPS *Management Policies 2006*

Impact Topic	Reasons for Retaining Impact Topic	Relevant Laws, Regulations, and Policies
Park Operations	Construction activities would require temporary changes in park operations to address traffic control and keep the public informed about road conditions. Road maintenance, repairs, and snow removal would benefit from road rehabilitation and associated improvements.	NPS *Management Policies 2006; OMB Circular A-123; Federal Managers Financial Integrity Act of 1982 (31 USC 3512(d)); Government Performance and Results Act of 1993 (GPRA)*

Impact Topics Dismissed from Further Analysis

The following impact topics were eliminated from further analysis because impacts would be minor or less: prime or unique farmland, soils, geologic resources and geologic hazards, socioeconomics, environmental justice, soundscape, lightscape, historic structures, Indian trust resources, ethnographic resources, museum collections, wilderness, and Wild and Scenic rivers. The rationale for dismissing these specific topics is stated for each resource.

Soils

Site-specific soil data are not available along the Nisqually – Paradise Road; however, the soils in the project area are likely to include alluvial soils derived from river or glacial deposits, colluvial soils on sideslopes, soils derived from volcanic mudflows, and soils formed from pyroclastic deposits of ash (Franklin et al. 1988). Soils in the project area, on adjacent cut and fill slopes beyond the edge of the pavement have been disturbed by past human activities such as construction of the road and periodic ditch maintenance.

The no action alternative would have local long-term minor adverse effects on soils from deterioration of the road and slope stabilization concerns that could lead to erosion. Road rehabilitation activities under the preferred alternative would occur primarily within areas of existing disturbance with only incidental impacts to adjacent shoulders. Installation of a new culvert and riprap outlet protection at New Tahoma Creek would result in a disturbance to about 0.3 of an acre of soils from placement of riprap on the road fill slope. Construction of embankment stabilization walls and modified fill slopes would result in temporary soil disturbance to about 0.02 of an acre. Proposed riprap armoring of the road shoulder and embankment at Kautz Creek would impact about 0.62 of an acre, including 0.20 of an acre of a previously constructed overflow ditch. Riprap material also would extend slightly below the toe of the fill slopes. Culvert replacement at multiple locations would also result in temporary disturbances of soils near culvert inlets and outlets.

All temporarily disturbed soils would be revegetated with native vegetation following construction to reduce the potential for erosion and establishment of invasive plant species. Existing soils along the road shoulder would be compacted and covered with 2-inches of topsoil/aggregate mix, which would suppress germination of native seed bank in the underlying native soil. However, the topsoil/aggregate mix would be reseeded with native plant species. Soil/aggregate, as discussed in the *Vegetation and Special Status Species* section also has the potential to introduce invasive plant species. The preferred alternative would result in local short-term minor adverse impacts to soils from construction-related

disturbance that would temporarily affect soils and a long-term minor adverse impact from placement of riprap on road sideslopes at New Tahoma Creek and Kautz Creek. Compaction and loss of native soils on the road shoulder or from other excavations could also result in local long-term minor adverse impact to soil resources. Planned use of temporary and permanent erosion control best management practices (BMPs) including revegetation would reduce the potential for erosion and soil loss. Additional discussion on soil erosion is included in the *Water Resources—Quantity and Quality* section. Because impacts to soils would be minor or less, this impact topic was dismissed from further analysis in the EA.

Geologic Resources and Geologic Hazards

The park is known for many interesting geologic features, including glacial features on Mount Rainier, cirques, glacial valleys, and topography defined by glacial moraines and glacial drift (NPS 2005). Volcanic processes have contributed to the many geologic features. Mount Rainier has an extensive historic record of geologic hazards including lava flows, ash eruptions, avalanches, debris, and mudflows. The preferred alternative would stabilize the road, improve drainage, and reinforce slopes through a variety of techniques, as described in the "Alternatives" chapter. No rock scaling or disturbance to rock outcrops or important geologic features are proposed. However, because of the dynamic natures of the geologic processes at work in Mount Rainier, the Nisqually – Paradise Road would remain at risk for geologic events that are difficult to predict. Because the preferred alternative provides a long-term benefit and would not adversely affect geologic conditions, this topic was dismissed from further analysis. Geologic hazards in relation to public safety are discussed in the impact topic *Public Health and Safety* in the "Affected Environment and Environmental Consequences" chapter. The *Floodplain* and *Water Resource* sections discuss effects on New Tahoma Creek and Kautz Creek. The no action alternative would not address existing road stability issues, which could lead to slumping, erosion, or road failure. Because direct impacts on geology would be minor or less and other sections of the EA address geologic hazards, floodplains, and water resources, this impact topic was dismissed from further analysis in the EA.

Socioeconomics

Mount Rainier is an important resource contributing to regional economics including Ashford and surrounding communities, which provide visitor services for those entering the park through the Nisqually Entrance. The preferred alternative would result in construction-related spending of about $27 million, which would provide a short-term benefit to the local and regional economy from employment opportunities and spending on goods, services, and materials. Construction activity and traffic delays may deter some visitors from coming to Mount Rainier or traveling on the Nisqually – Paradise Road, although the park would notify the public of construction-related delays to minimize visitor impacts. While some park visitors may be inconvenienced during construction, no substantial change in visitor attendance is anticipated. Cougar Rock Campground would remain open throughout construction. The preferred alternative would result in regional short-term minor adverse effects on the economy if visitor numbers decrease during construction. Over the long term, road improvements would provide beneficial economic effects on regional businesses from improvements that maintain access to the park and increase the quality of the visitor experience. Failure to repair the road under the no action alternative could lead to road

failure and unplanned road closures that would result in adverse impacts to local businesses if visitors are not able to enter the park. Because socioeconomic effects would primarily be beneficial with less than minor short-term adverse effects under the preferred alternative, this impact topic was dismissed from detailed discussion in the EA.

Environmental Justice

Presidential EO 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing the disproportionately high and/or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. According to the U.S. Environmental Protection Agency (EPA), environmental justice is the

> …fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.

The goal of "fair treatment" is not to shift risks among populations, but to identify potentially disproportionately high and adverse effects, and identify alternatives that may mitigate these impacts.

Ashford and surrounding communities contain both minority and low-income populations; however, environmental justice was dismissed as an impact topic for the following reasons:

- The park staff and planning team actively solicited public participation as part of the planning process and gave equal consideration to all input from persons regardless of age, race, income status, or other socioeconomic or demographic factors.
- Implementation of the preferred alternative would not result in any identifiable adverse human health effects. Therefore, there would be no direct or indirect adverse effects on any minority or low-income population.
- The impacts associated with implementation of the preferred alternative would not disproportionately affect any minority or low-income population or community.
- Implementation of the preferred alternative would not result in any identified effects that would be specific to any minority or low-income community.
- The impacts to the socioeconomic environment resulting from implementation of the preferred alternative may have short-term adverse economic effects, but over the long term, effects would be beneficial. In addition, the park staff and planning

team do not anticipate the impacts on the socioeconomic environment to appreciably alter the physical and social structure of nearby communities.

Soundscape

An important part of the NPS mission is preservation of natural soundscapes associated with national park units, as indicated in NPS *Management Policies 2006* and DO-47: *Sound Preservation and Noise Management*. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all natural sounds within the park, together with the physical capacity for transmitting natural sound through air, water, or solid material. Acceptable frequencies, magnitudes, and durations of human-caused sound varies among NPS units, as well as potentially throughout each park unit, but are generally greater in developed areas and less in undeveloped areas. The park strives to preserve the natural soundscape associated with the physical and biological resources of the park. The overall soundscape in the park is generally quiet with minimal intrusion from human-generated sources except along roads and near high use areas (Formichella 2009). The soundscape along the road is influenced primarily by vehicle traffic. According to the Mount Rainier 2011 Annual Visitor Statistics Report, about 544,305 vehicles traveled the road in 2011, including oversized vehicles such as buses, recreational vehicles, motorcycles and trucks (NPS 2012a). Park operations, maintenance, and administration activities also contribute to the traffic and noise generated along the road.

Ambient noise levels in the project area likely range from about 50 to 70 decibels (dBA), and result from natural processes such as wind, the Nisqually River where the road is near the river, from human activities such as vehicles traveling on the Nisqually-Paradise Road, overflights, and from human voices at parking areas. There would be no change to the existing soundscape under the no action alternative. Periodic road maintenance and repairs would continue to be conducted when necessary and the noise associated with these operations would likely involve trucks, graders, backhoes, and other equipment.

Rehabilitation activities under the preferred alternative would result in temporarily elevated noise levels along the road from equipment for milling and pulverizing the asphalt surface, as well as graders, trucks, backhoes, and other equipment or machinery. No blasting or pile driving is anticipated. Construction activities would generate more noise than existing conditions, with noise levels from 70 to 90 decibels or more likely, depending on the type of equipment or activity. While most of the noise would occur within the road corridor, truck traffic from delivering supplies and asphalt, and removing milled asphalt would increase traffic-related noise along roads leading to the construction area. Night construction would be allowed at locations where deep patches and MSE walls are constructed and utility lines installed because this work would require temporary closure of the road to traffic. Night construction would be limited by restrictions to protect species of concern as described in resource protection measures on page 46. Night construction work would introduce elevated noise levels during a time when there is very limited traffic. All of the night work construction and staging areas are more than 1 mile from Cougar Rock campground and Longmire. Construction noise would likely be buffered by natural terrain and distance, but noise levels would be monitored and night construction activities or schedules would be adjusted, as needed to minimize visitor impacts.

Effects on the existing soundscape from work activities under the preferred alternative would be local, short-term, minor, and adverse. Incidental tree mortality from excavation work along the road would reduce canopy cover and have a local long-term minor adverse effect on the sound environment. Because there would be no adverse effects on the soundscape following construction activities and none of the road improvements would increase traffic capacity, this topic was dismissed from further analysis. Considerations of noise impacts on visitor use and experience and wildlife and special status species are addressed under those heading topics.

Lightscape

In accordance with NPS *Management Policies* 2006, the NPS strives to preserve natural ambient lightscape, which are natural resources and values that exist in the absence of human-caused light. The park strives to limit the use of artificial outdoor lighting to that necessary for building security and human safety. The park also strives to ensure that all outdoor lighting is shielded to the maximum extent possible to keep light on the intended subject and out of the night sky. No new permanent outdoor lighting is proposed as part of the preferred alternative. Night construction would be allowed at locations where deep patch work requires closure of the road to traffic and for construction of a MSE wall near Christine Falls and utility work. Night construction would be subject timing limitations for sensitive species as described on page 46. Night construction would temporarily introduce artificial lighting within the construction area. Lights used for night work are unlikely to be visible from Cougar Rock campground or the Longmire area because of the distance from the work site, the terrain, and dense forest. Lights used for night construction activities would be shielded and directed downward to minimize impacts. Construction vehicles traveling along the road during the night are expected to be limited with only a slight increase over normal night traffic. The impact of this local short-term night illumination would have a minor adverse effect on the night sky. For this reason, lightscape was dismissed from further analysis in this EA.

Historic Structures

Mount Rainier National Park's status as an outstanding example of rustic style architecture and naturalistic landscape architecture led to its designation as the Mount Rainier NHLD in 1997. Significant structures included in the NHLD are the Nisqually – Paradise Road and associated small-scale features such as crenellated masonry guardwalls, bridges, scenic pullouts, curbs, masonry culvert headwalls, gates, signs, and interpretive displays. Most of these elements were constructed with native materials and were designed to blend with the surrounding landscape and provide a seamless vista experience (NPS 2004a). In addition to more than 100 buildings and structures within the corridor listed as contributing to the NHLD, four buildings along the corridor are individually listed as National Historic Landmarks; the Longmire Community Building, Service Station, Administration Building, and Paradise Inn. The Nisqually Entrance log arch is also a contributing element to the NHLD (NPS 2004a). Because historic structures are an integral part of the Nisqually – Paradise Road cultural landscape contributing to the NHLD, potential effects to historic structures are discussed in the *Cultural Landscape* section of the "Affected Environment and Environmental Consequences" chapter.

Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by the Department of the Interior agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights. The order represents a duty to carry out the mandates of the federal law with respect to Native American and Alaska Native tribes. There are no Indian trust resources in the park; therefore, Indian trust resources was dismissed as an impact topic in this EA.

Ethnographic Resources

Ethnographic resources are defined by the NPS as any "site, subsistence, or other significance in the cultural system of a group traditionally associated with it" (DO-28). There are no known ethnographic resources in the project area or general vicinity. The six Native American tribes traditionally associated with the lands of the park were apprised of the proposed project by letter. No comments from the tribes were received during the scoping period.

Copies of the EA will be forwarded to each associated tribal group for review and comment. If subsequent issues or concerns are identified, appropriate consultations would be undertaken. Because it is very unlikely that ethnographic resources would be affected, and because appropriate steps would be taken to protect any human remains, funerary objects, sacred objects, or objects of cultural patrimony inadvertently discovered, ethnographic resources was dismissed as an impact topic in this EA.

Museum Collections

According to DO-24: *Museum Collections*, the NPS requires the consideration of a projects impact on museum collections. Museum collections include historic artifacts, natural specimens, and archival and manuscript material. These collections may be threatened by fire, vandalism, natural disasters, and careless acts. The preservation of museum collections is an ongoing process of preventive conservation, supplemented by conservation treatment, when necessary. The primary goal is preservation of artifacts in the most stable condition possible to prevent damage and minimize deterioration. The Preferred and No Action alternatives would not affect the park's museum collections; therefore, museum collections were dismissed as an impact topic in this EA.

Wilderness

In 1988, Congress designated approximately 97% (228,480 acres) of the park as wilderness under the Wilderness Act of 1964. The wilderness boundary is generally 200 feet from either side of the centerline of paved roads and 100 feet from the centerline of unpaved roads. All proposed project work would occur within the existing road corridor and adjacent sideslopes. The proposed project would not encroach into the wilderness area; therefore, there would be no direct disturbance to wilderness.

Construction-related noise for pavement milling, pavement overlay, utility line excavation, and placement of soil aggregate would generally last two to three days at any given location. More extensive repairs would range from about 25 days at the Narada Falls and Kautz Creek parking areas, 45 nights for Kautz Creek drainage work, 7 days at the Comet Falls trailhead, and 15 days at Christine Falls trailhead. Noise from construction-related activities would result in a short-term adverse effect to wilderness values, such as solitude for visitors on park trails in the vicinity of the project or disturbance to wildlife. This would slightly diminish the quality of the wilderness experience during construction. Additional information on impacts to the wilderness experience are discussed under the *Visitor Use and Experience* impact topic, which has been retained for further analysis. Impacts to wildlife from noise are discussed under the *Fish, Wildlife, and Special Status Fish and Wildlife Species* impact topic. Because there would be no direct disturbance to wilderness, and impacts would be short-term and less than minor, this topic was dismissed from further evaluation in this EA.

Prime or Unique Farmland

In 1980, the Council of Environmental Quality directed federal agencies to assess the effects of their actions on farmland soils classified as prime or unique by the United States Department of Agriculture, Natural Resources Conservation Service. Prime or unique farmland is defined as soil that particularly produces general crops such as common foods, forage, fiber, and oil seed; and unique farmland produces specialty crops such as fruits, vegetables, and nuts. There are no prime or unique farmlands associated with the project area; therefore, prime or unique farmland was dismissed as an impact topic in this EA.

ALTERNATIVES

INTRODUCTION

This chapter describes the no action alternative and the preferred alternative for repair of the Nisqually – Paradise Road. The no action alternative would not repair the road and would continue the present level of management, operations, and maintenance. The preferred alternative was developed to address the purpose and need for the project to resurface, restore, and repair the road, while protecting and preserving park natural and cultural resources.

The preferred alternative presents the NPS's preferred management action and defines the rationale for the action in terms of resource protection and management, visitor and operational use, cost, and other applicable factors. Other alternatives that were considered but eliminated from detailed analysis are discussed in this chapter. Also included in this chapter is a comparison of how well the alternatives meet project objectives and a summary comparison of the environmental effects of each of the alternatives.

NO ACTION ALTERNATIVE

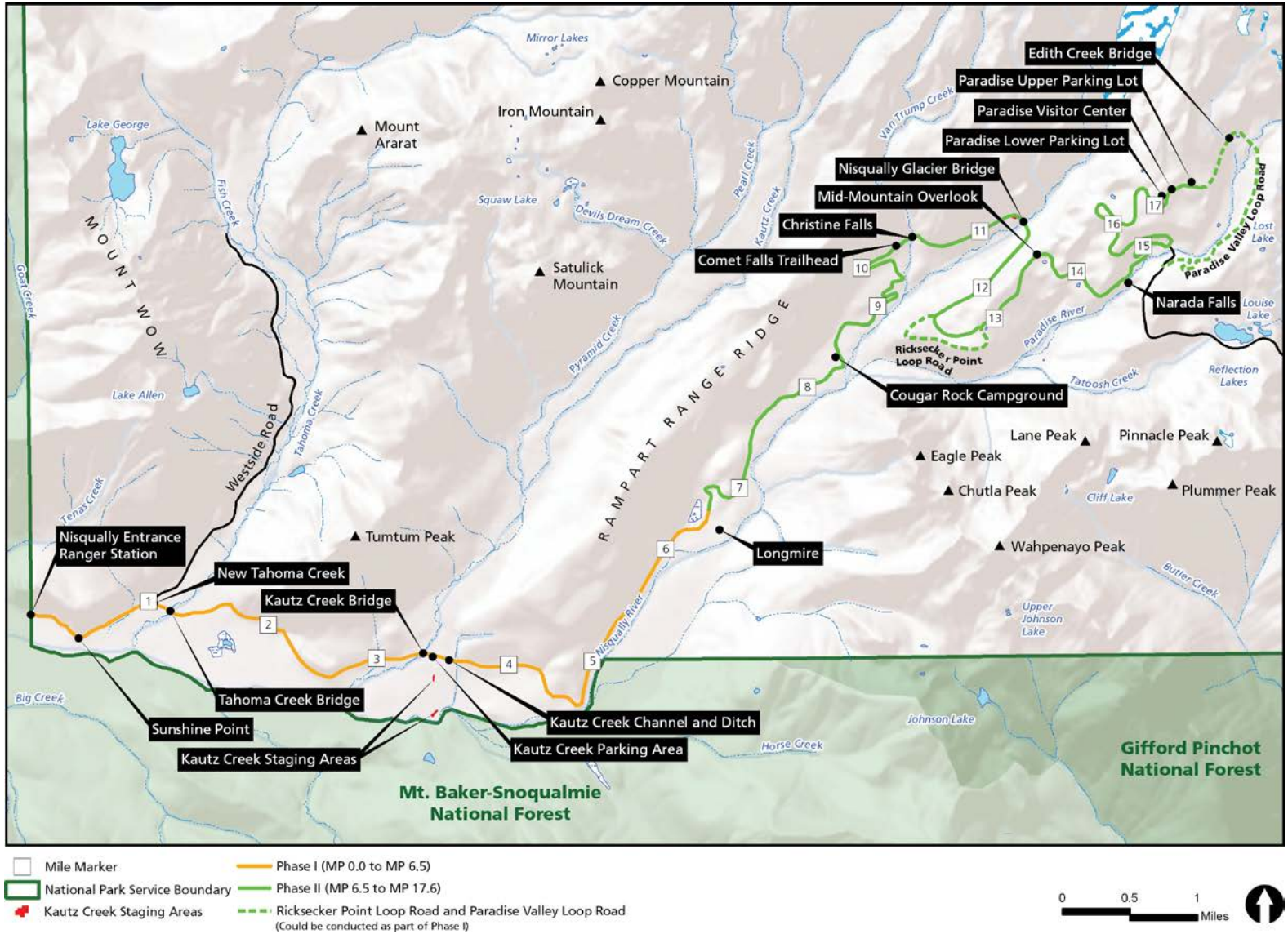
Under the no action alternative, the Nisqually – Paradise Road would not undergo a comprehensive program of repairs and improvements. Instead, roadway deficiencies and the deficiencies of adjacent roadway facilities would continue to be addressed on a piecemeal basis. Larger and more costly preventative repairs including those to the pavement structure, deteriorating slopes, and inadequate drainage would not occur, thereby permitting the continued deterioration of the entire roadway prism. No Federal Lands Highway Program Funds would be used for ongoing maintenance activities. Instead, the piecemeal repairs would be paid for using the park's own limited funds. The no action alternative would not meet the project purpose and need, including correction of visitor safety issues associated with the condition of the road or the potential for damage to natural resources from road failure or inadequate drainage structures.

The no action alternative provides a basis for comparison with the preferred alternative and the respective environmental consequences. Should the no action alternative be selected, the NPS would respond to future needs and conditions without major actions or changes in the present course.

PREFERRED ALTERNATIVE

The preferred alternative is comprised of a comprehensive and integrated set of site-specific actions intended to address the deficiencies of the entire roadway prism for 17.6 miles of the road between the park boundary at the Nisqually Entrance and the Paradise area (Figure 2). In addition, the 1.0-mile Ricksecker Point Loop Road and 2.2-mile Paradise

FIGURE 2. NISQUALLY – PARADISE ROAD REHABILITATION PROJECT AREA



Valley Road would be repaved. Federal Lands Highway Program funds would be used to finance the implementation of the preferred alternative.

The proposed roadwork would be conducted in two phases and would take up to four years to complete depending on available funding. The first phase extends from the Nisqually Entrance at milepost (MP) 0.0 to Longmire at MP 6.5 and is scheduled to occur 2013–2014. This phase may also include reconstruction of a guardwall on the Ricksecker Loop. The second phase of roadwork would occur 2015-2016 and is between MP 6.5 and the end of the Paradise Valley Road (MP 17.6). This phase includes repaving the parking lots at Paradise and repaving Paradise Valley Road (Figure 2). Ricksecker Loop Road paving could be conducted during either phase. The estimated construction cost for the two phases is about $27 million. Following is a description of proposed roadwork activities for the preferred alternative.

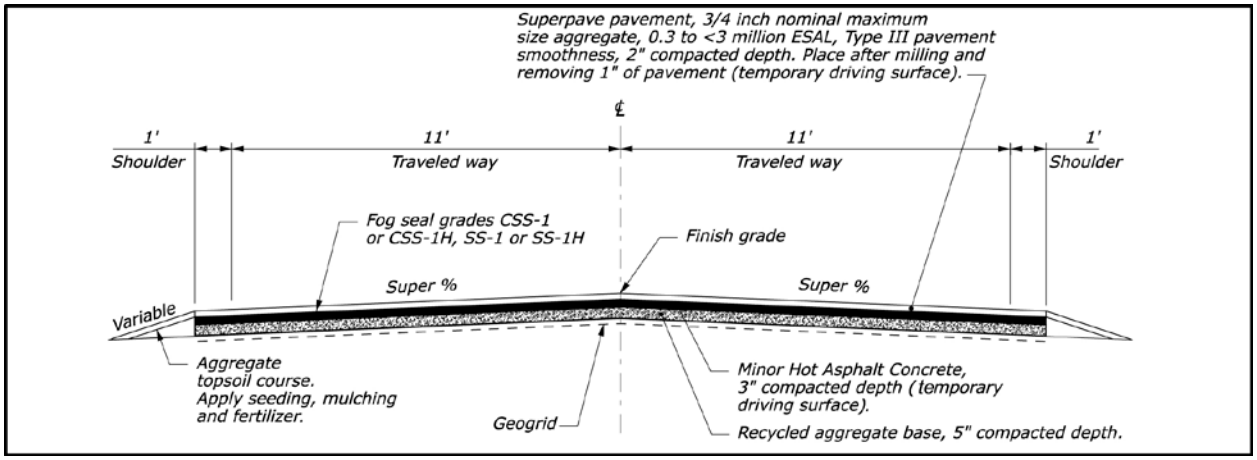
ROAD STABILIZATION AND PAVING

A variety of actions are needed to address structural and design deficiencies, and repair deteriorating road conditions. These measures include subgrade reinforcement, subexcavation, deep patches, road repaving, and additional road improvements, as described in the following sections. In areas that require extending lane width into drainage ditches to maintain one-lane travel, steel plates or another type of temporary "bridge" would be used.

Subgrade Reinforcement

Subgrade reinforcement would be used at an estimated 26 locations along the road for a cumulative length of approximately 3,000 linear feet. The subgrade reinforcement work would vary from one-half, three-quarters, and the full width of the road. Subgrade reinforcement addresses inadequate or deteriorating conditions to the supporting material under the pavement. Deteriorating subgrade can lead to pavement settlement and cracking. This measure requires milling the existing pavement, installing a flexible geogrid fabric over the subgrade, and placing recycled aggregate base and hot asphalt concrete pavement (Figure 3).

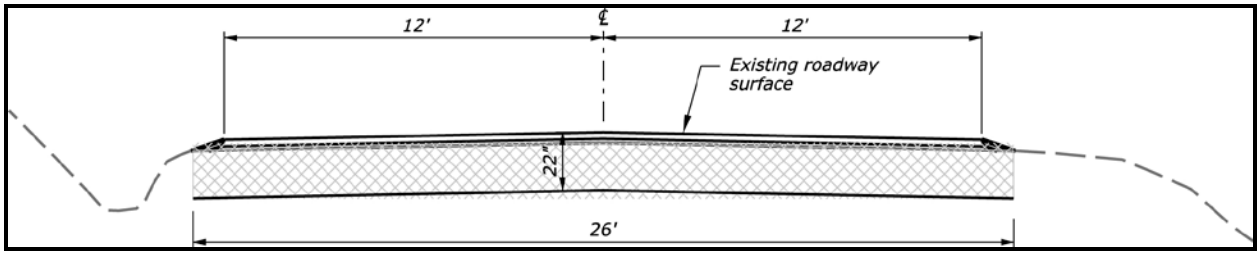
FIGURE 3. TYPICAL FULL-WIDTH SUBGRADE REINFORCEMENT



Subexcavation

Subexcavation would be used at an estimated 10 locations for a cumulative length of about 600 linear feet of road to reinforce the road base. The work would consist of milling the existing pavement and recycling the material as aggregate base. Excavation would occur to a depth of up to 2 feet below the existing pavement. Geotextile would then be placed at the bottom of the excavation followed by placement of select borrow material, compacted recycled aggregate, hot asphalt concrete, and pavement (Figure 4).

FIGURE 4. TYPICAL FULL-WIDTH SUBEXCAVATION

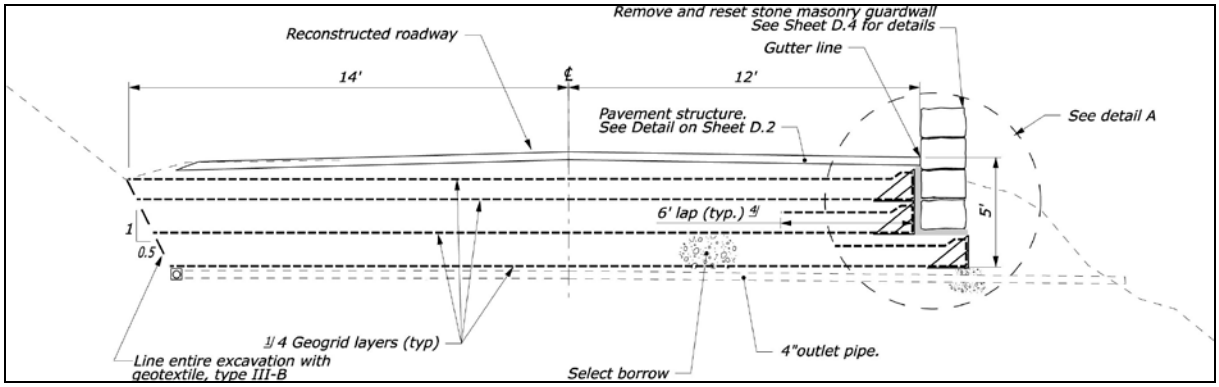


DEEP PATCHES

During the original construction of the Nisqually – Paradise Road, material from the hillside was removed (cut) and placed along the outside edge of the road (fill or sidecast) in many areas, with minimal keying, benching, or controlled compaction. Over time, settlement or consolidation of the inadequately compacted fill material and/or downslope fill creep has caused subsidence and cracking in the pavement. In addition, woody debris from the clearing and grubbing operation often went into the sidecast fills, which eventually decomposed and further promoted creep movement.

To minimize shallow downslope creep from occurring at the roadbed, deep patches would be used at an estimated 29 locations for a cumulative length of approximately 3,700 feet. Deep patches require excavating about 2 to 6 feet of the subsiding section of road and replacing it with compacted backfill that is reinforced with horizontal layers of geogrid (Figure 5). Similar to a MSE wall (as described later), each layer of reinforcement may be wrapped around the overlying layer of backfill, with the free end re-embedded into the backfill. Deep patches would be constructed over one-half or three-quarters of the road width. All of the work at deep patch sites would require full closure of the road to complete and would be conducted at night as described below in the *Traffic Control and Scheduling* section. Excavation for deep patches would be modified as needed near large trees as described below in the *Tree Protection* section.

FIGURE 5. TYPICAL DEEP PATCH



Road Repaving

The surface asphalt of the Nisqually – Paradise Road (17.6 miles), portions of the Ricksecker Point Loop Road (1.0 mile), Paradise, and Valley Road (2.2 miles) is deteriorating and exhibits asphalt tension cracks and horizontal and vertical displacement that results in costly and continuous maintenance activities. To repair this damage, the existing road pavement would be milled or pulverized, followed by an overlay of hot asphalt. Ricksecker Loop Road would be repaired and repaved. Treatment options and asphalt depth would vary with site-specific conditions. Traffic would travel on an aggregate surface during construction of structural repairs and drainage work prior to completion of paving. Trees identified by park staff within the construction limits would be protected from construction disturbance. A topsoil aggregate mix would be applied along the shoulder of all repaved road segments. Road shoulders would then be reseeded with native plant species using a hydroseeding process.

Historically, guardwalls along the road were 18 to 24 inches in height, but successive layers of pavement over the years has reduced the visible height of the guardwall. These historic guardwalls are important features that contribute to the NHLD and the cultural landscape, and also provide a safety barrier for vehicles. Prior to repaving sections of the road where the guardwall height is below historical elevations, the pavement would be milled to the greatest extent feasible to expose the original height of the guardwall.

Additional Road Improvements

Sunshine Point Curve (MP 0.4). This section of the road was reconstructed as an emergency action in 2006 following flooding of the Nisqually River that washed out the road. Additional rock would be placed on top of the existing riprap on the river side of the road outside of the floodplain to allow space for an adequate shoulder and vegetation establishment.

Ricksecker Point Loop Intersection. Minor changes in the road slope would be made at the intersection of the Nisqually – Paradise Road at the western entrance to the Ricksecker Point Loop Road by increasing the grade inside the curve. Grade correction measures would

address existing safety concerns with the sideslope of the road, particularly during icy conditions.

Pullouts and Parking Areas

Pullouts

The approximate 83 existing pullouts along the Nisqually – Paradise Road, Ricksecker Point Loop Road, and Paradise Valley Road would be retained and paved. Approximately two to five gravel pullouts along Paradise Valley Road would be paved. At about five locations, asphalt curbing would be removed or curb cuts would be made to improve accessibility. Minor grading of the shoulder on the edge of the pullout would be required at some locations. The Christine Falls upper pullout would be reconstructed to meet Americans with Disabilities Act standards for accessibility.

The existing pullout near MP 6.1 west of Longmire is slumping toward the Nisqually River. Large fractured rock was installed at this location (likely during the late 1950s) to control erosion and prevent undercutting of the embankment supporting the road. Finer roadfill materials are believed to have sifted through the large rock base over time, resulting in slumping of the road. Structural measures to better protect the road from slumping include reducing the width of the pullout and constructing a deep patch that extends from the outside of the pullout to the centerline of the road. An engineered log crib wall was constructed at the toe of the slope located immediately west of the turnout during September 2010 to repair river bank erosion and provide additional long-term slope stability.

Kautz Creek Parking Area

The Kautz Creek parking area includes a comfort station and picnic tables, and serves as a trailhead for the Kautz Creek Trail (Figure 2). The existing western entrance to the parking area would be moved east about 150 feet to improve the sight distance and safety for vehicles entering and exiting. The existing median would be redesigned to accommodate a 5-foot concrete walk and stone curb adjacent to the parking area on the east side of the proposed western entrance. The west side of the proposed entrance would accommodate stone cubing adjacent to the parking area. A berm with low growing vegetation would be maintained between the sidewalk and the road. The parking area would be reconfigured with striped spaces. Parking capacity may decrease slightly with the addition of the sidewalk. The existing asphalt sidewalk on the west side of the comfort station would be removed and a new curb added to accommodate reconfigured parking spaces. The sidewalk on the east side of the comfort station would be removed and a new realigned accessible sidewalk constructed adjacent to the picnic tables. All improvements would meet accessibility guidelines.

Paradise Parking Lots

Old asphalt in the Paradise lower parking area and upper parking area would be milled or removed and disposed of according to local ordinances and state law; materials may be recycled at a location outside the park. The new asphalt would be placed to match areas that

were paved in 2009 (Figure 2). A new concrete sidewalk would be added on the inside of the existing curb for the length of the new Jackson Visitor Center in the upper parking area.

Narada Falls Parking Area

A small raised picnic area would be formalized in the southeast corner of the parking area by adding approximately 120 linear feet of new stone curb, a stone curb cut for access and a crushed granite surface. The top of the existing historic stone curb would remain visible within the crushed granite surface. Improvements in parking lot layout may require shifting picnic table placement.

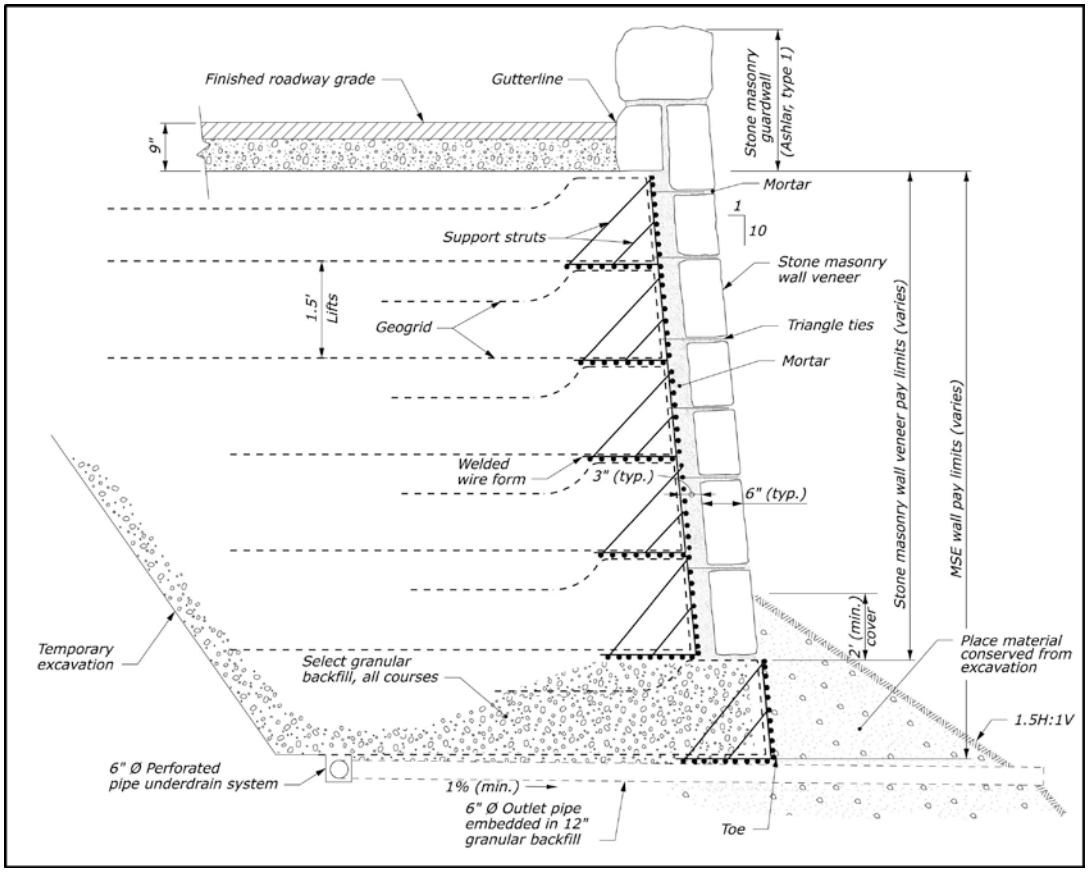
EMBANKMENT STABILIZATION

Embankment stabilization to prevent slumping of the road or adjacent guardwalls is needed at several locations. Mechanically stabilized earth (MSE) retaining walls are being considered for two locations along the road, including one location near Christine Falls (MP 10.6), and at a site along the Ricksecker Point Loop Road. MSE walls are classified as gravity retaining walls and are designed to withstand lateral earth and water pressures. They can be constructed faster and more economically than traditional concrete walls. The geogrid-reinforced MSE wall system consists of continuous layers of geogrid, laid down alternately with horizontal layers of compacted soil backfill. The wall facing is constructed by wrapping each layer of reinforcement around the overlying layer of backfill and then re-embedding the free end into the backfill. Each layer of backfill consists of one or more compacted lifts. Facing systems can vary from geotextile or geogrid to prefabricated concrete panels and stone masonry. Wall heights would range from about 4.5 to 15 feet, depending on the conditions at each site. Typically the faces of the MSE walls have a slope of less than 30 degrees from vertical. The proposed MSE walls would have a welded wire form facing to which masonry veneer would be attached. A typical MSE wall with an ashlar guardwall is shown in Figure 6.

Construction of MSE walls would require disturbance of vegetated areas during construction. Construction of the MSE wall near Christine Falls would disturb about 500 square feet of vegetation and MSE wall construction at Ricksecker Point Loop Road would disturb about 200 square feet of vegetation. MSE wall construction would require not require removal of trees less than 18-inches DBH and possible impacts to tree roots. Tree protection measures as described below would reduce impacts. Disturbed areas would be revegetated with native vegetation using salvaged or propagated plants following construction.

If existing guardwalls or retaining walls require removal for stabilization work, dismantling would require vegetation clearing, possible tree removal, labeling each rock, and rebuilding to the same appearance as the existing walls. If needed, the wall would be retrofitted with new stone and mortar consistent with historic design, materials, and pattern during reconstruction. Damaged stone would be replaced with new stone of a similar color, size, and edge treatment. A wedge of soil may be excavated at the base of walls, and replaced following reconstruction of the wall (Figure 6).

FIGURE 6. TYPICAL MSE WALL WITH ASHLAR GUARDWALL



DRAINAGE

West Side Road

An existing culvert under the West Side Road and a tributary to New Tahoma Creek is experiencing scour at the culvert outlet and currently the culvert outlet is perched about 12 inches above the shallow pool below. Additional rock would be placed at the culvert outlet, as well as on each side of the culvert, to reduce the potential for channel scouring and to improve conditions for amphibian movement.

New Tahoma Creek

A record flood in 2006 reactivated a formerly dormant flood channel carrying overflow from Tahoma Creek. This new channel, designated New Tahoma Creek, typically collects hillslope drainage along its lower reaches. The channel is anticipated to remain active and continue to carry overflow from Tahoma Creek during peak flow events that are increasing in frequency and magnitude. The existing 3-foot-high by 6-foot-wide concrete box culvert that carries New Tahoma Creek flows under the road has a conveyance capacity of about 170 cubic feet per second (cfs), which is inadequate to convey anticipated flood flows, including overflow events from the main channel. A new 11-foot-diameter corrugated metal pipe

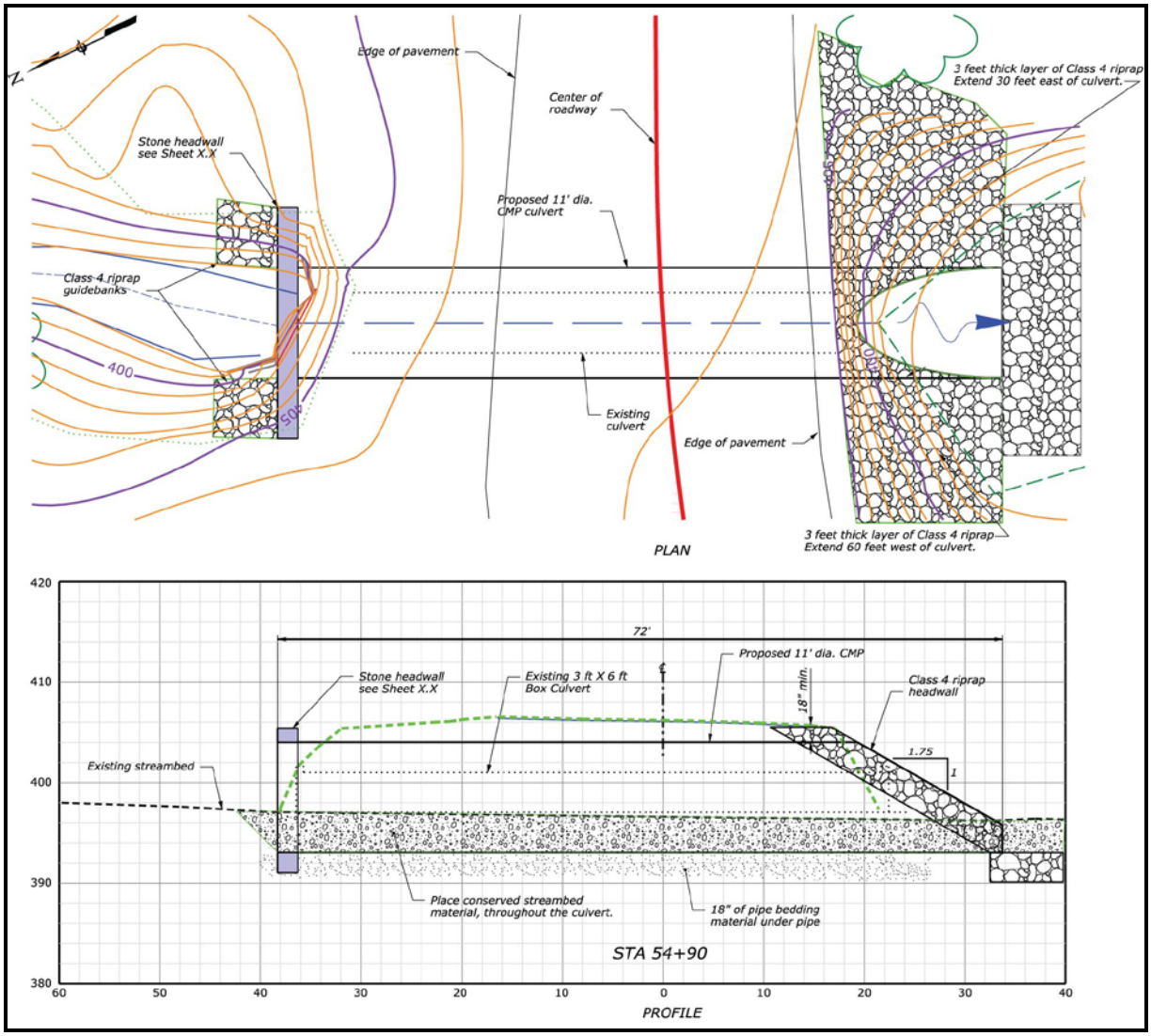
(CMP) is proposed for this location to provide additional streamflow capacity of up to about 700 cfs (Figure 7). About 3 feet of the culvert would be buried to provide a natural stream bottom. The culvert would be designed to provide for fish passage pursuant to state of Washington State water crossing structure regulations for culverts (WAC 222-110-070). The culvert inlet would be protected with a riprap and a stone veneer headwall using existing native material. The culvert outlet would be protected by placing large riprap rock from the pavement edge to the road embankment toe and extending the riprap along the embankment about 60 feet west of the new culvert to 30 feet east of the new culvert. Construction-related disturbance for installation of the new culvert and inlet and outlet protection would impact about 0.3 of an acre. Installing the culvert would require removal of existing small trees and shrubs and herbaceous vegetation; however, no mature trees would be removed. Impacts to tree roots would be minimized following the resource protection measures on page 42. Streamflow in New Tahoma Creek would be diverted around the construction zone via a pipe. Pumping of the diverted stream is expected to take approximately four days.

Kautz Creek

Deposits from a debris flow during the November 2006 flood event resulted in Kautz Creek being rerouted to a historic channel, about 0.25 of a mile east of the existing Kautz Creek Bridge (Figure 2). The new channel now carries the majority of Kautz Creek flow. In 2007, two 12-foot-diameter CMP culverts were installed at the Kautz Creek road crossing to provide conveyance capacity for the streamflow from the shifted channel. In addition, a riprap-armored overflow ditch was constructed for conveying excess floodwater along the uphill side of the road east about 0.2 of a mile toward a sag in the road profile. Three 30-inch-diameter CMP culverts were installed in the road sag to provide additional capacity for conveying flood flows. The uphill and downhill faces of the road embankment were armored for reducing erosion from floodwater overtopping the road.

Existing drainage structures (two 12-foot CMPs, three 30-inch CMPs, and overflow ditch) have a combined maximum capacity to carry about 2,290 cfs, including the 140 cfs capacity of 30-inch culverts (a 40-year storm event) before the road would be overtopped by flood water, possibly damaging the road pavement and eroding the road shoulder. There is a high potential for more, and possibly all, of the Kautz Creek flow to be conveyed across the alluvial fan surface to the overflow ditch. The existing ditch lacks the capacity needed for effectively capturing and redirecting the flow to the road profile sag and culverts. While the recently installed conveyance system has improved drainage, this area remains vulnerable to failure during high flow events because of a lack of hydraulic capacity. Thus, the park determined that additional improvements are needed to protect the road and better convey flows during flood events. Because of the high potential for the active channel flow to shift to another location on the alluvial fan, it is difficult to define flood flow volumes, locations of flows, and the best structures and drainages to protect the road. Several options were considered, including a bridge, raising the road, increasing the size of the ditch, and armoring the road, which was identified as the preferred technique. Other options that considered but dismissed are discussed in the section on *Alternatives Considered but Eliminated from Detailed Analysis* on page 54.

FIGURE 7. NEW TAHOMA CREEK CULVERT REPLACEMENT



The proposed improvements to the site include filling in the existing overflow ditch and armoring each side of the road embankment (Figure 8). The existing 12-foot- and 30-inch-diameter culverts would be retained. Kautz Creek flood flows across the alluvial fan surface that exceed the capacity of the 12-foot-diameter culverts would be conveyed as sheet flow across the filled-in overflow ditch and over the road. Filling in the overflow ditch allows the Kautz Creek flow to randomly access alluvial fan areas in a more natural, unrestrained manner. The grade control established by the riprap-filled ditch reduces the potential for a new large primary active channel developing. The riprap armoring protects the road from substantial damage during flood events, while minimizing resource impacts. Sediment would be cleared from the road following such events.

Proposed armoring of the north side of the road includes filling in the existing deep drainage ditch with riprap to form a shallow swale that would convey normal stormwater

runoff from the road to the three existing 30-inch-diameter culverts. Riprap also would be placed along the north and south sides of the road west of Kautz Creek for about 300 feet (Figure 8). Placement of riprap would buttress the over-steepened cut-bank on north side of overflow ditch, prevent further bank erosion and thereby stabilize large trees perched at top of bank. Backfilling of soil into rock pockets would allow slope to revegetate and cover exposed roots and prevent further degradation of intertwined tree roots on the bank. The existing 24-inch culverts would be left in place and filled over with riprap. Riprap also would be placed on the south side of the road about 700 feet east of the Kautz Creek channel. In total, about 0.62 of an acre of riprap would be placed on existing fill slopes and below the toe of the fill slope. Riprap on top of the road shoulder would be covered with aggregate/topsoil blended material and revegetated. Impacts to trees would be minimized by selectively placing riprap to avoid trees at the toe of the fill slope embankment. Approximately 100 feet of guardrail on the north side of the road and 170 feet of guardrail on the south side of the road would replace existing jersey barriers located at the Kautz Creek crossing, and would be constructed of materials compatible with the character of the road. Ditch work and guardrails would help address safety concerns associated with the drop off into Kautz Creek.

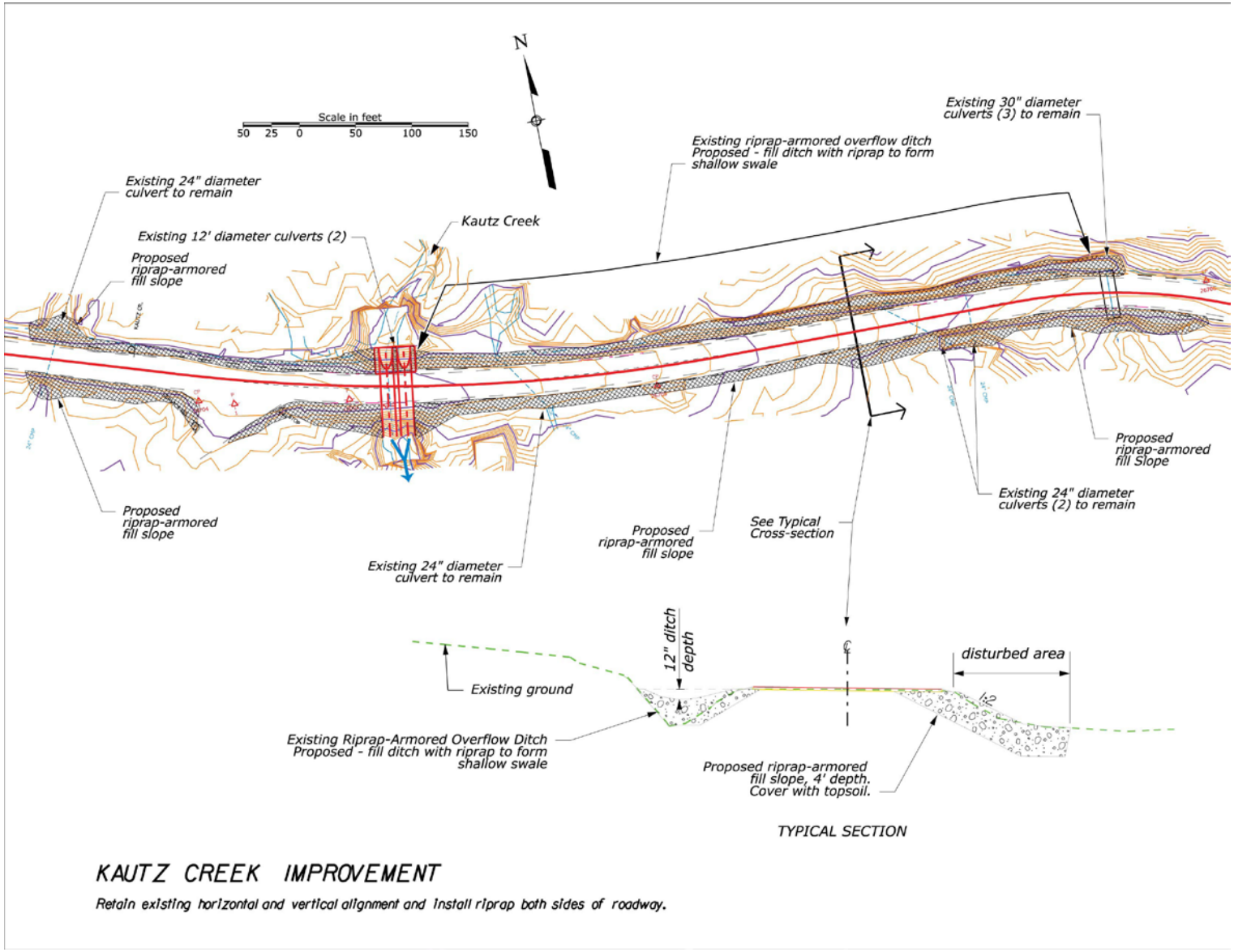
The total conveyance capacity from existing culverts with the proposed modifications would be about 2,200 cfs, or a 25-year flood event. Flood flows above this volume would begin to flow over the road, but with the proposed armoring, structural impacts to the road are expected to be minor. The road would be closed to vehicle travel and public access when flows are anticipated to overtop the road.

Narada Falls

The road near Narada Falls has insufficient drainage on the inside of the road, and standing water results in icing and a safety hazard for vehicle travel (Figure 2). Final design would provide additional capacity to adequately drain the road surface in this area. The existing drainage ditch inlets would be cleaned and additional drop inlets installed, if feasible. The road surface would be milled down to expose both the stone guardwall and historic scuppers or new scuppers would be installed to allow drainage through the guardwall. Repavement would be done in a manner to improve drainage off the road surface.

The southwest corner of the Narada Falls parking area appears to be slumping downhill along with outward rotation of the guardwall approach from the west. The proposed improvements for this site include excavation within the existing walls, refilling with compacted material, or use of a modified deep patch, resetting the drain inlet (and replacing the deteriorated culvert that contributed to the damaged guardwall), and regrading and paving the parking area to improve drainage and reduce the potential for further slumping. Additional work would include placing a riprap energy dissipater at the base of the existing retaining wall and remortaring the wall stone.

FIGURE 8. KAUTZ CREEK DRAINAGE IMPROVEMENTS



Culverts and Ditches

The project area contains about 304 culverts of less than 48 inches in diameter. Some of the existing culverts are rusted, damaged, and clogged with debris. Based on an evaluation of existing culvert data in December 2011, the FHWA estimated up to one-third of the culverts in the project area would require replacement. An exact number of culverts to be replaced will not be known until the culverts have been cleaned as part of the construction contract and examined. Culverts, inlets, and stone masonry headwalls would be cleaned and inspected to restore drainage where required. Riprap splash pads, riprap-lined chutes, or drain pipes would be installed, as needed, on culvert outlets to control erosion. New culverts may be installed or existing culverts replaced where culverts are damaged or drainage deficiencies have contributed to road foundation instability, road embankment erosion, or traffic safety hazards.

The new culverts would be the same dimensions as the replaced culvert. However, when additional capacity is needed or existing culverts are less than 24 inches in diameter, the culvert would be replaced with an adequately sized culvert (at least 24 inches). Culvert replacement would require temporary disturbance of about 60 to 80 square feet at inlets and up to approximately 150 square feet at the outlets.

Existing culverts at MP 2.1 and MP 6.3 would be replaced with larger culverts to provide improved fish passage. Culvert replacement in perennial streams and fish-bearing intermittent streams (unless dry) would be restricted to the period from July 15 to September 15 to avoid in-water work during periods when salmonid eggs and fry incubate within stream gravels. Streamflow would be pumped around the construction site during culvert replacement. Additional measures for protecting aquatic and riparian habitat and fauna during culvert cleaning and replacement activities are outlined in resource protection measures on page 46.

At locations where 18-inch culverts need to be replaced and the historic headwalls (cut stone masonry, dry-stacked, or rubble type) are in good condition, the 18-inch culvert would be replaced in-kind rather than upsizing to a larger culvert, which would not impact the historic headwalls. At one location where the historic headwall is in poor condition, the 18-inch culvert would be replaced with a 24-inch culvert and the headwall would be reconstructed in-kind. Stone masonry headwalls associated with culvert replacement that are contributing features to the NHLD would be restored according to the Secretary of the Interior's Standards for the Treatment of Historic Properties.

BRIDGES, STONE RETAINING WALLS, GUARDWALLS, AND STONE CURBS

A variety of repairs and upgrades would be implemented to improve the condition of structural features adjacent to the Nisqually – Paradise Road, Ricksecker Point Loop Road, and Paradise Valley Road. Repairs to historic structures that are contributing features to the NHLD would follow the Secretary of the Interior's Standards for the Treatment of Historic Properties. Implementation of containment BMPs to prevent debris from entering streams during bridge work would allow construction to occur throughout the season.

Tahoma Creek Bridge. Bridge work would include either painting and repairing the railing or replacing the railing. In addition, the concrete decking would be repaired and electrical and telecom conduits would be installed.

Kautz Creek Bridge and Culvert Crossing. The existing steel bridge railing over Kautz Creek would either be repaired and repainted or replaced. Temporary concrete Jersey barriers currently being used at the Kautz Creek culvert crossing would be replaced with new steel-backed timber guardrails.

Edith Creek Bridge. The Edith Creek Bridge on the Paradise Valley Road needs several repairs to address deteriorating conditions (FHWA 2008). Riprap would be placed around the Edith Creek Bridge footing to protect it from scour and undermining of the north abutment without constricting the channel. Missing dry stacked stone would be replaced using existing stone present at the site. Abutment stone would be cleaned and repointed. A short section of curb would be constructed to direct runoff away from the bridge to prevent erosion and drainage behind the abutment. Patching would also be done on the bridge deck prior to road resurfacing, as well as repairs to the underside of the bridge.

Nisqually Glacier Bridge. Minor repairs and improvements are needed on the Nisqually Glacier Bridge crossing of the Nisqually River. Concrete approach sections would be constructed, along with patches on the outside edge of the bridge deck and replacement of concrete curbs. Damaged areas of sidewalk would be reconstructed and expansion joints repaired. The bridge railing would be painted.

Historic Stone Masonry. Minor repairs to historic stone guardwalls, retaining walls, culvert headwalls, and curbs would be conducted as needed. This may include cleaning the masonry and resetting stone. All work would be done to maintain the historic integrity of the design characteristics and craftsmanship. The existing reveal of exposed stone guardwalls would be maintained and as previously mentioned, in some locations the approximate original reveal would be restored following asphalt milling and repaving.

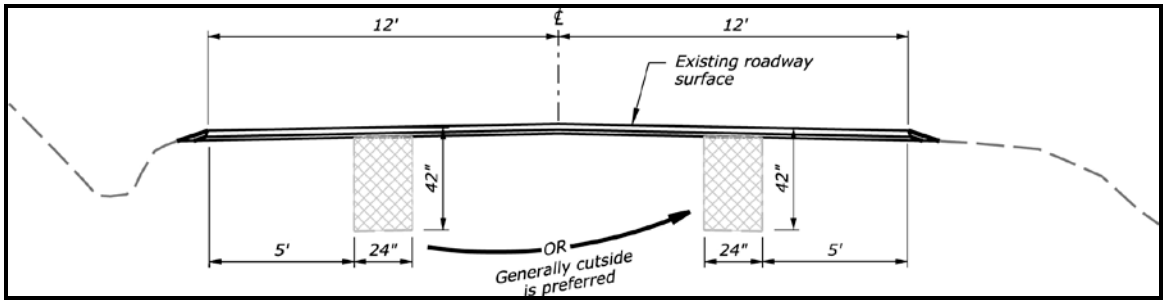
New culvert installation would maintain historic design and materials, including similar stones for headwalls and endwalls. Any repair of existing culvert headwalls and endwalls would retain the original materials whenever possible, and replacement stones would be of the same or similar material according to the Secretary of the Interior's Standards for the Treatment of Historic Properties. New stone would match the type and color used in existing stone structures; exposed surfaces would be clipped and feathered and the edges rounded to match the historic finish. As described previously, at locations where 18-inch culverts need to be replaced and the historic headwalls (cut stone masonry, dry-stacked, or rubble type) are in good condition, the 18-inch culvert would be replaced in-kind rather than upsizing to a larger culvert, which would not impact the historic headwalls. At one location where the historic headwall is in poor condition, the 18-inch culvert would be replaced with a 24-inch culvert and the headwall would be reconstructed in-kind.

Stone curbing design elements and materials would be retained during refurbishment or replacement. New stone curbing would be visually compatible (e.g., similar in scale, massing and materials, texture, and orientation) as existing stone curbing. Log curbing at the Nisqually Entrance also would be replaced in-kind.

UTILITIES

The project includes placing conduits and utility vaults beneath the road for future primary electrical power cable and fiber optics telecommunication improvements. The new conduits (six 2-inch-diameter PVC conduits) would house primary electrical power conductors and fiber-optic cable for telecommunication upgrades. The conduit would be installed prior to final paving. Vaults would be located periodically in existing asphalt pullouts or in the center of the travel lane when pullouts are not present. The conduit would be placed throughout the road corridor and would connect to 4.8 miles of conduits and vaults installed between Cougar Rock and Upper Miller in 2005. The existing buried powerline would be abandoned in place to minimize disturbance. Impacts to tree roots beneath the road would be minimized by locating the utility trench on the cut slope side of the road where tree roots are less likely to be present. Vaults for utility access would be located in pullouts where feasible.

FIGURE 9. UTILITY TRENCH EXCAVATION



TREE PROTECTION

The road between Nisqually and Paradise contains 253 trees larger than 18 inches in diameter at breast height (DBH) within 5 feet of the road pavement. Proposed road construction activities have the potential to adversely impact large trees adjacent to the road, although no trees larger than 18 inches DBH would be removed. Subexcavation and deep patches require excavation that could damage tree roots and impact the viability of the tree. Three areas of subexcavation and nine areas of deep patches were identified in the project area that could adversely impact up to 17 trees larger than 18 inches DBH. To reduce the potential for impacts, excavations near these trees would be limited to a depth of less than 1 foot within a 10-foot radius of the tree stem or the section of deep patch would be shortened to avoid excavation within 10 feet of the tree stem. Specific protocols for protecting trees are described in the resource protection measures on page 42. These measures include actions such as cutting roots cleanly after excavation with clean sharp tools, avoiding cutting roots 4 inches in diameter or greater, keeping exposed roots moist until covered with soil, backfilling the excavation as soon as possible, pruning roots, and watering the soil around the roots.

Similar tree protection measures would be used for construction of the MSE wall near Christine Falls, which supports four trees larger than 18-inches DBH and about 26 smaller trees less than 18-inches DBH. None of the larger trees would be removed, although root damage is possible and efforts would be made to minimize removal of smaller trees to the

extent feasible. In addition, tree stems close to the road can be wounded inadvertently by equipment. Trees larger than 18 inches DBH that are within 2 feet of the road edge would be wrapped with lumber to protect the stem. Orange construction fencing would be used around other large trees located from 2 to 5 feet from the road edge.

CONSTRUCTION AND TRAFFIC MANAGEMENT

The Nisqually to Paradise Road project would require several timing restrictions and measures to protect listed species and species of concern and visitor experience. The road would remain open subject to temporary traffic delays during daylight hours and night closures within constraints described below. Construction would occur between spring and fall, subject to weather conditions. Much of the roadwork would require closure of at least one lane with alternating traffic. Traffic delays during the day would be limited to a single delay of 20 minutes, with a total accumulated delay of no more than 30 minutes to minimize impacts to park visitors.

The road would be open for two-lane traffic on weekends with no construction work conducted on weekends or holidays. The weekend is defined as 5 p.m. Friday evenings to 10:30 p.m. Sunday evening. On holiday weekends, when Mondays is a holiday, the weekend would be defined as 5 p.m. Friday evenings to 10:30 p.m. Monday evening. Hauling after 9 p.m. and before 8 a.m. would not be allowed near Longmire and Cougar Rock (MP 6.1 to MP 10.0) to reduce impacts to overnight visitors. During construction of each deep patch, Kautz Creek drainage work, Tahoma Creek culvert and the subexcavated locations, visitors would have to travel on an aggregate surface during the week, until repairs are completed and these sections are paved. The proposed deep patch subexcavation, utility trenching work, and MSE wall construction would require full closure of the road, which would occur at night. Construction vehicles traveling along the road during the night are expected to be limited with only a slight increase over current night traffic.

Construction activities would be subject to the following additional seasonal construction timing and location restrictions in marbled murrelet and northern spotted owl habitat:

- Marbled Murrelet – Suitable marbled murrelet habitat occurs between MP 0.0 and approximately MP 12.0.
    - Daytime construction work may begin two hours after sunrise and would cease two hours before sunset in suitable marbled murrelet habitat from April 1 to September 23. This restriction does not apply to daytime activities between September 23 and April 1.
    - Night work would not occur between April 1 and June 15 in marbled murrelet habitat.
    - Night construction would be restricted from one hour after sunset to one hour prior to sunrise from June 15 to September 23. No restrictions related to marbled murrelet protections apply to nighttime activities between September 23 and April 1.

  - Within marbled murrelet habitat (MP 0.0 to MP 12.0), no day work would be allowed in the same area where night work occurred. Night construction work zones would be restricted to those areas 100 meters from day construction work zones.

- Northern Spotted Owl - Suitable northern spotted owl habitat occurs from MP 0.0 to MP 15.5.
  - No project activities, other than hauling, may occur in protected activity centers between March 15 and July 31 unless the current year's surveys conclude there is no conflict.
  - Current year surveys would be performed and preliminary results provided by June 1 of that year. If surveys reveal protected activity centers have shifted, then construction activities would be adjusted accordingly, with both daytime and nighttime construction being suspended immediately within newly identified protected activity centers and not permitted to begin at those locations until August 1.
  - Should annual northern spotted owl surveys be suspended, no construction may occur in unsurveyed habitat from MP 0.0 to MP 15.5 between March 15 and July 31.

VISITOR ACCESS DURING CONSTRUCTION

The one-way Paradise Loop Road would be closed to travel to allow for paving operations. Work on the Paradise parking area would occur in stages. Work on both the Paradise Loop Road and Paradise parking area would take place after Labor Day if possible and would be designed and implemented to minimize inconvenience to park staff and visitors while also ensuring the provision of a high-quality product.

The park is responsible for providing timely and accurate information to visitors during road construction activities to maintain a quality visitor experience. The park would provide clear and concise information on the status of construction work and any temporary traffic delays. To facilitate visitor planning, the status of roadwork and traffic delays would be advertised two weeks in advance and updated daily. The status of road construction and travel restrictions would be communicated via a number of outlets: the park website, regional newspapers, radio, entrance stations, visitor centers, news releases, local newspapers, media outlets, postings in local businesses, Washington State Department of Transportation (WSDOT) 511 information cell line, and other locations.

STAGING AREAS

Staging areas for equipment and storage of materials during construction would occur in pre-designated areas: Kautz Creek Service Area, Glacier Bridge, Westside Road intersection, and Ricksecker Loop Road. Some turnouts not associated with trailheads may be used (approved in advance). Two proposed material and equipment storage areas are in the Kautz Creek service area about 0.125 of a mile south of the Nisqually Road. These sites are approximately 9,000 square feet and 18,000 square feet, respectively, and would not be visible

from the Nisqually Road. To allow for efficient use of the site, the ditch between the road and the smaller staging area would be diverted around the west side of the staging area and the existing ditch would be filled in. The Kautz Creek area is infested with many noxious weeds and precautions would need to be implemented if this site is to be used (especially for staging of rock and topsoil) to avoid the spread of noxious weeds. These precautions could include chemical/manual control of existing noxious weeds prior to staging, covering stockpiled soil/rock material; brushing off equipment before moving to other parts of project area.

Some staging areas may need to be located outside of the park. The contractor would be required to comply with all of the applicable environmental laws and resource protection measures (page 44), including a weed free certification according to North American Weed Management Association standards for all staging areas outside the park. Pullouts and parking along the road, not associated with trailheads, also may be used to temporarily store equipment or materials. The pullout west of the Twin Firs trailhead is located at a stream crossing and, therefore, equipment parking, fueling, and spoil storage would not be allowed. Repair work may require temporary closure of the Kautz Creek parking area and partial temporary closure of the Narada Falls parking area. To avoid noise disturbance near the Cougar Rock campground, the parking area immediately west of the Nisqually Glacier Bridge would be used for staging any material or equipment needed for night work. Trailhead parking areas would remain open during construction.

The Ricksecker Loop would be used as a truck turnaround through the entire construction season and a portion of the loop may be used for staging and material storage, depending on seasonal constraints.

WATER FOR DUST CONTROL

Water would be needed during construction for dust control and other construction operations. Water would only be extracted from the park approved site on the lower Nisqually River located at the pullout at the suspension bridge in Longmire. In order to reduce impacts to the riverbank, the park would designate where pumping equipment would be located on the slope 14 days before using this water source. The contractor would be allowed to extract up to 15% of existing flow above park biologist designated minimum flow criteria, not to exceed 30,000 gallons per day. A muffled pump would be used to maintain noise levels similar to that of average ambient noise levels. Pumping for dust control and construction use would be restricted to two hours after sunrise and two hours before sunset. Water for use during night work would be pumped during the day and stored in tanker trucks.

RESOURCE PROTECTION MEASURES

To prevent and minimize potential adverse impacts associated with the preferred alternative, BMPs and mitigation measures would be implemented during the construction and post construction phases of the project. General and resource specific BMPs and mitigation measures for the project are listed below. (Note: This list is not all-inclusive, as there would be additional mitigation measures included in the contractor's specifications).

General Measures

- Construction limits would be clearly marked with stakes prior to the beginning of ground disturbing activities. No disturbance would occur beyond these limits other than protection measures for erosion/sediment control (these are typically placed just outside the clearing limit stakes). Temporary construction fencing would only be installed where determined necessary by FHWA/WFHLD and NPS project coordinators.
- All tools, equipment, barricades, signs, surplus materials, and rubbish would be removed from the project work limits upon project completion. Any asphalt surfaces damaged due to work on the project would be repaired to their original condition. All demolition debris would be removed from the project site, including all visible concrete and metal pieces.
- Materials, including removed stumps, unusable stone masonry headwall material, unusable pipe, signs, guardrail, and weed-infested soil would be disposed of outside the park, according to local, county, state, and federal regulations.
- Construction debris would be hauled from the park to an appropriate disposal location.
- Debris would not be burned or buried in the park.
- Delays for emergency response vehicles would be kept to a minimum by having emergency responders notify traffic monitors immediately via the park radio/frequency when the vehicle is dispatched, thus allowing approximately 10 minutes to clear the road before the arrival of the emergency vehicle. Emergency response providers and the contractor would need to coordinate on any road closures (for example, it may be necessary to temporarily stage emergency vehicles on both sides of a road closure).
- The contractor would provide temporary portable toilets for use by employees.

Air Quality

- Dust control (i.e., use of water as a dust suppressant) would occur, as needed, on active work areas where dirt or fine particles are exposed.
- Equipment would not be allowed to idle longer than 15 minutes when not in use.

Water Resources

- Measures to protect water quality from sedimentation are described below in the *Soils, Soil Erosion and Sediment Control* section.
- The contractor would be required to meet minimum federal and WSDOT soil erosion and sediment control standards for stream crossings (intermittent and perennial).
- Mechanized equipment would not be operated or material discharged or placed within the boundaries of any U.S. waters as identified by the ordinary high water mark or edge of a wetland. This includes wetlands, unless authorized by a permit issued by the U.S. Army Corps of Engineers (Corps) according to 33 USC § 1344, and

if required by the state agency having jurisdiction over the discharge of material into the waters of the U.S.

In the event of an unauthorized discharge:

- Further contamination would immediately be prevented.
- Appropriate authorities and the Contracting Officer (CO) would be immediately notified.
- Damages would be mitigated as required.

- The FHWA/WFLHD would acquire a National Pollution Discharge Elimination System (NPDES) permit for the project.
- Work areas, including material sources, would be separated by the use of a suitable barrier that would prevent sediment, petroleum products, chemicals, other liquids, or solid materials from entering the waters of the U.S. Barriers would be constructed and removed to avoid discharge of material into the waters of the U.S. Sediment or other material collected by the barrier would be removed and properly disposed of.
- Establish staging areas (used for construction equipment storage, vehicle storage, fueling, servicing, and hazardous material storage), if possible, at least 150 feet away from streams in a location and manner that would preclude erosion into or contamination of streams or wetlands. For storage of equipment and materials at designated staging areas within 150 feet of streams and wetlands, appropriate erosion protection measures would be implemented to protect water resources.
- Structurally adequate debris shields would be constructed to contain debris within the construction limits and prevent debris from entering waterways, travel lanes open to public traffic or areas designated not to be disturbed.
- The contractor would only extract water from the Park approved site on the lower Nisqually River located at the pullout at the suspension bridge in Longmire. In order to reduce impacts to the riverbank, the Park would designate where pumping equipment would be located on the slope 14 days before using this water source. The contractor would be allowed to extract up to 15 % of existing flow above park biologist designated minimum flow criteria, not to exceed 30,000 gallons per day. Water for use during night work would be pumped during the day and stored in tanker trucks.
- In order to prevent the spread of disease and pathogens when pumping water from streams for construction needs or stream diversion, the contractor would be required to decontaminate equipment before placing anything in the river and every time this equipment is moved and used in a separate surface water. The park would provide the contractor with decontamination procedures.
- The contractor would provide a screen (filtration size 0.08 inches maximum) on the end of the pump hose to filter out aquatic organisms. This screen should be cleaned of debris periodically. The contractor would provide a spill containment enclosure around the pump and or generator to contain gas, oil or other fluids. The contractor would provide a wattle or other filter barrier around the outside edge of the pullout to prevent siltation into the river. The CO would be notified 14 days prior to drawing

water to determine the presence of threatened or endangered species. The streambed and streambank vegetation would not be disturbed when drawing water. All Federal, state, and local permits, if required, would be obtained before drawing water.

- A Hazardous Spill Plan or Spill Prevention, Control and Countermeasures Plan, whichever is determined appropriate, would be in place, stating what actions would be taken in the event of a spill, notification measures, and preventive measures to be implemented, such as the placement of refueling facilities, storage, and handling of hazardous materials. The plan would be submitted at least two days before beginning construction work. Other measures related to the spill plan include:
    - All equipment on the project would be maintained in a clean and well-functioning state to avoid or minimize contamination from automotive fluids.
    - All equipment would be checked daily and any leaks would be immediately repaired upon discovery.
    - Vehicles or equipment leaking oil, gas, or antifreeze would not be stored in the park.
    - Chemicals, fuels, and other toxic materials would be stored, used, and disposed of in a proper manner.
    - Oil, hydraulic fluids, antifreeze or other chemicals would not be drained to the ground.
    - If possible, equipment or vehicles would be refueled at least 150 feet away from streams or identified wetlands in a location and manner that would preclude erosion into or contamination of streams or wetlands. For refueling at designated refueling areas within 150 feet of streams and wetlands, appropriate spill containment measures would be implemented to protect water resources.
    - A supply of acceptable absorbent materials would be kept at the job site in the event of spills. Acceptable absorbent materials are those that are manufactured specifically for the containment and cleanup of hazardous materials. Any spills would be cleaned up immediately.
    - In the event of a spill, the CO would be notified immediately. BMPs for drainage and sediment control, as described in the FHWA and NPS Stormwater Pollution Prevention Plan, would be implemented to prevent or reduce nonpoint source pollution and minimize soil loss and sedimentation in drainage areas.
- Vegetable oil-based hydraulic fluids are readily available and would be used in all heavy equipment to minimize potential impacts to water quality from spills.
- Fresh concrete, concrete byproducts, or other chemical contaminants would not be allowed to enter water bodies. Structures containing concrete would be sufficiently cured to prevent leaching prior to contact with the water body.
- Treated wood used for bridges or other structures would meet or exceed the standards established in the most current edition of “Best management Practices for

the Use of Treated Wood in Aquatic Environments" developed by the Western Wood Preservers Institute.

Floodplains

Additional resource protection measures for drainage improvements are included under Fish, Wildlife, and Special Status Species.

- The following measures would be used for drainage improvements at New Tahoma Creek and Kautz Creek:
    - Minimal placement of fill on floodplains is anticipated; except as needed to protect culvert inlets and outlets at New Tahoma Creek and to armor the road side slopes at Kautz Creek. Free natural drainage and natural contours would be preserved to the extent practicable when designing and completing improvements. Previously vegetated areas that are disturbed would be revegetated when construction is complete.
    - Project operations must cease under high flow conditions that inundate the project area, except for efforts to avoid or minimize resource damage.
    - Flood hazard mitigation would be provided by incorporating improved flood conveyance capacity for protecting life and minimizing damage to the road and natural resources.
    - Mitigation of flood hazards to road users would be accomplished by improved drainage and closure of the road during periods of very high flows if flooding is anticipated.

Soils, Soil Erosion and Sediment Control Measures

- Excavated material that is suitable for growth of native vegetation as determined by the park would be salvaged and stockpiled according to park stipulations before any additional construction work takes place.
- All conserved topsoil in the soil isolation zone from which it originated would be used before using excavated material. Topsoil refers to the uppermost soil horizon, usually 6 to 18 inches deep, which includes duff and other materials capable of supporting vegetation.
- An aggregate-topsoil course would be placed on road shoulders to match pavement structure and promote the establishment of native plant vegetation. The mixture would consist of 50% aggregate and 50% topsoil mix that would meet park's topsoil specifications.
- Topsoil would not be mixed with subsoil.
- All impacted areas would be hydroseeded and mulched to establish native plants, control erosion, and limit growth of invasive plant species. The hydroseeding method would be a two-step process that applies seed in a slurry of water, seed and tackifier on a prepared seedbed as the first step. The second step would apply wood fiber mulch and tackifier in a slurry of water over the first application. Tackifiers used in the process would be derived from plant materials to have no residual effects on the

soil, seed or germinating plants. The mulch and tackifier would serve to hold sediment in place until growing plants are able to hold soils in place. Hydroseeding should be done at the end of the construction season under conditions specified in the contract documents.

- If erosion control on disturbed areas at the end of the first construction season is needed, a plant-based tackifier and light mulch would be applied. Hydroseeding, the process described above, would then be applied at the end of the project after final paving.
- Use of BMPs in the project area for drainage area protection would include all or some of the following actions, depending on site-specific requirements:
    - Disturbed areas would be kept as small as practical to minimize exposed soil and the potential for erosion.
    - Erosion- and sediment-control devices would be installed and vegetation cleared prior to salvaging topsoil for storage.
    - Excavated material would be covered with water-repellent, breathable material during storage to prevent erosion/sedimentation.
    - Waste and excess excavated materials would be located outside of the ordinary high water mark of streams to avoid sedimentation.
    - Silt fences, sediment logs, temporary earthen berms, temporary water bars, sediment traps, stone check dams, or other equivalent measures would be installed. Erosion-control measures would be monitored to ensure they are properly installed and are functioning effectively.
    - Sediment traps, erosion checks, and/or filters would be constructed above or below all culvert drains (if such drains would be required) and in all other ditches before the runoff leaves the project construction limits.
    - Certified weed-free coir logs would be installed for filtering sediment from runoff and reducing the velocity of sheet flow. Logs would be installed according to plans and as directed by FHWA/WFLHD and the park to address erosion concerns. Logs would be placed in drainages that pass through work areas to limit erosion of exposed soils. Silt fencing would be installed around the perimeter of pullouts, which would be used for the storage of erodible materials. Silt fence would be installed according to plans; fencing would consist of one continuous piece of semipermeable fabric (or steps would be taken to join sections so there would be no gaps); fence would remain in an upright position after installation; materials and equipment would not be leaned against fencing to avoid fence collapse; and fencing would be repaired to ensure an effective barrier within 24 hours of deficiency notification.
    - Sediment logs would be placed around the perimeter, if materials would be stored on the road.
    - Straw or hay bales would not be used as filter barriers. When working in “wet” ditch lines, weed-free coir logs would be used at either end of the work area

across the ditch line to filter siltation and would be staked firmly in place. If water is running in one direction, a barrier would be needed at the downhill end of the work area only.

Vegetation

- No vegetation would be disturbed outside of the construction limits unless prior approval is obtained from the park. Any unauthorized disturbance would result in the contractor paying for the restoration of that area using the methods set forth in the contract documents.
- Ditches that currently support wetland plant species would be revegetated with native wetland species following ditch cleaning. Parking of equipment and private vehicles would be restricted to hardened surfaces, such as pullouts, concrete ditch lines, and closed lanes of the road to limit disturbance of roadside vegetation. All pullouts to be used as parking would be fenced around the perimeter with temporary construction fencing. No parking in wet ditches or adjacent to streams would be allowed.
- The park would review and approve construction limits within which clearing and grubbing would occur as identified in the project plans and contract documents and as staked on-site prior to construction commencing.
- Vegetation and root zones designated to remain would be fenced off for protection.
- Vegetation would be removed in a manner that would not injure the vegetation around it or compact or gouge the topsoil.
- Whenever possible designated trees, stumps, and snags to be cleared would be salvaged to be used for erosion control or natural litter on finished slopes. All salvaged woody debris would be stockpiled at the closest storage site within the same soil isolation zone by July 1 or by a park-approved deadline to avoid contamination from windborne weed seed.
- The following measures would be implemented to protect trees:
    - Any tree of concern to contractor would be inspected by park hazard tree expert and must be deemed likely to fail before tree is removed.
    - Excavations in the road for deep patches and other structural work near large trees would be limited to a depth of less than 12 inches or the bottom of the existing asphalt, whichever is greater, within a 10-foot radius of the tree stem or the section of excavation would be shortened to avoid excavation within 10 feet of the tree stem unless shown otherwise on the plan or otherwise directed by the CO.
    - Tree roots would be pruned with a saw making a clean vertical cut, removing the smallest portion of the root or root system possible that would still allow for excavation. Pruning equipment would be sterilized between each tree.
    - Excavated tree roots would be kept moist until covering with conserved topsoil.
    - Ropes, cables, or guy wires would not be fastened to trees.

- Construction materials or equipment would not be stacked against tree trunks.
- Protective measures would be installed around trees greater than 18 inches DBH in one of two ways depending on the proximity to road/staging areas:
    1. For trees immediately adjacent (2 feet or less) to pavement, staging areas, or other work areas, the tree trunk would be wrapped with vertical lengths of nominal 2-inch-thick lumber of varying width and lengths (i.e. 2" x 6" x 8') and secured with banding. Only 2-inch thick lumber would be wrapped around the parts of the tree trunk that face construction activity and that are vulnerable to damage. If lumber is not wrapped around the entire tree, then protective material would be placed under the banding to prevent it from cutting into the bark. Additionally, lumber covered sections of trees would be wrapped with orange construction fencing to provide a visual cue to heavy equipment operators. When possible, fencing would be extended to the dripline of the tree to protect the entire root system.
    2. For trees not immediately adjacent (2 to 5 feet) to construction activities, orange construction fencing would be installed. Fencing would only be installed around parts of the tree trunk that face construction activities and are vulnerable to damage. Construction fencing would be placed at least 2 feet out from the tree trunk to provide a 2-foot buffer. When possible, the fencing would be extended to the dripline of the tree to protect the entire root system.
- The park would provide a list of trees to be protected, with station numbers for each tree. This list would indicate which method would be used for each tree. FHWA/WFLHD would then identify all trees to be avoided in the field.
- Scarred tree surfaces would not be treated with tree paint. Damaged limbs would not be pruned unless approved by the CO.
- No tree roots would be cut or removed unless approved by the CO and park.
- The contractor would immediately report any tree damage caused by construction to the CO. If protected trees are damaged, the contractor would pay damages as determined by the CO and park.
- Clearing and grubbing would be done on an as needed basis and only with CO and park approval.
- Trees within excavation areas would be preserved as determined by the CO and the park.
- Vehicles/stage equipment would park only in pullouts or other approved areas to avoid damage to tree roots. No parking/staging would occur on road shoulders or other bare ground areas.
- Trees would not be pushed over with heavy equipment unless approved by the CO.

Special Status Vegetation Species

- If rare plant specimens (gnome plant, and lanceleaf grapefern) are encountered within the construction limits, they would be relocated in the spring prior to construction. They would be salvaged by the park prior to construction, stored outside the construction limits, and transplanted following construction.
- For *Thamnobryum neckeroides*, a moss species of interest:
    - Care would be taken to not remove vegetation or trees in the vicinity of the boulder complex where it was discovered to prevent changes in light intensity.
    - No slash from vegetation clearing would be disposed of around the boulder complex.
- For *Anthoceros fusiformis*, a hornwort species of interest:
    - Spores from this species would be collected before construction begins. Spores mature in late spring and continue to be produced throughout the summer months, ending with the first frost. These spores then would be used to "reseed" the area after construction is completed.
    - At the beginning of the construction, potentially impacted species would be moved by the park to an upslope position or an area of similar habitat outside of the project area. Because bryophytes do not have roots, this may work and could allow the population to survive.

Weed Control

- All imported rock and erosion-control materials that are capable of harboring plant seed would be certified weed-free according to North American Weed Management Association (NAWMA) standards to ensure that it is free of noxious weeds and accepted by FHWA/WFLHD and the park. Subsurface rock that has not been exposed to a weed source may be acceptable upon inspection by the park. The park would inspect all local material sources prior to use or transport of materials into the park.
- For a material source provider to be considered certified weed-free, all staging areas, work areas, and facilities associated with producing the material would be inspected by a qualified government inspector, qualified park employee or other proper officials or authority: a representative of that State's Department of Agriculture, a Weed Supervisor or Weed Superintendent, a University Extension Agent, or an individual designated by that State's law or regulations and determined to be free of all noxious weed and invasive plant species. Due to the presence of noxious weeds and exotic species within the project limits, the contractor would comply with the following measures:
    - The CO would inspect all contractor vehicles and equipment prior to entering the park for mud, weeds, and other unwanted substances. All vehicles (includes hydroseeder truck and inside of tank), heavy equipment, hauling vehicles, and trailers would be pressure-washed before their first entry into the park. Hauling vehicles that have previously transported weed-

contaminated material would be pressure-washed before transporting clean material. Subsequent entries of hauling vehicles into the park would not require pressure washing unless the vehicle shows signs of mud, plant material, or as requested by the FHWA/WFLHD or park.

- Vehicle loads would be covered to reduce exposure to noxious weeds when transporting rock, soil or other material that could contain weed seed. Excavated material, conserved topsoil, conserved rock/soil, and subexcavation material stockpiles would be covered with a breathable water repellent fabric, which would be anchored around the perimeter to hold it in place.
- The project would be divided into soil isolation zones to prevent the spread of noxious weeds by limiting the movement of weed-infested materials and equipment. The park would identify the starting and ending points for each zone to be included in the contract. The beginning and ending point of these zones would be clearly marked on the road, as directed by the FHWA/WFLHD and park. Rock, conserved topsoil, or stockpiled excavated material would not be transferred between the zones, unless approved by the park. Excavated materials must be retained in the zone where it originated at all times, unless approved by the park; or wasted at a disposal site outside the park with the park's approval. All vehicles and construction equipment showing signs of mud or plant material would be cleaned before moving them between different zones or leaving the project site to reduce the spread of noxious weeds. Equipment would be cleaned by brushing to remove material deposited on wheels, bumpers, and other exposed surfaces. Cleaning would not be required when moving vehicles and construction equipment between zones, provided they are clean and free of mud and/or plant material.
- Proposed locations for soil and rock stockpiles, and turnaround areas would be inspected and approved by the park resource advisor or plant ecologist before use. The park would treat a storage site before seed set if weeds are present to ensure the area is free of noxious weeds. The park would review proposed sites for acceptance. If the park does not approve the proposed site, an alternative site would be provided.

Wetlands

- Impacts to wetlands would be avoided and minimized to the extent practicable. No wetland fill would occur without authorization from the Corps and appropriate permitting under the Clean Water Act.
- Prior to construction work at New Tahoma Creek or other locations where wetlands may be present adjacent to the project area, certified weed-free coir logs or other erosion control measures would be installed to form a filter barrier to trap sediments from being deposited in wetlands. Construction fencing would be installed around wetlands to define construction limits.
- Hydrologic connections to wetlands adjacent to the road would be maintained via culverts, ditches, or other measures.

Fish, Wildlife, and Special Status Species

- Park staff would inform construction personnel of the occurrence and status of special status species within the project area, the potential impacts construction activities may have to the species and the potential penalties for taking or harming a special status species.
- Marbled Murrelet – Suitable marbled murrelet habitat occurs between milepost (MP) 0.0 and approximately MP 12.0.
    - Daytime construction work may begin two hours after sunrise and would cease two hours before sunset in suitable marbled murrelet habitat from April 1 to September 23. This restriction does not apply to daytime activities between September 23 and April 1.
    - Night work would not occur between April 1 and June 15 in marbled murrelet habitat.
    - Night construction work would be restricted from one hour after sunset to one hour prior to sunrise from June 15 to September 23. No restrictions related to marbled murrelet protections apply to nighttime activities between September 23 and April 1.
    - Within marbled murrelet habitat (MP 0.0 to MP 12.0), no day work would be allowed in the same area where night work occurred. Night construction work zones would be restricted to those areas 100 meters from day construction zones.
- Northern Spotted Owl – Suitable northern spotted owl habitat occurs from MP 0.0 to MP 15.5.
    - No project activities, other than hauling, may occur in protected activity centers from March 15 to July 31 unless the current year's surveys conclude there is no conflict.
    - Current year surveys would be performed and preliminary results provided by June 1 of that year. If surveys reveal protected activity centers have shifted, then construction activities would be adjusted accordingly, with both daytime and nighttime construction being suspended immediately within newly identified protected activity centers and not permitted to begin at those locations until August 1.
    - Should annual northern spotted owl surveys be suspended, no construction may occur in unsurveyed habitat from MP 0.0 to MP 15.5 from March 15 to July 31.
- The following measures would be taken to limit noise and disturbance from vehicles and construction equipment:
    - All motor vehicles and equipment would have mufflers conforming to original manufacturer specifications that are in good working order and are in constant operation to prevent excessive or unusual noise.

  - Sound attenuation devices (such as rubber strips or sheeting) would be installed and maintained on all equipment. This would include truck tail and other gate dampeners (both opening and closing) for all dump trucks on the project.
  - Use of un-muffled compression brakes would be prohibited within park boundaries.
  - The use of air horns within the park would not be allowed except for safety.
  - The contractor must use muffled pumping equipment for water withdrawals, water diversion, etc. (i.e., pump and generator to reduce noise to levels similar to that of the average ambient noise levels. No asphalt batch plants or rock crushing plants would be allowed within the park boundaries.

- If tree and shrub removal is required, nesting bird surveys would be done. If there are nesting migratory birds, then tree removal would be conducted outside of the nesting season for migratory birds (September to February) to avoid disturbing or take of a migratory bird nest.
- Any roadkill or wildlife collisions would be reported to the park immediately.
- Construction vehicle speeds would not exceed construction zone posted speed limits to decrease wildlife/vehicular incidents. Speed limits outside the construction zone would default to the posted speed limit.

Culvert Replacement Measures

- The appropriate Washington Department of Fish and Wildlife (WDFW) guidelines for the timing of in-water work would be followed. These guidelines are intended to avoid in-water work during periods when salmonid eggs and fry incubate within stream gravels.
  - In-water work is restricted to the period of July 15 to September 15 for all Nisqually River tributary streams (WAC-110-206).
  - No water rerouting or additional drainage would be added between MP 15 and MP 16 to protect wetland areas.
  - The culvert replacement at New Tahoma Creek would be limited to the period between August 1 and September 15 to minimize impacts to Fender's soliperlan stonefly.
  - Upstream of the isolated construction area, flow would be diverted around the construction site with a cofferdam (built with non-erosive materials) and an associated pump or a by-pass culvert.
  - The culvert would be installed in the dry or in isolation from the stream flow by the installation of a bypass flume or culvert, or by pumping the stream flow around the work area. Exception may be granted if siltation or turbidity is reduced by installing the culvert in the flowing stream. The bypass reach would be limited to the minimum distance necessary to complete the project. The project would incorporate mitigation measures as necessary to achieve no-net-loss of productive capacity of fish habitat. The following technical

provisions from Washington State Regulations would apply to temporary bypass culvert, or flume as applicable:

1. The temporary bypass culvert, flume, or channel would be in place prior to initiation of other work in the wetted perimeter.
2. A sandbag revetment or similar device would be installed at the inlet to divert the entire flow through the culvert, flume, or channel.
3. A sandbag revetment or similar device would be installed at the downstream end of the culvert, flume, or channel to prevent backwater from entering the work area.
4. The culvert, flume, or channel would be of sufficient size to pass flows and debris for the duration of the project.
5. For diversion of flow into a temporary channel the relevant provisions of the Washington State Regulations would apply.
6. Prior to releasing the water flow to the project area, all bank protection or armoring would be completed.
7. Upon completion of the project, all material used in the temporary bypass would be removed from the site and the site returned to pre-project conditions.
8. If fish may be adversely impacted as a result of this project, the park biologist would be notified and arrangements would be made by the NPS to capture and safely move fish from the job site to the nearest free-flowing water.

- Fish within construction sites that would be dewatered or isolated from the main water body would be captured and safely moved from the job site in accordance with the park Fish Removal and Dewatering Protocol. Fish capture and transportation equipment would be available on the job site during all in-water activities.
- Wastewater, from project activities and dewatering, would be routed to an area outside the ordinary high water line to allow removal of fine sediment and other contaminants prior to being discharged to state waters.
- Dewatering would not be required for culvert or ford removals on non-fish bearing streams unless substantial excavation of stream channel or culvert bedding materials would be required after the existing culvert or structure is removed.
- Any pump used for diverting water from a fish bearing water body would be equipped with a fish guard to prevent passage of fish into the pump. The pump intake would be screened with 3/32 inch or smaller mesh. Screen maintenance would be adequate to prevent injury or entrapment to juvenile fish and remain in place whenever water is withdrawn from the water body through the pump intake.
- Culverts would be approved for placement in small streams if placed on a flat gradient with the bottom of the culvert placed below the level of the

streambed a minimum of 20% of the culvert diameter for round culverts, or 20% of the vertical rise for elliptical culverts. The 20% placement below the streambed would be measured at the culvert outlet. The culvert width at the bed, or footing width, would be equal to or greater than the average width of the bed of the stream.

- Grade control structures would be permitted to prevent head-cutting above or below the culvert or bridge. Grade control typically would consist of boulder structures that would be keyed into the banks, span the channel, and would be buried in the substrate. Grade-control structures would accommodate fish passage for all species and life stages of fish present if technically feasible.
- Woody debris would be placed downstream of the road crossing when removed from the road-crossing inlet
- Culverts in fish-bearing streams would be designed, installed, and maintained to provide passage for all fish species and all life stages that are likely to be encountered at the site, if technically feasible.
- Existing roadways or travel paths would be used whenever reasonable. The number of new access paths to alleviate impacts to riparian vegetation and functions would be minimized.
- Disturbance of the bed and banks would be limited to that necessary to place the culvert and any required channel modification associated with it. Affected bed and bank areas outside the culvert and associated fill would be restored to pre-project configuration following installation of the culvert, and the banks would be revegetated within one year with native or other approved woody species. Vegetative cuttings would be planted at a maximum interval of three feet (on center), and maintained as necessary for three years to ensure 80% survival. Where proposed, planting densities and maintenance requirements for rooted stock would be determined on a site-specific basis. The requirement to plant woody vegetation may be waived for areas where the potential for natural revegetation is adequate, or where other engineering or safety factors preclude them.
- All fill material and man-made structures would be removed from stream channels. The natural stream channel profile would be restored. Bottom width opening of the fill removal at stream channel crossings would be equal to, or greater than, the natural bankfull channel width.
- Streambanks would be shaped to blend in to the existing natural banks upstream and downstream from the crossing removal.
- Streambed substrates would mimic the natural streambed characteristics upstream and downstream of the crossing replacement. Large woody material and/or large rocks may need to be placed within the crossing removal site to accomplish this objective.
- The toe of the excavation would be stabilized with large wood, appropriately sized rock, and/or vegetation as necessary to prevent excessive erosion of the new streambanks.

  - Culverts would be designed and installed to avoid inlet scouring and would be designed in a manner to prevent erosion of streambanks downstream of the project.
  - Installation of culverts at any location that differs from the approved plan would require Park and CO approval.

- Where ditch or culvert inlet cleaning is absolutely necessary (meaning drainage is impaired), work would be conducted during dry conditions (generally July and August). Parking and storing equipment and materials in these areas also would be avoided. Disturbed areas would be documented and submitted to the park biologist for follow-up assessments.
- The lane would not be extended into drainage ditches where wet ditch lines exist. Bridging of the ditch using a steelplate to provide minimum lane width may be allowed. All areas where extension of lane width is planned would subject to prior approval from the NPS Resource Advisor.
- The NPS Resource Advisor assigned to the project would be informed as soon as possible and at least two weeks before culvert or ditch cleaning, or repair or replacement activities occur. Amphibian surveys would be conducted by park resource staff to determine if amphibian species of concern (SOC) are present in culverts, and along wet ditches.
- Tadpoles would be removed prior to work.
- To prevent amphibians from using plastic sheeting, under drain pipes, and other miscellaneous construction materials as refuge sites, all construction materials would be stored within the paved road edge.
- Additional site specific resource protection measures for amphibians are shown in Table 2.

TABLE 2. AMPHIBIAN AND FISH RESOURCE PROTECTION MEASURES

MP	Construction Work	Night Work[1]	Resource Protection Measures[2]
0.0 – 0.3	Subexcavation	No	Restrict work to dry soil conditions in adjacent ditches, work day only, no work in May and June, extension of lane width only after NPS Resource Advisor approval.
0.4 – 0.6	Subgrade reinforcement	No	Restrict work to daylight hours; coir logs with drift fencing on both sides of road (extend 6 feet beyond ends).
0.6 – 0.7	Potential culvert replacement	No	Avoid ditch work, work within fish window (July 15 to September 15) or when conditions are dry if culvert is to be replaced or ditch work is necessary. If stream culvert is to be replaced, consult with NPS Resource Advisor.
0.8 – 0.85	Potential culvert replacement	No	Avoid ditch work, work within fish window (July 15 to September 15) or when conditions are dry if culvert is to be replaced or ditch work is necessary. If stream culvert is to be replaced, consult with NPS Resource Advisor.
0.9 – 1.1	Subexcavation, culvert replacement	No	Restrict work to daylight hours, and no extension of lane width. Work when conditions are dry if culvert is to be replaced or ditch work is necessary. Consult NPS Resource Advisor.

MP	Construction Work	Night Work[1]	Resource Protection Measures[2]
1.1 – 1.2	New Tahoma Creek culvert replacement	No	Work within fish window (July 15 to September 15), remove fish and tadpoles prior to work, install coir log with drift fence backing across channel on either end of work area and filter any sediment released.
1.6 – 1.7	Potential culvert replacement	No	Avoid ditch work, work within fish window (July 15 to September 15) or when conditions are dry if culvert is to be replaced or ditch work is necessary. If stream culvert is to be replaced, consult with NPS Resource Advisor.
1.75 – 2.5	Subexcavation, subgrade reinforcement, deep patch, potential culvert replacement	Yes	No work in May and June, coir log with drift fencing along edge of pavement on both sides of road (extend 6 feet beyond ends), work within fish window (July 15 to September 15) or when conditions are dry if culvert is to be replaced or ditch work is necessary. If stream culvert is to be replaced or lane width needs to be extended, consult with NPS Resource Advisor.
2.0 – 2.1	Potential culvert replacement	No	Day work only, install coir log with drift fencing along edge of pavement on both sides of road (extend 6 feet beyond both ends), work within fish window (July 15 to September 15) or when conditions are dry if culvert is to be replaced or ditch work is necessary. If stream culvert is to be replaced or lane width needs to be extended, consult with NPS Resource Advisor.
2.1 – 2.2	Potential culvert replacement, subexcavation nearby	No	Restrict work to daylight hours only, install coir log with drift fencing along edge of pavement on both sides of road (extend 6 feet beyond both ends), work within fish window (July 15 to September 15) or when conditions are dry if culvert is to be replaced or ditch work is necessary. Limit ditch work. If stream culvert is to be replaced or lane width needs to be extended, consult with NPS Resource Advisor.
2.2 – 2.3	Potential culvert replacements, deep patches, and subgrade reinforcements nearby	Yes	Work within fish window (July 15 to September 15) or when conditions are dry if culverts are to be replaced or ditch work is necessary. If stream culverts are to be replaced or lane width needs to be extended, consult with NPS Resource Advisor.
2.6 – 2.7	Subgrade reinforcement and potential culvert replacement	No	Work within fish window (July 15 to September 15) or when conditions are dry if culvert is to be replaced. If culvert is to be replaced consult with NPS Resource Advisor.
2.8 – 3.2	Subgrade reinforcement, deep patches, potential culvert replacements	Yes	Work within fish window (July 15 to September 15) or when conditions are dry if culvert is to be replaced. If culvert is to be replaced consult with NPS Resource Advisor.
3.4 – 3.6	Kautz Creek work	No	Work during dry period adjacent to stream, install sediment traps and erosion control.
4.3 – 4.4	Potential culvert replacements	No	Work within fish window (July 15 to September 15) or when conditions are dry if culverts are to be replaced or ditch work is necessary. If stream culverts are to be replaced or lane width needs to be extended, consult with NPS Resource Advisor. No equipment storage, fueling or stockpiling at turnout, which is located over culvert. Protect stream with sediment/silt barrier.
4.9 – 6.0	Deep patches, subgrade reinforcement, potential culvert replacement	Yes	Work within fish window (July 15 to September 15) or when conditions are dry if culverts are to be replaced or ditch work is necessary. If stream culverts are to be replaced or lane width needs to be extended, consult with NPS Resource Advisor.
6.1 – 6.2	Deep patch and potential culvert replacement	Yes	Work within fish window (July 15 to September 15) or when conditions are dry if culverts are to be replaced or ditch work is necessary. If stream culverts are to be replaced or lane width needs to be extended, consult with NPS Resource Advisor.

MP	Construction Work	Night Work[1]	Resource Protection Measures[2]
6.3 – 6.4	Potential culvert replacement	No	Work within fish window (July 15 to September 15) or when conditions are dry if culverts are to be replaced or ditch work is necessary. If stream culverts are to be replaced or lane width needs to be extended, consult with NPS Resource Advisor.
6.4 – 6.5	Potential culvert replacement	No	Work within fish window (July 15 to September 15) or when conditions are dry if culvert is to be replaced. If culvert is to be replaced consult with NPS Resource Advisor.
6.5 – 6.6	Potential culvert replacement	No	Work within fish window (July 15 to September 15) or when conditions are dry if culvert is to be replaced. If culvert is to be replaced consult with NPS Resource Advisor.
7.5 – 7.6	Potential culvert replacement	No	Work within fish window (July 15 to September 15) or when conditions are dry if culvert is to be replaced. If culvert is to be replaced consult with NPS Resource Advisor.
7.8 – 8.1	Standard road rehabilitation activities	No	Restrict work to dry soil conditions in adjacent ditches, no work in May and June. If lane width needs to be extended, consult with NPS Resource Advisor. Provide sediment barriers. No driving on uphill shoulder.
10.6 – 10.9	MSE wall, deep patch, potential culvert replacement	Yes	Restrict work to dry soil conditions in adjacent ditches. Avoid extension of lane width. If lane width needs to be extended, consult with NPS Resource Advisor. Install silt fence along edge of pavement on upslope side to protect water quality of adjacent seeps and wet ditch.
11.3 – 11.6	Standard road rehabilitation activities	No	Restrict work to day only, no extension of lane width. Install construction fencing on upslope side of road. Install sediment barriers.
11.7 – 12.0	Deep patch	Yes	No extension of lane width or ditch cleaning. Add sediment barriers to protect wet ditch and culvert crossing that discharge flow downslope.
14.8 – 15.8	Deep patch, drainage improvement	Yes	Restrict work to dry soil conditions in adjacent ditches. No extension of lane width or ditch cleaning. If ditch cleaning absolutely necessary, consult with NPS Resource Advisor. Use sediment barriers along both sides of the road.
18.4 – 21.0	Standard road rehabilitation activities	No	Restrict work to day only, no work until snow-bank on east side is completely melted and ditches are dry. Contingent on approval by NPS Resource Advisor who would visit site prior to construction to check conditions. Upslope habitat beyond paved road edge would be left undisturbed, no removal of substrate, including gravel, cobble, boulders or downed wood. No extension of lane width.

[1] Areas of night work have greater potential for amphibian impacts and additional resource protection measures may be used.
[2] All instream work would be conducted during the fish window from July 15 to September 15 or when conditions are dry.

- Feeding or approaching wildlife would be prohibited.
- The park wildlife ecologist would be notified if bear or fox loiter in the project area.
- A litter control program would be implemented during construction to eliminate the accumulation of trash. All food items would be stored inside vehicles, trailers, or wildlife-resistant receptacles except during actual use to prevent attracting wildlife.
- Visitors in traffic delays would be educated by NPS staff, when available, to not approach or feed wildlife.

Cultural Resources

- In the event of the inadvertent discovery of historic properties such as archeological resources, suspected human remains, funerary objects, sacred sites, or objects of cultural patrimony, the park archeologist and Superintendent would immediately be notified. The park would follow their *Archaeological Inadvertent Discovery Plan* approved by the SHPO. Work in the affected area(s) would stop immediately until the historic properties are reviewed by the park. As appropriate, consultation with the Washington Department of Archeology and Historic Preservation and any affected Native American tribes would also take place regarding disposition of affected artifacts and remains. During consultation, reasonable measures would be taken to protect the discovery site, including any appropriate stabilization or covering; to ensure the confidentiality of the discovery site; and to restrict access to the site of discovery.
- A monitoring plan would be developed by the park for project activities that have the potential to affect archaeological resources recommended or determined eligible for inclusion on the National Register of Historic Places. This plan would require an archaeological monitor to be present on-site during ground disturbing activities in or around culturally sensitive areas as determined by the park and consulting parties including the Washington Department of Archaeology and Historic Preservation. Based on the monitoring plan, the contractor would notify the park two weeks in advance of conducting activities in culturally sensitive areas
- Historic structures and landscapes would be protected by following the *Secretary of the Interior Standards for the Treatment of Historic Properties*.

Visitor Use and Experience

- Generally road travel delays would be kept to one stop for a maximum of 20 minutes with a 10-minute travel time, for a total maximum one-way delay of 30 minutes, except during temporary road closures.
- The status of road construction and travel restrictions would be communicated via a number of outlets: the park website, regional newspapers, radio, entrance stations, visitor centers, news releases, local newspapers, media outlets, postings in local businesses, WSDOT 511 information cell line, and other locations.

Public Health, Safety, and Park Operations

- During construction, signs would inform visitors of construction activities and closures along the Nisqually – Paradise Road.
- Appropriate barriers and barricades would be used to clearly delineate work areas and provide for safe vehicle travel through construction areas.
- Trucks hauling debris and other loose materials would be covered to maintain adequate freeboard to prevent spillage to paved surfaces.
- Construction workers would wear appropriate attire such as hard hats, gloves, and goggles to protect themselves from natural hazards such as falling rocks. Visitors would not be allowed outside their vehicles in a construction zone. Park staff would

also be required to wear protective gear if they are working outside in the construction zone.

- Any external lighting for night work would be shielded and down-casted as much as possible to minimize night sky pollution.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Resurface Existing Road

Minor improvements to the surface of the road, such as milling and overlay or chip and seal, would not address the underlying structural, geotechnical, and drainage issues contributing to the road problems. Maintenance costs would increase in the long term if structural and drainage deficiencies are not corrected. Resurface options were eliminated because they would not meet the project purpose and need.

New Tahoma Creek

Sediment deposition in the main Tahoma Creek stream channel has increased the magnitude and frequency of overbank flows to the existing box culvert at New Tahoma Creek. Continued aggradation of Tahoma Creek could lead to a channel avulsion with additional flows directed into New Tahoma Creek. A new bridge may eventually be needed at this location to provide the capacity to convey larger flows and debris. However, it was determined that replacement of the existing 3-foot by 6-foot culvert with an 11-foot-diameter culvert would allow conveyance of existing flows and some of the overbank flows from Tahoma Creek, which would be a substantial improvement over existing conditions. A new culvert also would provide fish passage. While the larger culvert would not be adequate to convey flood flows, construction of a bridge is beyond the scope and funding available for the rehabilitation project.

Kautz Creek

Flooding and debris in 2006 resulted in Kautz Creek being rerouted to the historic channel about 0.25 of a mile east of the Kautz Creek Bridge. Two 12-foot-diameter culverts were installed in 2007 to convey flow for the shifted Kautz Creek channel. FHWA and the park determined that additional improvements are needed to protect the road and better convey flood flows. Several options were considered including armoring the overflow ditch and adding additional culverts at the sag in the road east of Kautz Creek to increase conveyance capacity during flood flows. Additional culverts would increase the existing conveyance capacity during flood events, but would not provide as much protection of the road as the preferred alternative. Increasing the elevation of the road by about 2 feet for a distance of about 1,500 feet was also considered to improve conveyance capacity. Raising the elevation of the road would improve flood conveyance, but the preferred alternative would better allow natural stream migration to occur while armoring the road. Construction of a bridge was considered; however, because of the dynamic nature of Kautz Creek and uncertainty about future changes in the channel location, it is difficult to know where to

place the bridge. Construction of a bridge may be considered in the future, but it is currently beyond the scope and funding available for the rehabilitation project. While all of these options would help address drainage issues at Kautz Creek, the preferred action, as described on page 27, provided the best immediate solution to protecting both the road and adjacent natural resources.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

According to the Council of Environmental Quality regulations implementing NEPA (43 CFR 46.30), the environmentally preferable alternative is the alternative "that causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources. The environmentally preferable alternative is identified upon consideration and weighing by the Responsible Official of long-term environmental impacts against short-term impacts in evaluating what is the best protection of these resources. In some situations, such as when different alternatives impact different resources to different degrees, there may be more than one environmentally preferable alternative."

The preferred alternative to repair the Nisqually to Paradise Road Rehabilitation, is the environmentally preferable alternative for several reasons: 1) it would best preserve the natural and cultural features along the road because it implements structural improvements that would provide long-term protection of environmental and cultural resources adjacent to the road; 2) drainage improvements would reduce the potential for road failure, erosion and impacts to water quality and cultural resources; 3) it would support sustainable design concepts and energy efficiency by providing for the reuse of existing asphalt. For these reasons, the preferred alternative causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources, thereby making it the environmentally preferable alternative.

By contrast, the no action alternative is not the environmentally preferable alternative because although there would be no construction or ground-disturbing activities that would damage previously undisturbed elements of the biological and physical environment 1) it would not protect park natural and cultural resources, as the road would continue to deteriorate without rehabilitation; 2) inadequate drainage could lead to road damage, erosion, and impacts to water quality, natural resources, and cultural resources; and 3) continued high maintenance requirements would not be energy efficient.

ALTERNATIVES COMPARISON TABLE

A comparison of the alternatives and the degree to which each alternative fulfills the needs and objectives of the proposed project is summarized in Table 3.

TABLE 3. ALTERNATIVES COMPARISON

No Action Alternative	Preferred Alternative Repair Nisqually – Paradise Road
Under the no action alternative, the NPS would not implement road repair or improvements. Routine road maintenance would continue, but the road pavement and structural integrity would continue to deteriorate. There would be no improvements to surface pavement, subgrade, drainage, walls, bridges, utilities, parking, and pullouts.	Under the preferred alternative, the NPS would implement the repairs and improvements necessary to restore the condition of the road. The proposed improvements would repair structurally deficient areas of the road, correct drainage issues, improve flood conveyance, repave the entire road and Paradise parking areas, improve parking lot safety, rehabilitate or refurbish bridges, protect existing guardwalls and retaining walls, install slope embankment protection, add new guardrail at Kautz Creek, and install a buried powerline and upgraded communication utilities in the road.
Meets Objectives?	
The no action alternative does not fulfill the project objectives. Visitor enjoyment and safety concerns would not be addressed because problems associated with the condition of the road surface, drainage, parking, and pullouts would not be addressed. The efficiency of park operations would not be improved and maintenance requirements and costs would increase. Park natural and cultural resources and the scenic quality of the road would be compromised by deteriorating road conditions, inadequate drainage and flood conveyance, erosion, and damage to historic cultural features.	The preferred alternative fulfills the project objectives by implementing needed road repairs and improvements. Visitor enjoyment and safety would benefit from measures to improve the condition of the road, pullouts, parking, drainage, and other rehabilitation measures. Road and facility infrastructure improvements would make travel by vehicles easier and safer. The efficiency and cost of park operations would improve from better road conditions and reduced maintenance requirements. Park cultural resources, including the NHLD, would be protected by road rehabilitation, slope stabilization, drainage improvements, and other structural repairs that reduce the potential for deterioration of historic features. Road repairs and improvements would be implemented in a manner to minimize adverse effects on natural resources. The preferred alternative would meet project objectives.

IMPACT SUMMARY

A summary of potential environmental effects for the alternatives is presented in Table 4.

TABLE 4. IMPACT SUMMARY TABLE

Impact Topic	No Action Alternative	Preferred Alternative Repair Nisqually – Paradise Road
Air Quality	The no action alternative would have local short-term negligible to minor adverse impacts to air quality and long-term negligible to minor adverse impacts to GHG emissions from periodic road maintenance activities that generate vehicle emissions.	Road rehabilitation would result in local short-term negligible to minor adverse impacts to air quality and GHG emissions.
Vegetation and Special Status Species	The no action alternative would have local long-term negligible to minor adverse effects on vegetation and special status plants adjacent to the road from erosion, drainage problems, and periodic maintenance.	The preferred alternative would have impacts to vegetation from road shoulder compaction, introduced soils, and the likelihood that road repairs would result in an increase in exotic plant species. The preferred alternative would have local long-term minor adverse effects from road rehabilitation disturbances that are estimated to temporarily affect about 0.02 of an acre and local long-term adverse impacts

Impact Topic	No Action Alternative	Preferred Alternative Repair Nisqually – Paradise Road
Vegetation and Special Status Species (continued)		from placing riprap on about 0.72 of an acre of roadside vegetation at New Tahoma Creek and Kautz Creek. Excavations within the road for structural repairs would be scaled back to reduce impacts to tree roots, but a local long-term minor adverse impact would occur from excavation that removes tree roots that may lead to mortality for up to 17 trees larger than 18 inches DBH. Replacement of about 100 culverts would have a local short-term minor adverse effect on vegetation. Weed establishment in areas of disturbed soil also is possible, but would be reduce with weed control practices. A few specimens of state rare plant species—gnome plant and lanceleaf grapefern—may be adversely affected by construction; although salvage and transplanting may reduce impacts. One bryophyte species of interest is likely to be adversely impacted from ditch work adjacent to the road. Improvements to drainage and reductions in erosion would have a long-term beneficial effect on vegetation.
Wetlands	The no action alternative would have local long-term negligible adverse effects on wetlands adjacent to the road from erosion, drainage problems, and periodic maintenance work.	The preferred alternative would have local long-term minor adverse effects from road repair and improvement disturbances that are estimated to affect about 1.0 acre of roadside ditch supporting wetland vegetation, and less than 0.25 of an acre of wetlands from drainage work at New Tahoma Creek and installation of two new fish passable culverts on small perennial streams. Less than 0.10 of an acre of stream channel would be temporarily disturbed from culvert installation at New Tahoma Creek and placement of rock for to improve amphibian movement at the West Side Road culvert outlet. Replacement of about 100 culverts would result in a temporary wetland disturbance at some locations. A local long-term adverse impact to less than 0.01 of an acre of wetlands would occur from drainage work at Kautz Creek. Road repairs and drainage improvements would have a long-term beneficial effect on wetlands from improved water conveyance, reduced erosion, and less sediment deposition.

Impact Topic	No Action Alternative	Preferred Alternative Repair Nisqually – Paradise Road
Water Resources — Quantity and Quality	The no action alternative would result in local long-term minor to moderate adverse effects on water resources from ongoing drainage and erosion problems associated with the deteriorating condition of the road and inadequate drainage.	Proposed road rehabilitation work and drainage improvements would have local short-term minor adverse effects on water quality from surface disturbances that may generate erosion and increased sediment runoff. Proposed erosion control measures to minimize erosion during construction, and revegetation of disturbed areas would minimize short-term effects. Rehabilitation work would result in a long-term benefit to water resources by increasing the conveyance capacity of drainage structures, and improving or restoring hydrologic functions. Water extractions from local streams would result in a local short-term minor adverse effect on streamflow and water quality from periodic withdrawals.
Floodplains	The no action alternative would have a local long-term moderate adverse impact on the New Tahoma Creek and Kautz Creek floodplains by not increasing the capacity of existing drainage structures to better convey flood flows.	Installation of new drainage structures at New Tahoma Creek and drainage improvements at Kautz Creek would have a long-term beneficial effect by increasing the capacity to carry flood flows and reducing the potential for damage to the road and other resources.
Fish, Wildlife, and Special Status Fish and Wildlife Species	The no action alternative would have no new impacts on fish, wildlife, and special status wildlife species or critical habitat, although periodic road maintenance and repair work to address deteriorating road conditions would have a short-term minor adverse impact on fish, wildlife, and special status species, and critical habitat. Impacts to the northern spotted owl and marbled murrelet would be local, short-term, minor to moderate, and adverse from the periodic repairs required to address deteriorating road conditions.	The additional noise and disturbance during construction would result in temporary impacts to fish, amphibians, mammals, birds, and some special status wildlife species. The preferred alternative may affect, but is unlikely to adversely affect, the northern spotted owl. Mitigation measures would be implemented to restrict the timing of construction activities near northern spotted owl habitat until young owls have fledged. The preferred alternative may affect and is likely to adversely affect marbled murrelets because it is not feasible to limit construction to avoid the breeding season. Mitigation measures for northern spotted owls also would reduce impacts to marbled murrelets. Impacts to golden eagle, northern goshawk, peregrine falcon, pileated woodpecker, Lewis' woodpecker, olive-sided flycatcher, Vaux's swift, long-eared myotis, long-legged myotis, Pacific Townsend's big-eared bat, pika, coastal cutthroat and other native fish species, Cascades frog, tailed frog, Van Dyke's salamander, Larch Mountain salamander, and Fendler's soliperan stonefly would be local, short- to long-term, minor to moderate, and adverse from temporary disturbances during construction. Impacts to Cascade fox may be short-term and adverse, but may increase survival. Installation of a fish-passable culvert at New Tahoma Creek and other culvert replacements would be a long-term benefit to cutthroat trout and other aquatic species. There would be no effect to EFH for Chinook salmon, Coho salmon, or pink salmon.

Impact Topic	No Action Alternative	Preferred Alternative Repair Nisqually – Paradise Road
Cultural Landscape	Impacts to the cultural landscape and NHLD are anticipated to be local, long-term, and beneficial for typical maintenance work. However, should there be a failure to a structural feature of the road, adverse impacts to the cultural landscape and NHLD would be local, short- to long-term, and minor to moderate.	Under the preferred alternative, there would be localized short-term negligible to minor adverse impacts to the cultural landscape setting during project construction. However, the proposed road rehabilitation would have a local long-term beneficial impact to the cultural landscape and associated historic structures from improvements designed to repair and replace deteriorating structural features that contribute to the integrity of the road. The proposed project would not alter any of the character defining features of the road. The park finds that the undertaking as described would have no adverse effect to historic properties including the Mount Rainier NHLD.
Archeological Resources	The no action alternative would have no new impacts on archeological resources and no cumulative effects.	The park determined that the preferred alternative would not adversely affect any known archaeological resources. Limiting the majority of the rehabilitation to the existing road prism, and monitoring by a park archeologist during ground disturbing activities in culturally sensitive areas, would reduce the potential for adverse impacts.
Visitor Use and Experience	The no action alternative would have local long-term minor to moderate adverse effects on visitor use and experience from ongoing deterioration of the road and structural features that contribute to the quality of the visitor experience, and that provide access to recreation resources. Although the road would remain open to visitor access, as road conditions deteriorate, periodic maintenance projects or road failure would require traffic delays or road closure at random times and locations, which would inconvenience visitors.	Traffic delays would inconvenience visitors traveling along the Nisqually – Paradise Road during construction. In response to construction activities, some visitors may avoid the park, visit other portions of the park, or choose alternate routes for regional travel connections. The park would inform visitors in advance of construction via a number of sources so visitors can best plan their schedule and activities and minimize impacts. The effect on visitor experience and recreation resources would be short-term, moderate, and adverse at the local and parkwide level during construction. The preferred alternative would provide local long-term beneficial effects on the quality of the visitor experience following construction by improving the quality and condition of the road.
Visual Resources	The no action alternative would have a local long-term minor to moderate adverse effect on the visual character of the road corridor if deteriorating road infrastructure is not repaired. Past, present, and reasonably foreseeable projects would result in local long-term beneficial impacts to visual resources.	Road rehabilitation would have a local short-term minor adverse impact to visual quality during and immediately following construction work, but would have a long-term beneficial effect by protecting and preserving the scenic and visual character of the road.

Impact Topic	No Action Alternative	Preferred Alternative Repair Nisqually – Paradise Road
Public Health and Safety	The no action alternative would result in local long-term minor to moderate adverse effects on public health and safety by not addressing safety issues and needed road rehabilitation and repairs. The potential for accidents would be similar to existing conditions and may increase as the road continues to deteriorate and the need for maintenance increases.	Proposed rehabilitation and improvements would address public health safety concerns associated with the Nisqually – Paradise Road. Improvements to road pavement, visibility, sight distance at the Kautz Creek parking area, and drainage would improve safety and driving conditions. The preferred alternative would result in local long-term beneficial effects on public health and safety from improvements to the structural features of the road and safety measures that reduce the potential for accidents.
Park Operations	The no action alternative would result in local long-term minor to moderate adverse effects on park operations by not addressing safety issues and needed road repairs. Maintenance requirements and costs would increase as the road and associated infrastructure continues to deteriorate.	The proposed road rehabilitation and improvements would address road maintenance concerns in the project area. Improvements to road pavement, embankments, and drainage would improve safety and driving conditions, reduce maintenance requirements, and reduce the risk of future road failure. Construction work and associated traffic delays would cause a disruption in normal traffic patterns, parking, and visitor activities in the park; and place a greater demand on park staff. The preferred alternative would result in local and parkwide short-term moderate adverse impacts to park operations during construction. Completion of the preferred alternative would result in local short-term moderate adverse impacts during and construction and local long-term beneficial effects to park operations by improving the road surface and decreasing maintenance requirements.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter provides a description of the resources potentially impacted by the alternatives and the likely environmental consequences. The chapter is organized by impact topics that were derived from internal park and external public scoping. Impacts are evaluated based on context, duration, intensity, and whether they are direct, indirect, or cumulative. More detailed information on resources in the park may be found in the GMP (NPS 2001).

GENERAL METHODS

This chapter contains the environmental impacts, including direct and indirect effects, and their significance for each alternative. The analysis is based on the assumption that the mitigation measures identified in the *Resource Protection Measures* section in the "Alternatives" chapter would be implemented for the preferred alternative. Overall, the NPS impact analyses and conclusions were based on the review of existing literature and park studies, information provided by experts within the park and other agencies, professional judgment and park staff insights, and public input.

The following terms are used in the discussion of environmental consequences to assess the impact intensity threshold and the nature of impacts associated with each alternative.

Type: Impacts can be beneficial or adverse.

Context: Context is the setting within which an impact would occur, such as local (in the project area near the road), parkwide (in the park outside of the project area), or regional (in west-central Washington).

Impact Intensity: Impact intensity is defined individually for each impact topic. There may be no impact; or impacts may be negligible, minor, moderate, or major.

Duration: Duration of impact is analyzed independently for each resource because impact duration is dependent on the resource being analyzed. Depending on the resource, impacts may last for the construction period, a single year or growing season, or longer. For the purposes of this analysis, impact duration is described as either short-term or long-term.

Direct and Indirect Impacts: Effects can be direct, indirect, or cumulative. Direct effects are caused by an action and occur at the same time and place as the action. Indirect effects are caused by the action and occur later or farther away, but are still reasonably foreseeable. Direct and indirect impacts are considered in this analysis, but are not specified in the narratives. Cumulative effects are discussed on page 62.

Threshold for Impact Analysis: The duration and intensity of effects vary by resource. Therefore, the definitions for each impact topic are described separately. These definitions were formulated through the review of existing laws, policies, and guidelines; and with assistance from park staff, regional NPS, and Washington office NPS specialists. Impact intensity thresholds for negligible, minor, moderate, and major adverse effects are defined in a table for each resource topic.

CUMULATIVE EFFECTS

Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time. The Council of Environmental Quality regulations that implement NEPA require an assessment of cumulative impacts in the decision-making process for federal projects.

Methods for Assessing Cumulative Effects

Cumulative impacts were determined by combining the impacts of the Preferred or No Action alternative with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects in the park or the surrounding region that might contribute to cumulative impacts. The geographic scope of the analysis includes actions in the Nisqually – Paradise Road corridor, as well as other actions in the park or surrounding lands where overlapping resource impacts are possible. The temporal scope includes future projects within a range of approximately 10 years.

Past, present, and reasonably foreseeable actions were then assessed in conjunction with the impacts of the alternatives to determine if they would have any added adverse or beneficial effects on a particular natural or cultural resource, park operation, or visitor use. The impact of reasonably foreseeable actions would vary for each of the resources. Cumulative effects are considered for each alternative and are presented in the environmental consequences discussion for each impact topic.

Past Actions

Past actions include activities and events that have influenced and affected the current condition of the environment in the project area. The Nisqually – Paradise Road was originally completed in 1915 and has undergone periodic reconstruction, maintenance, repairs, and overlays since that time. In 2006, flooding washed out a portion of the road at Sunshine Point, and required temporary closure of the road and permanent closure of the campground. This section of the road was subsequently realigned away from the Nisqually River. Streambank stabilization measures on the Nisqually River west of Longmire (MP 6.1) were completed in the fall of 2010 to address erosion and protection of the Nisqually – Paradise Road. Road construction and associated roadside developments at the Nisqually

Entrance; facilities at Longmire; Cougar Rock campground; and other pullouts, parking areas, and trailheads along the road have all contributed to the current status of resources in the project area. The park completed construction of the Henry M. Jackson Memorial Visitor Center at Paradise from June 2006 to October 2008 and demolition of the H.M. Jackson Visitor Center in 2009. Elsewhere in the park, with the exception of backcountry trails, most development and past actions have occurred primarily within road corridors.

Current and Future Actions

The park is planning several actions in or near the Nisqually – Paradise Road corridor in the future that could contribute to the cumulative effects from road rehabilitation. These actions include:

- Implementation of a hazard tree management plan that would selectively remove trees at widely dispersed sites that are a potential risk to visitors and employees should the trees fall. Removal of hazard trees has been identified at multiple locations along the Nisqually – Paradise Road including sites at the Entrance Station, Sunshine Point, Kautz Creek Picnic Area, Longmire, Cougar Rock campground/picnic area, Narada Falls, and Paradise.

- The park is currently evaluating flood control and streambank protection measures for several segments of the Nisqually River that parallel the Nisqually – Paradise Road. Previous flooding and normal annual streamflow at Sunshine Point is eroding the streambank and pose a threat to the adjacent road. It is anticipated the park would implement structural measures, such as point bars or engineered logjams, at these locations in the future.

- The park is currently repairing about 10 miles of Stevens Canyon Road because of deteriorating road conditions and structural deficiencies. This work is similar in nature to that proposed for the Nisqually – Paradise Road. The Stevens Canyon Road repair work would begin at the intersection with SR 123 and end at intersection with the Nisqually to Paradise Road. Work is ongoing to 2013.

- Cyclic road maintenance and plow operations (ditch cleaning with no erosion control or restoration; dumping of foreign soils/rock on road shoulders and down embankments to maintain pavement; accidental strikes to roadside trees by plow operations; removal of woody debris/logs and live vegetation to promote drainage) would continue to impact roadside vegetation.

Another future project in the park is changes in the management of Carbon River Road in the northwest corner of the park that reduces vehicle access following extensive flooding. In addition, the park is currently evaluating options for protecting an approximate 2-mile section of SR 410 that is at risk of flooding from the White River in the northeast section of the park. Both projects are in different watersheds and are a substantial distance from the proposed Nisqually – Paradise Road rehabilitation work. Because these two projects are not expected to measurably contribute to the cumulative effects of the Nisqually – Paradise Road project, they were not included in the evaluation of cumulative impacts.

AIR QUALITY AND GREENHOUSE GAS

Affected Environment

The park is designated a Class I area under the Clean Air Act of 1977. Class I area designation is granted to national parks greater than 6,000 acres, designated wilderness areas, memorial parks greater than 5,000 acres, and international parks. This designation maintains the highest air quality and allows only small increments of pollutants above the existing park levels. In addition, the designation requires protection of air quality related values (AQRV) important to the overall park visitor experience. AQRVs include visibility or a specific scenic, cultural, physical, ecological, or recreation resource. For example, air pollutants can create haze that obscures or diminishes scenic views. Air pollution such as acid rain also can damage soils and vegetation, and affect water quality. Air quality in the project area is generally considered good depending on the time of year and regional conditions. However, relatively high levels of sulfur and nitrogen compounds, and low pH levels have been detected in precipitation samples in past years. In addition, contaminants (current use and historic use pesticides, mercury and other semivolatile organic compounds) have been documented in park surface waters. Episodic acidification occurs at some lakes in the park during spring snowmelt (Clow and Campbell 2008). Most of the air pollutants at the park are generated by outside sources such as power plants and paper mills, urban transportation in the Seattle and Tacoma area, and slash burning associated with logging on forest lands surrounding the park.

Vehicles are the primary source of air pollution within park boundaries. Vehicles contribute particulate and nitrogen oxide pollutants to the air. Nitrogen oxide is converted to ozone in a process that is termed photochemical smog. In this process, nitrogen oxide reacts with sunlight to produce ozone. Ozone and particulate pollution are occasionally measured at high levels in the park. However, the level of vehicle traffic in the park is not considered a major contributor to ambient air pollutant levels. Other sources of emissions within the park include generators, heating systems, a few wood stoves and fireplaces in park buildings, and campfire smoke.

The NPS is committed to controlling greenhouse gases (GHG) and has developed a Climate Change Response Strategy. In addition, EO 13514, “Sustainability and Reduction of GHG” requires that federal agencies reduce GHG in their operations. The NPS has formed a partnership with the EPA to collaborate on controlling GHG and climate change. This program is called the Climate Friendly Parks Program, which provides management tools and resources to address climate change. The program approach involves measuring existing emissions, developing strategies to mitigate emissions and adapt to impacts, sharing information, and educating the public about measures they can use to lessen their effect on climate change.

The NPS has developed a tool called Climate Leadership in Parks (CLIP) to determine the baseline levels of GHG in the national park system. In the park, three GHGs require consideration: carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O). Each of these GHGs have a different global warming potential (GWP) per metric ton produced. Nitrous oxide has far greater GWP than methane, which has far greater GWP than carbon dioxide. In order to accurately assess GHG emissions emitted by the park, the metric tons of each gas is converted to metric tons carbon dioxide equivalent (MTCO2E) using the GWP

factor. Using CLIP, it was determined that in the park, the 2006 annual GHG emissions for each of these GHGs was: CO2 – 11,954 MTCO2E; CH4 – 529 MTCO2E; and N2O – 203 MTCO2E. The park uses these estimated figures as the baseline against which it evaluates the effectiveness of its efforts to reduce GHG emissions.

Impact Intensity Threshold

Potential impacts to air quality were based on anticipated emissions during construction. The threshold for the intensity of an impact on air quality is defined in Table 5.

TABLE 5. AIR QUALITY IMPACT AND INTENSITY THRESHOLDS

Impact Intensity	Intensity Description
Negligible	The effects to air quality would be below or at a low level of detection, with only a small amount of GHG released into the environment.
Minor	An action's effects on air quality would be detectable with a minor increase in GHG in a localized area. The measurable or anticipated degree of change would have a slight effect, causing a slightly noticeable change of less than about 20% compared to existing conditions. If mitigations were needed to offset adverse effects, it would be relatively simple to implement and would likely be successful.
Moderate	An action would result in a change or alteration of the air quality. The measurable or anticipated degree of change is readily apparent and appreciable, and would be noticed by most people, with a change likely to be between 21% and 50% compared to existing conditions. The effects would be localized or widespread. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful. The project would create greater than minor amounts of GHG.
Major	An action would result in a change in air quality over a relatively large area. The measurable or anticipated degree of change would be substantial, causing a highly noticeable change of greater than about 50% compared to existing conditions. Key ecological processes would be altered and landscape-level changes would be expected. Mitigation measures to offset adverse effects would be necessary, extensive, and may not be successful. The project would create more than moderate amounts of GHG that could affect the local atmosphere.

Duration:
Short-term impact—lasts only for the duration of project implementation.
Long-term impact—lasts beyond the period of project implementation.

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts. The ongoing maintenance and repair of the road would result in periodic localized increases in air pollutants and GHG from construction equipment and vehicles. GHG would be generated from the exhaust emissions of vehicles and equipment involved in the maintenance activity. There may be some dust generated if maintenance involves soil disturbance. The increase in air pollutants would be reoccurring and more frequent over time as deteriorating road conditions require greater maintenance and repair. Air pollutants are likely to disperse quickly depending on wind and precipitation. Thus, the no action alternative would cause local short-term negligible to minor adverse air quality impacts and a long-term negligible to minor adverse contribution to GHG emissions.

Cumulative Impacts. Past actions, such as road construction and maintenance activities have resulted in periodic short-term increases in vehicle emissions. Rehabilitation of the Stevens Canyon Road, streambank protection measures along the Nisqually River, and

hazard tree removal would result in short-term negligible to minor adverse air quality effects from equipment and vehicles. The Stevens Canyon Project would not increase the road capacity and associated vehicle emissions. Past, present, and reasonably foreseeable future projects would have parkwide short-term negligible to minor adverse effects on air quality and GHG emissions. Those impacts, in combination with the recurring local short-term negligible to minor adverse effects of the no action alternative, would result in a parkwide short-term negligible to minor adverse cumulative impact.

Conclusion. The no action alternative would have local short-term negligible to minor adverse impacts to air quality and long-term negligible to minor adverse impacts to GHG emissions from periodic road maintenance activities that generate vehicle emissions. Cumulative effects would be parkwide, short-term, and negligible to minor.

Preferred Alternative—Repair Road

Direct and Indirect Impacts. GHG emissions for the construction phase of the project were estimated by calculating the number and types of construction equipment that may be used in the project for the construction period based on previous road construction projects in the park. The hours of operation were estimated, and commuting miles traveled included mileage from Ashford to construction areas along the road to Paradise. Delivery trucks to transport equipment and supplies were assumed to come from Bozeman, Montana and Seattle, Washington. The estimated GHG emissions were then compared to the 2006 baseline GHG emission data calculated using the CLIP tool. Construction associated with the preferred alternative would result in emissions (given in MTCO2E) of CO2 – 281.5, CH4 – 0.3, and N2O – 2.5 that would be spread out over several years (Table 6). Compared to the baseline levels, the proposed project would increase GHG levels by about 2.4%. Thus, the increase in GHG on an annual basis would generate local short-term negligible to minor adverse impacts.

TABLE 6. GREENHOUSE GAS INVENTORY CALCULATIONS

Equipment Used	Hours	Gallons per Hour	Total Fuel Consumed
Excavator	1,440	4	5,760
Truck (10 cy)	2,880	2	5,760
Loader (3.5 cy bucket)	1,440	4	5,760
5-Ton Roller	1,440	2	2,880
Total			**20,160**
Commuting/Vehicle Type	**Miles Traveled**	**Times Traveled**	**Number of Vehicles**
Tractor-Trailer (Bozeman, MT)	2,680	4	2
Tractor-Trailer (Seattle, WA)	200	4	2
Trucks (May–Oct.)	25	280	7
Trucks (May–Aug.)	46	180	7
Emissions ($MTCO_2E$)*	**CO_2**	**CH_4**	**N_2O**
Equipment	204.54	0.2	1.6
Tractor-Trailer	32.3	Negligible	Negligible
Trucks for Commuting	44.7	0.1	0.9
Total	**281.54**	**0.3**	**2.5**

*Metric tons of carbon dioxide equivalent.

Ground-disturbing activities during construction from pulverizing or milling existing asphalt, excavation, shoulder work, and wall construction would temporarily generate dust and affect air quality. As proposed in the resource protection measures on page 37, water would be used, as needed, as a dust suppressant to minimize the potential for construction impacts to air quality. The proposed road rehabilitation would not increase vehicle capacity and, therefore, would not increase air emissions from existing levels of vehicle traffic. Air quality impacts from construction vehicles and equipment exhaust emissions, and generation of dust from ground disturbance would result in local short-term minor adverse impacts to air quality and a contribution to GHG.

Cumulative Impacts. Past actions, such as road construction and maintenance activities have resulted in periodic short-term increases in vehicle emissions. Rehabilitation of the Stevens Canyon Road, streambank protection measures along the Nisqually River, and hazard tree removal would result in short-term negligible to minor adverse air quality effects from equipment and vehicles. The Stevens Canyon Project would not increase the road capacity and associated vehicle emissions. Past, present, and reasonably foreseeable future projects would have parkwide short-term negligible to minor adverse effects on air quality and long-term minor adverse impacts to GHG emissions. Those impacts, in combination with the local short-term minor adverse effects of the preferred alternative, would result in a parkwide short-term negligible to minor adverse cumulative impact on air quality. The preferred alternative would not contribute to long-term GHG emissions.

Conclusion. Road rehabilitation would result in local short-term negligible to minor adverse impacts to air quality and GHG emissions. Cumulative effects would be parkwide, short-term, negligible to minor, and adverse.

VEGETATION AND SPECIAL STATUS PLANT SPECIES

Affected Environment

A total of 306 plant species occur in the Nisqually – Paradise Road project area (NPS 2009a). Vegetation communities in the park range from temperate forests to alpine and subalpine vegetation. The Nisqually – Paradise Road crosses several vegetation communities in the project area. The road begins in temperate forests in the Nisqually River Valley, passes through montane forests at middle elevations, and then passes through subalpine parkland in the area near Paradise. Three life zones are present within the project area—the western hemlock zone, pacific silver fir zone, and mountain hemlock zone (NPS 2009a).

The western hemlock zone has a temperate climate and occurs at low elevations (2,000 to 3,000 feet) from the Nisqually Entrance to 1 mile past Longmire. The dominant trees in this zone are very old (700 to 1,000 years) Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), and red cedar (*Thuja plicata*). Other features of this zone include a well-developed multilayered canopy with numerous snags and heavy accumulations of woody debris, including large logs. Understory species include dwarf Oregon grape (*Berberis nervosa*), swordfern (*Polystichum munitum*), devil's club (*Oplopanax horridus)*, Oregon oxalis (*Oxalis oregana*), foamflower (*Tiarella trifoliata*), western oakfern (*Gymnocarpium dryopteris*), salal (*Gaultheria shallon*), red alder (*Alnus rubra*), skunk cabbage (*Lysichiton*

americanus), lady fern (*Athyrium* sp.), Alaska blueberry (*Vaccinium alaskaense*), and beargrass (*Xerophyllum tenax*).

The pacific silver fir zone occurs at middle elevations (3,000 to 4,200 feet) from 1 mile past Longmire to Ricksecker Point. This zone has a montane climate with moderate snow accumulations. The dominant vegetation is silver fir (*Abies amabilis*) with a well-developed shrub layer of huckleberry species (*Vaccinium* sp.). Noble fir (*Abies procera*) is a co-dominant species in this zone with some yellow cedar (*Chamaecyparis nootkatensis*). The understory species include big huckleberry (*Vaccinium membranaceum*), Alaska blueberry, and slide alder (*Alnus sinuata*).

The mountain hemlock zone occurs at higher elevations (4,200 to 5,500 feet) from Ricksecker Point to Paradise. The mountain hemlock zone has cold weather and is influenced by heavy snow accumulations. The vegetation in this zone is subalpine parkland, which is a mosaic of meadows with scattered tree islands. The dominant tree species are subalpine fir (*Abies lasiocarpa*) and mountain hemlock (*Tsuga mertensiana*). Other species include big huckleberry, beargrass, and blueleaf huckleberry.

Numerous large trees greater than 18 inches DBH occur near the road in the project area, especially red cedar, Douglas-fir, and western hemlock. These trees are valued because of their ecological significance and in addition, many of these trees are considered "specimen" trees because of their historic importance. Specimen trees are large trees that were purposely retained during original road construction as part of the roadway design to enhance the visitor experience as the road winds through the forest. The road between Nisqually and Paradise contains 253 trees larger than 18 inches DBH within 5 feet of the road pavement. The largest trees in the project area include a western red cedar 90 inches in diameter, a Douglas-fir 87 inches DBH, and a western hemlock 53 inches DBH.

A plant survey in the project area identified 68 species of exotic plants (plants that are not native to the park) including 11 listed as Washington State noxious weeds (NPS 2009a). Nonnative grasses such as bentgrass (*Agrostis stolonifera*), orchard grass (*Dactylis glomerata*), and Kentucky bluegrass (*Poa pratensis*) are widespread in the project area. Clover (*Trifolium* sp.) and dandelions (*Taraxacum officinale*) also are widespread. Noxious weeds in the project area are shown in Table 7. The park's vegetation restoration crew is funded to treat noxious weeds along the road corridor for several years pre- and post-project.

TABLE 7. NOXIOUS WEEDS IN THE NISQUALLY – PARADISE ROAD PROJECT AREA

Common Name	Scientific Name	State Noxious Weed Class*
Spotted knapweed	*Centaurea maculosa*	B
Ox-eye daisy	*Chrysanthemum leucanthemum*	B
Canada thistle	*Cirsium arvense*	C
Bull thistle	*Cirsium vulgare*	C
Scott's broom	*Cytisus scoparius*	B
Wild carrot	*Daucus carota*	B
Polar hawkweed	*Hieracium atratum*	B
St. John's wort	*Hypericum perforatum*	C
Hairy cat's-ear	*Hypochaeris radicata*	B
Reed canarygrass	*Phalaris arundinacea*	C
Common tansy	*Tanacetum vulgare*	C

*Class B – control/contain and prevent from spreading to new areas. Class C – educate and encourage to control.

The park also hosts several federal plant species of concern or that are considered sensitive by the state of Washington because of their limited distribution (endemism) or because they are disjunct from more abundant population centers. Table 8 lists sensitive plants potentially occurring in the project area according to habitat.

TABLE 8. SENSITIVE PLANT SPECIES IN MOUNT RAINIER NATIONAL PARK

Common Name	Scientific Name	Status	Habitat Needs and Occurrence
Whitebark pine	*Pinus albicaulis*	FC	Whitebark pine occurs at and above forest line, reaching in some cases to tree line within the park. This species is not present in the project area.
Obscure paintbrush	*Castilleja cryptantha*	FSC, SS	Obscure paintbrush is found in subalpine meadows. This species has been documented in the park, but does not occur in the project area.
Mount Rainier lousewort	*Pedicularis rainierensis*	SS	Mount Rainier lousewort is found in moist subalpine meadows, open coniferous forests, and rocky slopes from 5,000 to 6,800 feet in elevation. It occurs in several locations in the park, but has not been documented in the project area.
Gnome plant	*Hemitomes congestum*	SW	Gnome plant is found in dense coniferous forests. It has been documented in the project area and elsewhere in the park.
Triangular-lobed moonwort	*Botrychium ascendens*	FSC, SS	Triangular-lobed moonwort occurs outside the park on the upper slopes of the Crystal Mountain ski area. No surveys have confirmed its presence in the park.
Northern microseris	*Microseris borealis*	SS	Northern microseris generally occurs in wet meadows, sphagnum bogs, and in the mountains from 30 to 4,760 feet in elevation. It is known to occur in wet meadows in the park, but has not been found in the project area.
Wheeler's bluegrass	*Poa nervosa*	SS	In Washington, Wheeler's bluegrass occurs on rock outcrops, cliff crevices, and occasionally in talus near the base of cliffs or outcrops. This species is not present in the project area.
Curved woodrush	*Luzula arcuata*	SS	Curved woodrush is often found on glacial moraines at relatively high elevations. This species has not been documented in the project area.

Common Name	Scientific Name	Status	Habitat Needs and Occurrence
Pygmy saxifrage	*Saxifraga rivularis*	SS	Pygmy saxifrage is found on damp cliffs, rock crevices, and talus near snowbanks; as well as alpine slopes, cracks, and shaded cliffs. This species has not been documented in the project area.
Tall agoseris	*Agoseris elata*	SS	Tall agoseris occurs in meadows, open woods, and exposed rocky ridge tops on various slope aspects, from low elevations to timberline. This species is not present in the project area.
Lanceleaf grapefern	*Botrychium lanceolatum*	SW	Lanceleaf grapefern occurs in well-drained meadows; wet, mossy benches in mature red cedar forests; mossy talus slopes near creek drainages; mixed mature coniferous forests; alpine meadows; roadbeds; and disturbed areas. This species has been documented in the project area.

FC= federal candidate species for listing, FSC= federal species of concern (not federally protected, but may need conservation action), SS= state sensitive species (species that are vulnerable or declining in Washington and at risk of becoming threatened or endangered), SW= state watch list (species are more abundant and/or less threatened in Washington than previously assumed).

No state or federally listed threatened or endangered plants were observed in the project area during a thorough vegetation survey of the project area completed by park staff during summer 2009 (NPS 2009a). Two species on the state watch list also were documented (gnome plant and lanceleaf grapefern). A population of gnome plant was found growing alongside a pull-out on the Nisqually – Paradise Road. The gnome plant is thought to be uncommon in the park. Lanceleaf grapefern was formerly listed as a state sensitive species, but was downgraded to the state watch list when it was found to be more widespread than previously believed. Three specimens of lanceleaf grapefern were found along the Nisqually – Paradise Road in the project area. In addition, no federal or state sensitive listed bryophyte species were found in a survey along the road from MP 0.0 to MP 6.2 (Harpel 2010). However, two species of interest were found, a moss (*Thamnobryum neckeroides*) and a hornwort (*Anthoceros fusiformis*). *Thamnobryum neckeroides* is ranked G4 (apparently secure), S2 (fewer than 10 known sites) while *Anthoceros fusiformis* is ranked G2/G4 with G3 (vulnerable) rank by NatureServe (2010).

Impact Intensity Threshold

Predictions about impacts were based on the expected disturbance to vegetation communities, and professional judgment and experience with previous projects. The thresholds of change for the intensity of an impact on vegetation are defined in Table 9.

TABLE 9. VEGETATION AND SPECIAL STATUS PLANTS IMPACT AND INTENSITY THRESHOLDS

Impact Intensity	Intensity Description
Negligible	The impacts on vegetation (individuals or communities) would not be measurable. The abundance or distribution of individuals would not be affected or would be slightly affected. The effects would be on a small scale and no species of special concern would be affected. Ecological processes and biological productivity would not be affected.
Minor	The action would not necessarily decrease or increase the project area's overall biological productivity. The alternative 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. Mitigation to offset adverse effects, including special measures to avoid affecting species of special concern, would be required and would be effective. Mitigation may be needed to offset adverse effects, would be relatively simple to implement, and would likely be successful.
Moderate	The action would result in effects on some individual native plants, and also would affect a sizeable segment of the species' population over a relatively large area. Permanent impacts would occur to native vegetation, but in a relatively small area. Some special status species also would be affected. Mitigation measures would be necessary to offset adverse effects and would likely be successful.
Major	The action would have considerable effects on native plant populations, including special status species, and would affect a relatively large area within and outside the park. Extensive mitigation measures to offset the adverse effects would be required; the success of the mitigation measures would not be guaranteed.

Duration:
Short-term impact—following project completion, recovery takes less than one year.
Long-term impact—following project completion, recovery takes more than one year.

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts. There would be no project-related ground disturbance with the potential to adversely impact vegetation and special status plant species. Vegetation adjacent to the existing road could be affected by erosion of unstable sideslopes from slumping and sediment deposition. Periodic maintenance activities to repair road damage could result in vegetation disturbance or introduction of invasive plant species. These potential impacts to vegetation and special status plant species would occur periodically and would be local, short-term, negligible to minor, and adverse.

Cumulative Impacts. Past actions, such as road construction and maintenance activities, have resulted in vegetation clearing and the introduction of invasive exotic plants. Planned future hazard tree removal would result in the removal of individual trees. The rehabilitation of the Stevens Canyon Road would result in temporary disturbances to vegetation and the potential for weed introduction. Stream stabilization along sections of the Nisqually River would reduce the potential for erosion and slumping, leading to vegetation impacts. Past, present, and reasonably foreseeable future projects would have a local long-term minor adverse effect on vegetation and special status plants. Those impacts, in combination with the local long-term negligible to minor adverse effects of the no action alternative, would result in a local long-term minor adverse cumulative impact to vegetation and special status plant species.

Conclusion. The no action alternative would have local long-term negligible to minor adverse effects on vegetation and special status plants adjacent to the road from erosion,

drainage problems, and periodic maintenance. Cumulative effects would be local, long-term, minor, and adverse.

Preferred Alternative—Repair Road

Direct and Indirect Impacts. Road rehabilitation would occur primarily within the existing disturbed road prism, but incidental effects on vegetation and special status plants adjacent to the road would occur from paving operations and structural repairs. Drainage and culvert work, embankment stabilization, and other actions also would result in disturbances to vegetation as described below.

Proposed road construction activities have the potential to adversely impact trees adjacent to the road, but no trees larger than 18-inches in DBH would be removed. Subexcavation and deep patches require excavation within the paved road, which can damage tree roots under the road and threaten the viability of the tree from the loss of tree roots, reduce water infiltration, and make the tree more susceptible to wind-throw from the loss of supporting roots. Most conifer roots are less than 4 feet below the soil surface in moist forest environments, such as western Washington and most conifer roots are in the upper 12 inches of soil (Bloomberg and Hall 1986; Eis 1973, 1987; J. Hadfield, pers. comm. 2010; McMinn 1963). Deep patches may require excavation to depths of 5 feet, which would remove the roots within the area of excavation. An inventory of trees in the project area indicated that 17 trees larger than 18 inches DBH would be affected within areas proposed for subexcavation and deep patches. Various research studies have been conducted on the distribution of tree roots from the stem of the tree (Bloomberg and Hall 1986; Eis 1973, 1987; J. Hadfield, pers. comm. 2010; McMinn 1963). Studies have indicated that the root area of a tree may extend from 22% to 35% of the tree height (Eis 1973). For the tall mature trees in the project area, tree roots may extend even farther.

Recommendations from Hadfield (pers. comm. 2010) indicate that a 100-foot tall conifer growing in a forest theoretically would have almost all of its roots within 25 feet of the trunk. If excavation was done on one side of the tree but stopped 10 feet from the root collar the excavation would disturb about 25% of the tree roots. Conversely, 75% of the tree roots would not be affected by the excavation 10 feet from the trunk. Trees with 75% of their roots undisturbed are unlikely to experience detrimental effects. Thus, to reduce potential impacts, excavations near roadside trees would be reduced to a depth of less than 1 foot within a 10-foot radius of the tree trunk or the section of deep patch would be shortened to avoid excavation within 10 feet of the tree trunk. Specific protocols for protecting trees are described in the resource protection measures listed on page 42. These measures include actions such as cutting roots cleanly after excavation with clean sharp tools, avoiding cutting roots 4 inches in diameter or greater, keeping exposed roots moist until covered with soil, backfilling the excavation as soon as possible, and watering the soil around the roots. Although these measures would serve to reduce the potential for tree impacts, it is likely that the 17 large trees adjacent to the road excavation work would be adversely impacted by root removal.

In addition, tree stems close to the road can be wounded inadvertently by equipment. Trees larger than 18 inches DBH that are within 2 feet of the road edge would be wrapped with lumber to protect the stem. Orange construction fencing would be used around other

large trees located from 2 to 5 feet from the road edge as described in the resource protection measures.

Installation of a new culvert and riprap outlet protection at New Tahoma Creek would result in a disturbance to about 0.3 of an acre of sparsely vegetated fill slopes. No tree removal is anticipated for installation of the culvert headwalls and riprap and nearby tree roots would be protected using resource protection measures. Temporary disturbances would be revegetated with native species, although areas where riprap is installed would not be revegetated.

Proposed drainage improvements at Kautz Creek would reduce vegetation impacts by placing riprap within the existing unvegetated ditch on the north side of the road and on the fill slopes adjacent to the north and south sides of the road. Riprap placement would impact an area of about 0.62 of an acre, of which about 0.42 of an acre is sparsely vegetated fill slopes. Placing riprap on fill slopes and below the toe of the fill slope would primarily impact herbaceous vegetation. Riprap on the north overflow ditch would help protect existing trees by covering roots and reducing the slope angle. Impacts to trees would be reduced by selectively placing riprap to avoid trees at the toe of the fill slope embankment. Riprap armoring of the existing overflow ditch would protect the ditch and prevent further erosion of the cutslope that could lead to undercutting trees, exposing tree roots, and potential windfall.

Replacement of about 100 damaged and deteriorating culverts, including upgrades to make several culverts fish passable, would result in temporary vegetation disturbances at culvert inlets and outlets. Most of this work, including culvert and outlet protection, would occur within in the cut and fill slopes adjacent to the road prism. All temporary disturbances would be revegetated following construction.

Installation of MSE embankment stabilization walls at two locations would result in about 0.02 of an acre of temporary vegetation disturbance. The MSE wall at Ricksecker Point Loop Road would impact about 200 square feet of vegetation and trees less than 18-inches DBH. Construction of the MSE wall near Christine Falls would disturb about 500 square feet of vegetation. The roots of several large trees including a 48.5-inch DBH western redcedar, two Douglas-firs (19 and 20.5-inches DBH) and one 24-inch DBH Alaska yellow cedar may be damaged. Approximately 26 smaller trees, consisting of a mix of Alaska yellow cedar, Pacific yew, western hemlock, and willows less than 6-inches DBH may be removed or their roots impacted. Approximately seven trees, consisting of a mix of red alder, Douglas-fir, and Alaska yellow cedar measuring 9 to 15-inches DBH may also be removed or their roots damaged. Efforts would be made to retain existing trees to the extent feasible. Temporarily disturbed areas would be revegetated following construction and BMPs would be used to reduce impacts to tree roots as described in the resource protection measures.

The infestation and spread of invasive exotic plants is possible from construction activities. Weeds frequently invade disturbed ground where they are easily established and have a competitive advantage relative to native species under environmental conditions created by human activities if left unchecked. Implementation of BMP weed control practices would reduce the potential for weed establishment and long-term impacts.

The state watchlist gnome plant and lanceleaf grapefern occur in a few locations in the project area, and a few individuals of these species would likely perish from vegetation clearing. If rare plant specimens can be relocated in the spring prior to construction, they would be salvaged prior to construction, stored outside the construction limits and transplanted following construction. Two bryophyte species of interest are present near the edge of the road at several locations. Impacts to a moss species (*Thamnobryum neckeroides*) of interest are unlikely since it is located more than 5 feet from the edge of the road and the potential disturbance area. A hornwort species (*Anthoceros fusiformis*) of interest was found in several roadside ditches within 5-feet of the road and would likely be disturbed from ditch cleaning and roadside work. Resource protection measures, including spore collection and transplanting would be used to offset impacts to the hornwort.

To reduce impacts to native vegetation and special status species; and avoid the introduction of invasive species, construction activities would be confined to the smallest area necessary to complete the work, and all areas of disturbed vegetation would be restored with native vegetation following construction. A topsoil aggregate mix would be applied along the road shoulder, and all repaved road segments would be reseeded with native plant species. Revegetation of disturbed areas is expected to take more than one year because of the short growing season.

Overall, the preferred alternative would have local long-term minor adverse effects from the loss of about 0.72 of an acre of vegetation from placing fill on the roadside. Excavation for deep patches and other road structural repairs would have a local long-term minor adverse impact on up to 17 trees larger than 18 inches DBH from excavation that removes tree roots. Removal of a portion of the root system may result in direct tree mortality or, it might weaken the resistance of the tree to diseases and insects which may ultimately kill the tree. Local long-term minor adverse impacts to two state sensitive species and two bryophyte species are possible from construction disturbances.

Cumulative Impacts. Past actions, such as road construction and maintenance activities, have resulted in vegetation clearing and the introduction of invasive exotic plants. Planned future hazard tree removal would result in the removal of individual trees. Rehabilitation of the Stevens Canyon Road would result in temporary disturbances to vegetation and the potential for weed introduction. Stream stabilization along sections of the Nisqually River would reduce the potential for erosion and slumping, which lead to vegetation impacts. Past, present, and reasonably foreseeable future projects would have a local long-term minor adverse effect on vegetation resources and special status plant species. Those impacts, in combination with the local long-term minor adverse effects of the preferred alternative, would result in local long-term minor adverse cumulative impacts.

Conclusion. The preferred alternative would have impacts to vegetation from road shoulder compaction, introduced soils, and the likelihood that road repairs would result in an increase in exotic plant species. The preferred alternative would have local long-term minor adverse effects from road rehabilitation disturbances that are estimated to temporarily affect about 0.02 of an acre and local long-term adverse impacts from placing riprap on about 0.72 of an acre of roadside vegetation at New Tahoma Creek and Kautz Creek. Excavations within the road for structural repairs would be scaled back to reduce impacts to tree roots, but a local long-term minor adverse impact would occur from excavation that removes tree

roots that may lead to mortality for up to 17 trees larger than 18 inches DBH. Replacement of about 100 culverts would have a local short-term minor adverse effect on vegetation. Weed establishment in areas of disturbed soil also is possible, but would be reduce with weed control practices. A few specimens of state rare plant species—gnome plant and lanceleaf grapefern—may be adversely affected by construction; although salvage and transplanting may reduce impacts. One bryophyte species of interest is likely to be adversely impacted from ditch work adjacent to the road. Improvements to drainage and reductions in erosion would have a long-term beneficial effect on vegetation. Cumulative effects would be local, long-term, minor, and adverse.

WETLANDS

Affected Environment

Wetlands are present in several locations in and near the project area. Tahoma Creek, Kautz Creek, and the Nisqually River are perennial streams crossed by the existing road. These streams have streambeds composed of unconsolidated rock, cobbles, and gravel where they cross the road, with minimal wetland development. Several other smaller streams cross the road from Nisqually to Paradise and down the Valley Road. Many of these streams have more silty/sandy bottoms with cobbles and gravel. Scrub-shrub and forested wetlands are scattered along Tahoma Creek and the Nisqually River. New Tahoma Creek is a small channel with gravel substrate and scrub-shrub and emergent wetlands in some locations. The recently developed Kautz Creek channel has a cobble and stone substrate with no wetlands present where the road crosses. Wetlands are also present near multiple culvert inlets and outlets where perennial or intermittent flows are conveyed under the road. Available mapping indicates wetlands are present in scattered locations near the road (ERO 2011; NPS 2000; USFWS 1984).

Wetlands from the Nisqually Entrance to Longmire occur within the floodplains of the Nisqually River and Tahoma Creek and in association with culverts under the Nisqually – Paradise Road. Wetlands occur on the uphill side of the road as small hillside seeps or along flowing channels. Wetlands on the downhill side of the road are often associated with discharge from a culvert. Western red cedar, red alder (*Alnus rubra*), and western hemlock are common in the overstory of these wetlands. Common shrubs in the wetlands include salmonberry (*Rubus spectabilis*) and devil's club. Common herbaceous species include skunk cabbage, horsetail (*Equisetum arvense*), coltsfoot (*Petasites frigidus*), lady fern (*Athyrium felix-femina*), and deer fern (*Blechnum spicant*). Two small palustrine wetlands are located on the downstream side of the road at New Tahoma Creek (ERO 2011).

Wetlands are less common from Longmire to the Nisqually Glacier Bridge and occur in locations associated with seeps and at culvert outlets. Common species in the lower elevation portions of this section are the same as the Nisqually Entrance to Longmire section. Western hemlock and red cedar occur in the overstory, with devil's club and salmonberry in the shrub layer. Douglas fir and silver fir are common in the uplands on the edges of the wetlands. In the higher elevations of this section, a few seep areas dominated by Sitka alder (*Alnus sinuata*) are present, adjacent to the road. Common species in the wet ditches include coltsfoot,

bentgrass, fowl mannagrass (*Glyceria elata*), creeping buttercup (*Ranunculus repens*), and lady fern (ERO 2011).

Wetlands from Nisqually Glacier Bridge to the Paradise Visitor Center are generally alder and willow-dominated hillside seeps with a few open wetland meadows in flat areas. Extensive seep wetlands occur on the hillsides near the Nisqually Glacier Bridge and between the switchbacks from approximately MP 14.8 to MP 15.9. The dominant vegetation in seep wetlands was typically willow (*Salix* sp.) and Sitka alder, with scattered trees such as subalpine fir (*Abies lasiocarpa*) and yellow cedar. Large wetland complexes are present further from the road on the downhill side, including an open wet meadow at approximately MP 14 and a slope wetland adjacent to the Paradise River at approximately MP 15. Herbaceous species in wetlands included sedges (*Carex* sp.), rushes (*Juncus* sp.), clasping arnica (*Arnica amplexicaulis*), Canby's licorice root (*Ligusticum canbyi*), and Indian poke (*Veratrum viride*). Sedges typically dominated the wetland vegetation in open meadow wetlands (ERO 2011).

In addition, wetland vegetation is present in seasonally wet ditches in low areas along the edges of the road at locations scattered throughout the project area for a total of about 6.7 linear miles (NPS 2009a; ERO 2011). These ditches convey road drainage and intercept natural seeps and sideslope runoff. Ditches typically convey water to culverts or streams and are typically on the uphill side of the road. Wet ditches are typically less than 3 feet wide and about 3 feet from the edge of the pavement. Plants common in these roadside wet ditches include sedges (*Carex lenticularis*), bulrush (*Scirpus microcarpus*), rushes (*Juncus* sp.), fowl mannagrass, pale false mannagrass (*Puccinellia pauciflora*), leathery grapefern (*Botrychium multiflorum*), yellow willowherb (*Epilobium luteum*), tinker's penny (*Hypericum anagalloides*), muskflower (*Mimulus moschatus*), water parsley (*Oenanthe sarmentosa*), and speedwell (*Veronica americana*). Wet ditches in upper elevations of the project area are often dominated by bentgrass, creeping buttercup, and mowed willows and alder (NPS 2009a; ERO 2011).

Impact Intensity Threshold

Potential impacts to wetlands were assessed based on the intensity of the effect as defined in Table 10.

TABLE 10. WETLAND IMPACT AND INTENSITY THRESHOLDS

Impact Intensity	Intensity Description
Negligible	No measurable or perceptible changes in wetland size, integrity, or continuity would occur.
Minor	Any impact would be measurable or perceptible, but slight. A small change in size, integrity, or continuity could occur due to short-term indirect effects such as construction-related runoff. However, the overall viability of the resource would not be affected.
Moderate	Any impact would be sufficient to cause a measurable change in the size, integrity, or continuity of the wetland or would result in a small, but permanent, loss or gain in wetland acreage.
Major	The action would result in a measurable change in all three parameters (size, integrity, and continuity), or a permanent loss of large wetland areas. The impact would be substantial and highly noticeable.

Duration:
Short-term impact—following project completion, recovery takes less than one year.
Long-term impact—following project completion, recovery takes more than one year.

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts. There would be no project-related ground disturbance with the potential to adversely impact wetlands. Wetlands adjacent to the existing road could be affected by erosion of unstable sideslopes from slumping, sediment deposition, or periodic maintenance activities to repair drainage structures or other road damage. Wetland effects would be local, long-term, negligible, and adverse.

Cumulative Impacts. Past actions, such as road construction and maintenance activities, have resulted in vegetation clearing within wetlands and filling of wetlands. Past construction of culverts and bridges impacted streams and associated wetlands. Stream stabilization along sections of the Nisqually River could result in impacts to wetlands along the streambank, but actions would reduce the potential for erosion and slope failure that could lead to greater wetland impacts. The Stevens Canyon Project would have both short- and long-term less than minor adverse impacts to wetlands, along with long-term beneficial effects to wetlands. Past, present, and reasonably foreseeable future projects would have a local long-term minor adverse effect on wetlands. Those impacts, in combination with the local long-term negligible adverse effects of the no action alternative, would result in a local long-term minor adverse cumulative impact to wetlands.

Conclusion. The no action alternative would have local long-term negligible adverse effects on wetlands adjacent to the road from erosion, drainage problems, and periodic maintenance work. Cumulative effects would be local, long-term, minor, and adverse.

Preferred Alternative—Repair Road

Direct and Indirect Impacts. Road rehabilitation would occur primarily within the existing disturbed road corridor, but incidental impacts on wetlands and waters adjacent to the road would occur. Grading of roadside ditches that have filled with sediment to restore drainage away from the road would have a long-term adverse impact on about 1 acre of wet ditches that support wetlands plant species. All wet ditches would be reseeded with native wetland plant species following ditch grading. Replacement of about 100 culverts and culvert cleaning at some locations would result in small temporary wetland disturbances or sediment deposition in wetlands at culvert inlets and outlets. Existing culverts at MP 2.1 and MP 6.3 would be replaced with larger culverts to support fish passage. Installation of the larger culverts would have less than 0.25 acre of temporary impact to wetlands. The new culverts would have a beneficial effect to the adjacent wetland complex from improved hydrology and fish passage. The potential exists for sediment to be transported to wetlands downhill from the road during construction; however, erosion control material would be used to capture or redirect sediments from entering wetlands below culvert outlets during cleaning and replacement work. Restoration, in this case, refers to reestablishing environments in which natural ecological processes can, to the extent practicable, function as they did prior to disturbance.

Installation of the new culvert at New Tahoma Creek, and placing riprap at the culvert outlet would result in incidental short-term impacts to less than 0.007 of an acre of wetlands and less than 0.10 of an acre of stream channel below the ordinary high water mark. No

permanent loss of stream channel would occur at New Tahoma Creek. Placement of rock below the existing West Side Road culvert outlet to reduce scour and facilitate amphibian movement would affect a small area of waters, but no wetlands. The Kautz Creek drainage improvements would result in a permanent impact to less than 0.01 of an acre of wetlands on the north side of the road at approximately MP 3.5 from placement of riprap fill in the existing overflow ditch. Less than 0.01 of an acre of streambed would be permanently affected by riprap placed near inlets to the two 12-foot-diameter culverts on Kautz Creek.

All construction activities near wetlands would be confined to the smallest area necessary to complete the work, and all temporarily disturbed wetland areas would be restored with native wetland vegetation following construction. Overall, the preferred alternative would have local short-term minor adverse effects from temporary wetland disturbance and a local long-term minor adverse to wetlands from ditch grading and placement of riprap in a roadside ditch. Road rehabilitation and drainage work that reduce erosion and promote soil stability would have long-term beneficial effects on wetlands.

According to the NPS Procedural Manual #77-1: Wetland Protection (NPS 2012), incidental wetlands, (e.g. the wet ditches described above), that may have been created by inadequate road drainage in this case, or as a result of other human activities, are subject to NPS NEPA compliance procedures. However, actions impacting these types of artificial wetlands may be excepted from Statement of Findings requirements and compensation requirements if, after evaluation of impacts on wetland functions and values, the anticipated wetland loss or degradation is determined to be minor (including no adverse impacts on state or federally listed or candidate species or their critical habitats). Wetland impacts for this project would be minor. The Cascade frog (a federal and state species of concern), tailed frog (a federal species of concern), Van Dyke's salamander (a federal and state species of concern), and Larch Mountain salamander (a federal species of concern) are known to occur in the project area. Amphibian surveys prior to construction, limiting ditch and culvert work to the dry season, and other timing restrictions would reduce the potential for adverse impact to amphibians. See amphibian resource protection measures on page 46.

Regarding the impacts to wetlands from the culvert replacements described above, especially those to be replaced with larger culverts to support fish passage, according to the NPS Procedural Manual #77-1: Wetland Protection (NPS 2012), actions designed to restore degraded (or completely lost) wetland, stream, riparian, or other aquatic habitats or ecological processes are also excepted from Statements of Findings requirements and compensations requirements. Actions causing a cumulative total of up to 0.25 of an acre of new, long-term adverse impacts on natural wetlands may be allowed under this exception if they are directly associated with and necessary for the restoration (e.g., small structures).

Cumulative Impacts. Past actions, such as road construction and maintenance activities, have resulted in filling of wetlands. Past construction of culverts and bridges impacted streams and associated wetlands. Stream stabilization along sections of the Nisqually River could result in impacts to wetlands along the streambank, but actions would reduce the potential for erosion and slope failure that could lead to greater wetland impacts. The Stevens Canyon Project would have both short- and long-term less than minor adverse impacts to wetlands along with long-term beneficial effects to wetlands. Past, present, and reasonably foreseeable future projects would have a local long-term minor adverse effect on wetlands.

Those impacts, in combination with the local long-term minor adverse effects of the preferred alternative, would result in local long-term minor adverse cumulative impacts.

Conclusion. The preferred alternative would have local long-term minor adverse effects from road repair and improvement disturbances that are estimated to affect about 1.0 acre of roadside ditch supporting wetland vegetation, and less than 0.25 of an acre of wetlands from drainage work at New Tahoma Creek and installation of two new fish passable culverts on small perennial streams. Less than 0.10 of an acre of stream channel would be temporarily disturbed from culvert installation at New Tahoma Creek and placement of rock for to improve amphibian movement at the West Side Road culvert outlet. Replacement of about 100 culverts would result in a temporary wetland disturbance at some locations. A local long-term adverse impact to less than 0.01 of an acre of wetlands would occur from drainage work at Kautz Creek. Road repairs and drainage improvements would have a long-term beneficial effect on wetlands from improved water conveyance, reduced erosion, and less sediment deposition. Cumulative effects would be local, long-term, minor, and adverse.

WATER RESOURCES—QUANTITY AND QUALITY

Affected Environment

Water is an integral feature of the park, with about 470 rivers and streams within the park boundary. The Nisqually River, which emanates from the Nisqually Glacier, parallels the Nisqually – Paradise Road from the East Entrance until the bridge crossing at about MP 11.6 (Figure 2). Tahoma Creek is another principal drainage, which is spanned by a bridge at MP 1.2, and New Tahoma Creek is a channel that carries overflow from the Tahoma Creek via an existing box culvert. Kautz Creek is a large perennial stream with a bridge crossing near MP 3.4, and a second Kautz Creek channel formed by a flood event in 2006 crosses under the road via two large culverts installed following the flood. Christine Falls is on Van Trump Creek and Narada Falls is on the Paradise River. The Nisqually – Paradise Road crosses a number of other smaller perennial and intermittent drainages throughout the project area. In addition, the roadside ditches intercept road drainage and sideslope discharges. This water is typically collected by the ditches and conveyed under the road by culverts or other drainage structures.

The water quality for streams in the park is generally good with the exception of airborne contaminants found in some surface waters. Almost all surface waters originate within the park; therefore, most water quality problems are associated with park management activities immediately adjacent to and upstream of the road. Precipitation events and glacial melt generate runoff that contributes sediments to the streams, and large storms can result in the transport of substantial volumes of soil material, cobbles, and boulders. Water quality in the park also is influenced by vehicle deposition of oils, chemicals, and rubber on roads and parking areas; and the subsequent runoff that can reach streams. Periodic maintenance or ground disturbance as part of park operations that expose soil material increases the potential for erosion and sedimentation in streams.

Impact Intensity Threshold

Available information on hydrology and water quality in the project area was compiled from previous studies and assessments for the proposed project. Potential impacts from the alternatives are based on professional judgment, experience with similar actions, and project disturbance. The thresholds of change for the intensity of an impact on water resources are defined in Table 11.

TABLE 11. WATER RESOURCES—QUANTITY AND QUALITY IMPACT AND INTENSITY THRESHOLDS

Impact Intensity	Intensity Description
Negligible	An action would have no measurable or detectable effects on water quality or the timing or intensity of streamflows.
Minor	An action would have measurable effects on water quality or the timing or intensity of streamflows. Water quality effects could include increased or decreased loads of sediment, debris, chemical or toxic substances, or pathogenic organisms.
Moderate	An action would have clearly detectable effects on water quality or the timing or intensity of flows, and potentially would affect organisms or natural ecological processes. In addition, an impact would be visible to visitors.
Major	An action would have substantial effects on water quality or the timing or intensity of flows, and potentially would affect organisms or natural ecological processes. In addition, an impact would be easily visible to visitors.

Duration:
Short-term impact—following project completion, recovery takes less than one year.
Long-term impact—following project completion, recovery takes more than one year.

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts. The no action alternative would not result in any new disturbances that would impact water resources. Road drainage problems would persist, which would lead to erosion or possible road damage that would transport sediment into adjacent drainages. Hydrologic and water quality effects of the no action alternative would be local, long-term, minor to moderate, and adverse.

Cumulative Impacts. Past and ongoing actions, such as road construction and maintenance activities, have resulted in the disturbance and loss of fish and wildlife habitat. Past and planned flood control and streambank improvement projects along the Nisqually River and Tahoma Creek would result in short-term adverse effects to stream water quality from introduction of sediments during construction and long-term beneficial effects that protect eroding streambanks. The Stevens Canyon Road project would have potential short-term adverse effects on water quality in the upper Paradise River drainage during construction, but long-term beneficial effects. Implementation of the hazard tree management plan would have negligible effects to water quality. Past, present, and reasonably foreseeable future actions would have a local long-term minor adverse impact on water resources. Those impacts, in combination with the local long-term minor to moderate adverse impacts of the no action alternative, would result in local long-term minor adverse effects to water resources.

Conclusion. The no action alternative would result in local long-term minor to moderate adverse effects on water resources from ongoing drainage and erosion problems associated

with the deteriorating condition of the road and inadequate drainage. Cumulative effects would be local, long-term, minor, and adverse, with a minor to moderate adverse contribution from the no action alternative.

Preferred Alternative—Repair Road

Direct and Indirect Impacts. Proposed road repairs involving excavation, grading, and exposure of soil material would increase the potential for erosion and stream sedimentation until vegetation is established, paving is completed, drainage work is installed, and other stabilization work is finished. Installation of a new culvert at New Tahoma Creek would result in a temporary increase in stream sediment, but a long-term improvement in conveyance capacity from 170 to 700 cfs, which would reduce the potential for road damage and water quality impacts. Drainage improvements at Kautz Creek would be conducted outside of the active stream channel; but proposed riprap placement would result in temporary disturbances that could deliver sediments to the creek until the site is stabilized. The total conveyance capacity from existing culverts would remain about 2,200 cfs, or a 25-year flood event. Flood flows above this volume would begin to flow over the road, but with proposed armoring of the road slopes, structural impacts to the road and water quality impacts are expected to be minor. Filling in the overflow ditch allows the Kautz Creek flow to randomly access alluvial fan areas in a more natural, unrestrained manner. The grade control established by the riprap-filled ditch reduces the potential for a new large primary active channel developing. The riprap armoring protects the road from substantial damage during flood events, while reducing resource impacts. Drainage improvements would provide long-term benefits to water resources from more controlled conveyance of flood flows and reduced potential for erosion during high flows.

Other drainage improvements including culvert and ditch cleaning, installation of new culverts or culvert replacement, abutment protection of the Edith Creek Bridge, and drainage improvements at Narada Falls and elsewhere would temporarily introduce sediments into drainages, but would have a long-term benefit by restoring or improving drainage functions and protecting structural and natural features. There would be a negligible increase in impervious area from paving two to five gravel pullouts, additional paving at the Kautz Creek and Paradise Valley parking areas. The additional paving would be partially offset by reducing the size of a pullout at MP 6.1, removal of asphalt at the Glacier Bridge parking area, and replacing asphalt at the Narada Falls parking area with crushed granite. BMPs, including erosion and sediment control measures for stormwater management during construction, would be used to protect disturbed areas from erosion and sediment transport. Overall, the planned structural and drainage improvements would result in a local short-term minor adverse impact to water quality from ground disturbances that introduce sediment into drainages, and a long-term beneficial effect from rehabilitation of deteriorating road conditions and improved drainage conveyance.

Water needed for construction would be extracted from an approved site on the lower Nisqually River at Longmire. Water withdrawals from these streams would be limited to 15% above park biologist designated minimum flow criteria, not to exceed 30,000 gallons per day. Periodic water extraction during construction would have a local short-term minor adverse effect on streamflows and water quality. Water used for dust suppression also would protect water quality by reducing airborne sediment deposition in streams.

Cumulative Impacts. Past and ongoing actions, such as road construction and maintenance activities, have resulted in the disturbance and loss of fish and wildlife habitat. Past and planned flood control and streambank improvement projects along the Nisqually River and Tahoma Creek would result in short-term adverse effects to stream water quality from introduction of sediments during construction and long-term beneficial effects that protect eroding streambanks. The current Stevens Canyon Road project would have potential short-term adverse effects on water quality in the upper Paradise River drainage during construction, but long-term beneficial effects. Implementation of the hazard tree management plan would have negligible effects to water quality. Past, present, and reasonably foreseeable future actions would have a local long-term minor adverse impact on water resources. Those impacts, in combination with the local short-term minor adverse impacts and long-term beneficial effects of the preferred alternative, would result in local long-term beneficial effects to water resources.

Conclusion. Proposed road rehabilitation work and drainage improvements would have local short-term minor adverse effects on water quality from surface disturbances that may generate erosion and increased sediment runoff. Proposed erosion control measures to minimize erosion during construction, and revegetation of disturbed areas would minimize short-term effects. Rehabilitation work would result in a long-term benefit to water resources by increasing the conveyance capacity of drainage structures, and improving or restoring hydrologic functions. Water extractions from local streams would result in a local short-term minor adverse effect on streamflow and water quality from periodic withdrawals. Cumulative effects would be local, long-term, and beneficial.

FLOODPLAINS

Affected Environment

The floodplain processes in the park are dynamic and complex. The streams and rivers draining Mount Rainier from the numerous glaciers carry large quantities of water, sand, gravel, and boulders. Because of the sediment and debris that these streams carry downstream, the banks and floodplains of streams are extremely unstable. Deposition of glacial sediments from floods and debris flows is the primary cause of channel instability. Because of these instabilities, floodplains continue to change and evolve following each storm event or glacial activity. The Federal Emergency Management Agency maintains Flood Insurance Rate Maps for floodplains, but no floodplain maps have been developed for the project area.

Floods in the park can occur throughout the year from precipitation events, glacial outburst, and rapid melting of snow and ice. Floods from melted glacial ice typically occur during the summer and fall, and precipitation-induced flooding occurs most frequently in late fall and early winter. Glacial outburst-generated floods occur from a sudden release of water from a glacier and are known to occur in the summer and fall. Tahoma Creek has experienced glacial outbursts, and flood events in 2006 led to debris flows that closed the West Side Road and washed out portions of the Nisqually – Paradise Road. The 2006 flood redirected about 20% of the Tahoma Creek flow to the New Tahoma Creek channel (Kennard 2009). Kautz Creek also has experienced flood events, including the event in 2006

that resulted in stream avulsion (the creation of a new channel). The new Kautz Creek channel washed-out a section of the Nisqually – Paradise Road and resulted in the installation of two 12-foot culverts in the new channel. The new channel and culvert crossings are still vulnerable to failure from future hydrologic events that exceed the existing structures' capacities (Kennard 2009). Increased aggradation (deposition of sediment) of stream channels from flood events and debris flows is expected to remain a concern for protecting park roads and infrastructure. Continued changes in the Tahoma and Kautz creek channels and floodplains are likely in the future.

The Nisqually River also has experienced large flood events that have changed the course of the channel and resulted in the washout and closure of the Nisqually – Paradise Road at Sunshine Point in 2006. This storm breached a protective levy and washed out about 5 acres of the Sunshine Point campground, which led to its closure. The placement of 10,000 tons of rock was required to rebuild the road and protect the streambank in 2007. Future actions are being considered to reinforce the streambank at this location. Erosion of an overhanging bank on the Nisqually River at a pullout west of Longmire was addressed as part of a planned streambank stabilization process to protect the Nisqually – Paradise Road in the fall of 2010.

Impact Intensity Threshold

Floodplains are defined by the NPS Floodplain Management Guideline (July 1, 1993) as "the lowland and relatively flat areas adjoining inland and coastal waters, including flood-prone areas of offshore islands, and including, at a minimum, that area subject to temporary inundation by a regulatory flood." EO 11988, "Floodplain Management" requires an examination of impacts to floodplains, potential risks involved in placing facilities within floodplains, and protecting floodplain values. The NPS has adopted the policy of preserving floodplain values and minimizing potentially hazardous conditions associated with flooding (NPS Floodplain Management Guideline 1993). Predictions of short- and long-term site impacts were based on previous studies of impacts to morphologically similar floodplains from similar projects and recent scientific data. The thresholds of change for the intensity of an impact are defined in Table 12.

TABLE 12. FLOODPLAIN IMPACT AND INTENSITY THRESHOLDS

Impact Intensity	Intensity Description
Negligible	There would be very little change in the ability of a floodplain to convey floodwaters, or its values and functions. The proposed project would not contribute to flooding.
Minor	Changes in the ability of a floodplain to convey floodwaters, or its values and functions, would be measurable and local, although the changes would be barely measurable. The proposed project would not contribute to flooding. No mitigation would be needed.
Moderate	Changes in the ability of a floodplain to convey floodwaters, or its values and functions, would be measurable and local. The proposed project could contribute to flooding. The impacts could be mitigated by modification of proposed facilities in floodplains.
Major	Changes in the ability of a floodplain to convey floodwaters, or its values and functions, would be measurable and widespread. The proposed project would contribute to flooding. The impacts could not be mitigated by modification of proposed facilities in floodplains.

Duration:
Short-term impact—recovery usually takes less than one year; impacts would not be measurable or measurable only during the life of construction.
Long-term impact—recovery usually takes more than one year; impacts would be measurable during and after project construction.

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts. In the absence of improvements to the culvert at New Tahoma Creek, periodic streamflow events are likely to exceed the capacity of the existing culvert. The existing 3-foot by 6-foot culvert would likely become obstructed by debris carried by flood waters, further reducing the culvert capacity. This may result in damage to the road, possible changes in the existing drainage channel, or creation of new channels. The current culvert would have a local long-term moderate adverse impact on the ability of New Tahoma Creek to convey flood flows.

The Kautz Creek channel and the associated overflow ditch and culverts would remain inadequate to carry flows for floods larger than a 40-year event. Channel incision, bank erosion, and woody debris could further compromise the ability of the two existing 12-foot culverts to carry streamflow. The risk of further channel avulsion upstream of the existing culverts remains high. Erosion of the overflow ditch would continue without additional armoring. The risk of flood events exceeding the capacity of existing drainage structures and overtopping the road, resulting in possible structural damage to the road and existing culverts, is high without improvements in conveyance capacity (Kennard 2009). Because existing drainage structures are inadequate to convey large flows, the no action alternative would have a local long-term moderate adverse impact on the ability of Kautz Creek to convey flood flows and maintain floodplain functions and values.

Cumulative Impacts. Past and ongoing actions, such as road construction, bridges, and culverts, are within stream floodplains and have modified natural floodplain processes. Past and planned flood control and streambank improvement projects along the Nisqually River and Tahoma Creek would result in short-term adverse effects to the floodplain and long-term beneficial effects that protect eroding streambanks. In some cases, drainage structures have constricted stream channels and reduced the capacity for carrying flood flows. More frequent flood events also are redefining the return interval for flood events. Planned flood control and streambank improvement projects along the Nisqually River would be designed to protect the Nisqually – Paradise Road and adjacent streambank from flood flows, but would also result in a change to the characteristics of the floodplain. Past, present, and reasonably foreseeable future actions would have local long-term minor adverse impacts on floodplain function, as well as beneficial effects from streambank stabilization measures. Those impacts, in combination with the local long-term moderate adverse impacts of the no action alternative would result in local long-term moderate adverse effects to floodplains.

Conclusion. The no action alternative would have a local long-term moderate adverse impact on the New Tahoma Creek and Kautz Creek floodplains by not increasing the capacity of existing drainage structures to better convey flood flows. Cumulative floodplain effects would be local, long-term, moderate, and adverse.

Preferred Alternative—Repair Road

Direct and Indirect Impacts. Replacement of the existing undersized box culvert at New Tahoma Creek with a new 11-foot culvert would have a long-term beneficial effect on the ability of this channel to convey flows. The conveyance capacity would be substantially

increased from 170 to 700 cfs, although flood events may still exceed the capacity of the larger culvert depending on the channel dynamics in Tahoma Creek and the amount of overflow that spills into New Tahoma Creek. The new culvert would provide improved protection of the road from flood damage and would allow fish passage. EO 11988, "Floodplain Management" requires an examination of impacts on floodplains and potential risks involved in placing facilities within floodplains. NPS DO-77-2: *Floodplain Management* states that a Statement of Findings (SOF) must be prepared and approved. Culvert replacement at New Tahoma Creek would have a local long-term beneficial effect on flood conveyance capacity and improving floodplain function.

Proposed drainage improvements at Kautz Creek would improve the ability to convey flood flows and protect the road from damage. Filling in the overflow ditch allows the Kautz Creek flow to randomly access alluvial fan areas in a more natural, unrestrained manner. The grade control established by the riprap-filled ditch reduces the potential for a new large primary active channel developing. The riprap armoring protects the road from substantial damage during flood events while reducing resource impacts. Proposed measures would improve floodplain function and would have a local long-term beneficial effect on the floodplain by increasing conveyance capacity and reducing the potential for damage to the road. A floodplain statement of findings in Appendix C provides additional detail on the impact to floodplains for the preferred alternative.

Cumulative Impacts. Past and ongoing actions, such as road construction, bridges, and culverts, are within stream floodplains and have modified natural floodplain processes. Past and planned flood control and streambank improvement projects along the Nisqually River and Tahoma Creek would result in short-term adverse effects to the floodplain and long-term beneficial effects that protect eroding streambanks. In some cases, drainage structures have constricted stream channels and reduced the capacity for carrying flood flows. More frequent flood events also are redefining the return interval for flood events. Planned flood control and streambank improvement projects along the Nisqually River would be designed to protect the Nisqually – Paradise Road and adjacent streambank from flood flows, but also would result in a change to the characteristics of the floodplain. Past, present, and reasonably foreseeable future actions would have a local long-term minor adverse impact on floodplain functions, as well as beneficial effects from streambank stabilization measures. Those impacts, in combination with the local long-term beneficial effects of the preferred alternative, would result in local long-term beneficial effects to floodplains.

Conclusion. Installation of new drainage structures at New Tahoma Creek and drainage improvements at Kautz Creek would have a long-term beneficial effect by increasing the capacity to carry flood flows and reducing the potential for damage to the road and other resources. Cumulative impacts would be local, long-term, and beneficial.

FISH, WILDLIFE, AND SPECIAL STATUS FISH AND WILDLIFE SPECIES

Affected Environment

Mount Rainier supports a wide diversity of fish and wildlife species. At least 229 bird species, 56 mammal species, 14 amphibian species, and 5 reptile species are known to occur within the park (NPS 2008b). The project area contains habitat for many species of birds, mammals, reptiles, amphibians, fish, invertebrate species (e.g., insects and mollusks), and several special status species as described below for terrestrial and aquatic species.

Special status species include species listed as endangered, threatened, candidate, or proposed for listing under the Endangered Species Act (ESA); federal species of concern; species listed as endangered, threatened, candidate, or sensitive by the Washington Department of Fish and Wildlife (WDFW); and species monitored by the WDFW. Federally listed species present in the park, based on surveys, staff knowledge, U.S. Fish and Wildlife Service (USFWS) data, available habitat, and known range are listed in (Table 13).

TABLE 13. FEDERALLY LISTED ENDANGERED, THREATENED, PROPOSED, AND CANDIDATE WILDLIFE SPECIES, MOUNT RAINIER NATIONAL PARK

Common Name	Scientific Name	Federal Status	Habitat present in or near project area?	Species documented in or near project area?
Northern spotted owl	*Strix occidentalis caurina*	Threatened	Yes	Yes
Marbled murrelet	*Brachyramphus marmoratus marmoratus*	Threatened	Yes	Yes
Fisher	*Martes pennanti*	Candidate	No	No
Gray wolf	*Canis lupus*	Endangered	Yes	No
Canada Lynx	*Lynx canadensis*	Threatened	No	No
Grizzly bear	*Ursus arctos horribilis*	Threatened	No	No
Chinook salmon *(Puget Sound Evolutionarily Significant Unit)*	*Oncorhynchus tshawytscha*	Threatened	No	No
Bull trout	*Salvelinus confluentus*	Threatened	Yes	Unlikely
Steelhead (*Puget Sound*)	*Oncorhynchus mykiss*	Threatened	No	No
Dolly varden trout	*Salvelinus malma*	Proposed	No	No
Coho salmon	*Oncorhynchus kisuytch*	Proposed	No	No

The park also provides habitat for federal species of concern; species listed as endangered, threatened, sensitive, or species of concern by WDFW; and species monitored by the park. Several sensitive wildlife species are known to occur, or have the potential to occur, in the park and project area (Table 14).

TABLE 14. SENSITIVE WILDLIFE SPECIES, MOUNT RAINIER NATIONAL PARK

Common Name	Scientific Name	Status	Habitat Needs and Occurrence*
Bald eagle	*Haliaeetus leucocephalus*	FSC, ST	Bald eagles migrate through the park and sometimes forage in the park. There is no known habitat within the project area.
Golden eagle	*Aquila chrysaetos*	SC	Golden eagles have been seen throughout the park in suitable habitat. They may nest in the park.
Merlin	*Falco columbarius*	SC	Merlins are rare park visitors to subalpine areas in summer and are occasionally observed in fall. No known nesting occurs in the park.
Northern goshawk	*Accipiter gentillis*	FSC, SC	Northern goshawks nest in trees in mature or old growth coniferous forests. Visitors and park biologists regularly observe goshawks in the park. Suitable habitat occurs in old growth forests near the project area.
Peregrine falcon	*Falco peregrinus*	FSC, SS	Peregrine falcons nest primarily on cliffs along rivers or near lakes. In the spring and fall, migrants may pass through the park. Peregrines occasionally nest in cliffs several hundred meters above the road.
Pileated woodpecker	*Dryocopus pilieatus*	SC	Pileated woodpeckers are relatively common in low elevation forest in the park and could occur near the project area.
Lewis' woodpecker	*Melanerpes lewis*	SC	Lewis' woodpeckers are a rare migrant in western Washington.
Oregon vesper sparrow	*Pooecetes gramineus affinis*	FSC	It is not known if this newly described subspecies occurs in the park. Oregon vesper sparrow life history suggests that only drier, open areas on the east side of the park would be suitable habitat and this species would not likely occur near the project area.
Olive-sided flycatcher	*Contopus cooperi*	FSC	The olive-sided flycatcher breeds in the park and prefers forest edges adjacent to open areas, such as burns, montane meadows, and subalpine areas. This species could occur in subalpine areas near the eastern end of the project area.
Vaux's swift	*Chaetura vauxi*	SC	Vaux's swifts may be found in forested areas and are considered common in spring, summer, and fall. This species is believed to nest in the park.
California wolverine	*Gulo gulo luteus*	FSC, SC	Wolverines inhabit high elevation coniferous forests and subalpine areas and have home ranges of up to 100 square miles. Wolverines were last documented in the park in 1933 and are unlikely to occur in the project area.
Long-eared myotis	*Myotis evotis*	FSC	Long-eared myotis inhabit forests and chaparral. A nursing colony occurs near Longmire.
Long-legged myotis	*Myotis volans*	FSC	Long-legged myotis forage over ponds, streams, open meadows, and forest edges. Night roosts occur in caves or mines. This species occurs in the park.
Pacific Townsend's big-eared bat	*Corynorhinus townsendii townsendii*	FSC, SC	Pacific Townsend's big-eared bats hibernate in caves and use caves and abandoned buildings for breeding and roosting. Nursery colonies are extremely sensitive to human activity. Two hibernacula occur near Longmire.

Common Name	Scientific Name	Status	Habitat Needs and Occurrence*
Pika	*Ochotona princeps*	PM	Pika inhabit talus slopes within the park. A survey at 32 sites along the Nisqually – Paradise Road in 2009 found most sites with suitable habitat were occupied by pika (NPS 2009c).
Coastal cutthroat trout (*Western Cascades*)	*Oncorhynchus clarki clarki*	FSC	The coastal cutthroat trout is the only anadromous subspecies of cutthroat trout in North America and there are native resident populations.
Cascades frog	*Rana cascadae*	FSC, SC	Cascades frogs occur in mountainous areas, marshes, and ponds. A 2009 survey documented 220 individual Cascades frogs in or near the project area in the Paradise River and Van Trump Creek watersheds (NPS 2009d).
Tailed frog	*Ascaphus truei*	FSC	Tailed frogs are relatively common in the park and have been found in all suitable habitat (fast flowing streams) when surveyed. A 2009 survey documented 36 individuals in or near the project area in the Lower Tahoma Creek, Paradise River, and Van Trump Creek watersheds (NPS 2009d).
Western toad	*Bufo boreas*	FSC, SC	Western toads were formerly more abundant in the park. They have recently been found in only a few montane lakes and wetlands immediately outside the park; therefore, they may be present in the project area.
Columbia torrent salamander	*Rhyacotriton kezeri*	FSC, SC	Columbia torrent salamanders occur adjacent to the park and are expected to occur in the park. There are no records of this species in the project area.
Larch Mountain salamander	*Plethodon larselli*	FSC	Larch mountain salamanders are found in forested and talus environments in cool, moist conditions under wood or rock. They have been found in several locations in the park, including the project area.
Van Dyke's salamander	*Plethodon vandykei*	FSC, SC	Van Dyke's salamanders are found in a variety of habitats, including streambanks, upland forests, talus areas, and seeps at a range of elevations. This species has been documented in several areas within the park, including within the project area.
Fender's soliperlan stonefly	*Soliperlan fenderi*	FSC	Fender's soliperlan stonefly inhabits cold, fast-flowing streams. This species has been documented several times near the Westside Road and is expected to be present elsewhere in the park. This species is known to occur in Tahoma Creek near the project area. One individual was documented at the junction of the West Side Road and the Nisqually – Paradise Road (NPS 2009d).

*Potential occurrence based on presence of suitable habitat, known distribution, NPS records, and NPS staff knowledge of the project area.
FSC= federal species of concern, ST= state threatened, SC= state species of concern, SS= state sensitive species, PM= monitored by the park.
Source: WDFW 2010, USFWS 2010.

Terrestrial Species

At least 87 bird species are known or suspected to nest in the park (NPS 2005). The most abundant bird species in forested and subalpine habitats in the project area are the gray jay

(*Perisoreus canadensis*) and dark-eyed junco (*Junco hyemalis*). Other common species in forested and subalpine habitats in the park include hairy woodpecker (*Picoides villosus*), northern flicker (*Colaptes auratus*), violet-green swallow (*Tachycineta thalassina*), Steller's jay (*Cyanocitta stelleri*), common raven (*Corvus corax*), mountain chickadee (*Poecile gambeli*), red-breasted nuthatch (*Sitta canadensis*), golden crowned kinglet (*Regulus satrapa*), American robin (*Turdus migratorius*), yellow-rumped warbler (*Dendroica coronata*), pine siskin (*Carduelis pinus*), and many others.

Small mammals likely to occur in the project area include deer mouse (*Peromyscus maniculatus*) and Douglas squirrel (*Tamiasciurus douglasii*). Suitable habitat for marmots (*Marmota caligata*) and pikas (*Ochotona princeps*) is present in rocky areas. Pikas have been found in numerous locations on talus slope primarily at the eastern side of the Nisqually – Paradise Road and along the Paradise Valley Loop Road (NPS 2009c). Small and medium-sized carnivores that may occur in the project area include long-tailed weasel (*Mustela frenata*), pine marten (*Martes americana*), raccoon (*Procyon lotor*), bobcat (*Lynx rufus*), and coyote (*Canis latrans*). Large mammals includes black bear (*Ursus americanus*), black-tailed deer (*Odocoileus hemionus columbianus*), and mountain lion (*Felis concolor*). A Cascade red fox (*Vulpes vulpes cascadensis*) den was located within about 50 feet of one of the pullouts on the Paradise Valley Road in 2009), and two alternate fox dens were located 15 to 80 feet from the Nisqually – Paradise Road near Paradise in 2010.

Northern spotted owl

The northern spotted owl is strongly associated with structurally complex old growth forests. Suitable habitat has multiple canopy layers and contains trees of a variety of species, sizes, and ages, including standing and downed dead trees. The owls require large amounts of suitable habitat, with median home ranges typically around 3,000 to 5,000 acres per pair of owls. Spotted owls nest in cavities or platforms in trees, and pairs are typically spaced about 1 to 2 miles apart. Northern spotted owls are long-lived, territorial birds, and often spend their entire adult life in the same territory.

Northern spotted owls' nesting and fledging season extends from March 15 through September 30. The breeding season is divided into an early season of March 15 to July 31 and a late season of August 1 to September 30. In late March or early April, the female will lay one to three eggs. Young are fed by both parents until August or September, although fledging may occur in May or June; by October the young disperse from the nest site. Nest trees may include Douglas-fir, grand fir, Pacific silver fir, or other species. Nests are usually found in forests up to 4,800 feet in elevation.

Mount Rainier National Park contains approximately 80,000 acres of suitable spotted owl habitat (NPS 2009b). Spotted owl habitat extends up to an elevation of about 4,800 feet in the park. Surveys for spotted owls have been conducted annually in the park since 1997 as part of an ongoing spotted owl demography study (NPS 2008a, 2009b). In 2011, spotted owls were detected at 11 sites in the park, including 7 pair sites, but no nesting attempts were documented (Bagnall 2011). It is common for spotted owls to nest in alternating years, with most nesting attempts occurring in even years, and relatively few nesting attempts documented in odd years (Anthony et al. 2006). In 2010, an average of 0.50 young fledged per territorial female (Bagnall 2010). Critical habitat for spotted owls has been designated on

National Forest lands in Lewis and Pierce counties, but no critical habitat has been formally designated in the park (USFWS 2008).

The USFWS uses a 0.7-mile radius (984 acres) from the activity center to delineate the most heavily used area during the nesting season (USFWS 2006). Much of the Nisqually – Paradise Road is within suitable spotted owl habitat and portions are within 0.7 of a mile of the centers of four territories. Owls in one territory produced one young in 2008, but did not breed in 2010. A pair nested, but failed to produce young in 2010 in another territory. Another territory was last occupied in 2005.

Marbled murrelet

The marbled murrelet is a robin-sized seabird. Marbled murrelets forage in sheltered near-shore waters and are year-round residents of coastal areas from northern California north to Alaska. Murrelets typically nest high in the canopy of old growth forests or stands of large trees infected with mistletoe and make daily inland-to-sea migrations. Approximately 26,500 acres of potential murrelet nesting habitat is in the park. Suitable habitat is typically below 3,800 feet in elevation. High quality habitat is distributed along the western boundary of the park in valleys running east and west, separated by high elevation ridges. Lower quality suitable habitat continues along the southern and southeastern areas of the park. Critical habitat for the species has been designated within Lewis and Pierce counties, but the designation does not include the park.

A USFWS reassessment of available surveys and study findings indicate that marbled murrelets in western Washington and the park actively nest from April 1 through September 23. In Washington, on average, incubation begins in April and extends through July. Both sexes incubate the egg for about 30 days. The average nestling period extends from late May through August, lasting about 30 days. The total breeding season averages 124 days (Hamer and Nelson 1995). Adults feed the chicks up to eight times per day, most often at dusk and dawn. Adults leave the chicks alone on the nest except during active feeding. A fledgling's first flight is presumed to be from the nest directly to the marine environment. The marbled murrelet is thought to be most vulnerable to noise disturbance during the breeding season when adults are producing and incubating eggs.

Within the park, murrelets have been documented in four river corridors—Carbon, Mowich, Puyallup, and Nisqually (NPS 2008b). Audiovisual surveys have detected breeding behavior (subcanopy flights) in the Carbon, Mowich, and Puyallup rivers. Thus, these drainages are considered "occupied" per USFWS guidelines. Repeated radar surveys along the Nisqually River at Kautz Creek and Tahoma Creek confluences have detected very few (mean 4.7 per day, range 1 to 12) murrelet targets, suggesting the Nisqually River drainage contains few murrelets (Hamer Environmental 2000; ABR, Inc. 2005; ABR 2008; ABR 2009). Despite many years of surveys at several locations, no ground observer has ever detected marbled murrelets in the Nisqually River drainage. No active nests have been identified within the park; however, nest surveys have been few and limited to the Carbon River drainage.

Most of the project area below 3,800 feet in elevation is within suitable habitat for marbled murrelet, especially within the Nisqually River drainage. This primarily includes the portion of the road between MP 0.0 and MP 12.0 west of the Nisqually River Bridge.

Fisher

Historically, fishers were widely distributed in Washington in dense, mesic forests at low to mid elevations. Fishers have declined throughout their range and may be on the verge of extinction in Washington. The park contains extensive suitable habitat for this species. A state reintroduction program is in planning development, but immediate release sites are not likely to include the park. Fishers have not been documented in the park since 1947, but unconfirmed sightings were reported in the park in the 1990s (NPS 2008b). A 1991 study in the southeastern portion of the park did not detect fishers (Jones and Raphael 1992), nor did recent hair snare and remote camera bait station surveys (Reid et al. 2010).

Gray wolf

Gray wolves are wide-ranging carnivores that inhabit forests and tundra. Gray wolves were eliminated from Washington by the early 20th century, but now appear to be naturally recolonizing the state. Five packs have denned in the north-central region of Washington and one suspected pack has been found in the southwest region (WDFW 2010). The park contains abundant habitat and prey for gray wolves and wolves historically occurred in the park. There have been numerous reports of gray wolves in the park since 1980; however, no sightings have been confirmed by state or federal biologists in the park in the past 80 years (NPS 2008b). Carnivore surveys in the park, including snow tracking and baited camera stations in 2000 to 2002, did not find evidence of wolves (Reid, et al. 2010; NPS unpublished data).

Canada lynx

The Canada lynx is the rarest of three cat species native to Washington with probably fewer than 100 individuals in the state. Lynx are primarily associated with subalpine and boreal forest types in the mountains of north-central and northeastern Washington and formerly occurred in the southern Cascades. Subalpine and boreal forests have a patchy distribution in the park, which reduces the potential to support lynx (Stinson 2001). The park contains suitable habitat for lynx and their favorite prey, the snowshoe hare, in subalpine areas below the tree line. Extensive small carnivore surveys were completed in the park from 2000 to 2002 including following the National Lynx Detection Protocol, snow tracking, and baited camera stations (Reid et al. 2010). No sign of lynx were found during these surveys. There have been no confirmed reports of this species in the park since 1934 (NPS 2008b).

Grizzly bear

Grizzly bears are omnivores that inhabit semiopen country, usually in mountainous areas. Grizzly bears prefer open shrub communities, alpine and low elevation meadows, riparian areas, seeps, alpine slab rock areas, and avalanche chutes. This species typically has a home range between 30 and 100 square miles. Grizzly bears historically occurred in Washington, but were extirpated from the state by 1930. The park contains suitable grizzly bear habitat; however, there has never been a confirmed sighting of a grizzly bear in the park. In 1993,

grizzly bear tracks were identified by the WDFW, adjacent to the west side of the park (NPS 2008b). No grizzly bear sightings have been recorded near the park since 1993.

Aquatic Species

Seven species of amphibians were documented in or near the project area during a survey of the project area in 2009 (NPS 2009d). The most common species detected was the Cascade frog (*Rana cascadae*). Other species documented during the survey were tailed frog (*Ascaphus truei*), northwest salamander (*Ambystoma gracile*), red-legged frog (*Rana aurora*), long-toed salamander (*Ambystoma macrodactylum*), western red-backed salamander (*Plethodon vehiculum*), and Pacific chorus frog *(Pseudacris regilla*).

Cutthroat trout are found in most fish-bearing waters of the Nisqually River basin; however, the presence of large dams and other steep landform features prevent anadromous fish passage up the Nisqually into the park. Coastal cutthroat trout occur at relatively low densities (typically 20 to 30 fish/mile) in the Nisqually River during the summer (NPS 2009d). The low fish densities in the Nisqually River may be partially attributed to the relatively high level of human disturbance and park infrastructure in the Nisqually corridor compared to other parts of the park. Native coastal cutthroat trout populations also inhabit the Tahoma Creek and Kautz Creek watersheds.

Bull trout

Bull trout are members of the char subgroup of the salmon family, which also includes the Dolly Varden, lake trout, and Arctic char. Bull trout are known to exist in the park in the White, West Fork, Carbon, Mowich, and Puyallup rivers and their tributaries. No native char (bull trout or Dolly Varden) have been documented in the Nisqually River watershed in the park.

Steelhead

Steelheads are an anadromous form of rainbow trout and may be present in the Carbon and White rivers in the park. This species is not known to occur in the Nisqually River within the park and is not expected to occur in the Nisqually River upstream of Alder Creek Dam (including the project area), because the dam prevents this anadromous species from moving upstream.

Dolly Varden trout

The Dolly Varden trout is a member of the char subgroup of the salmon family and is proposed for federal listing under the Endangered Species Act because it occupies the same habitats and has nearly indistinguishable characteristics as bull trout, and belongs to the same genus. Recent DNA analysis conducted on native char in the park suggests that only bull trout are present in park streams (NPS 2008b). No native char (bull trout or Dolly Varden) have been documented in the Nisqually River watershed in the park.

Chinook salmon

The Puget Sound Chinook salmon Ecological Significant Unit (ESU) was listed as threatened on May 24, 1999 (NMFS 1999). This ESU includes all naturally spawned

populations of Chinook salmon from rivers and streams flowing into Puget Sound. This species is not known to occur in the Nisqually River within the park and is not expected to occur in the Nisqually River upstream of Alder Creek Dam (including the project area), because the dam prevents this anadromous species from moving upstream.

Coho salmon

Coho salmon were historically found in the White, Carbon, Mowich, and North and South Puyallup rivers. Coho salmon have been documented to have small spawning populations in the tributaries of the White and Carbon rivers with the park. This species is not known to occur in the Nisqually River within the park and is not expected to occur in the Nisqually River upstream of Alder Creek Dam (including the project area), because the dam prevents this anadromous species from moving upstream.

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (MSA; 16 USC 1855(b)), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance essential fish habitat (EFH) for those species regulated under a federal fisheries management plan. EFH has been designated to protect waters and substrates necessary for fish spawning, breeding, feeding, or growth to maturity (MSA § 3(10)). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable artificial barriers and longstanding, naturally impassable barriers. The geographic extent of freshwater EFH is specifically inclusive of all aquatic habitats within entire watersheds. For this action, the Nisqually River basin (USGS hydrologic unit number 17110015) is identified as EFH for Chinook salmon (*Oncorhynchus tshawytscha*), Coho salmon (*O. kisutch*), and pink salmon (*O. gorbuscha*). The distribution of anadromous salmonids including Chinook salmon, Coho salmon, and pink salmon in the Nisqually River basin is limited to reaches and tributaries downstream of LaGrande Dam, which was first constructed in 1910. Thus, there are no anadromous fish in the Nisqually River within the park.

Impact Intensity Threshold

Section 7 of the Endangered Species Act mandates all federal agencies to determine how to use their existing authorities to further the purposes of the Endangered Species Act to aid in recovering listed species, and to address existing and potential conservation issues. Section 7(a)(2) states that each federal agency shall, in consultation with the Secretary of the Interior, ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. NPS *Management Policies 2006* state that potential effects of agency actions would also be considered for state or locally listed species (i.e., special status species). The thresholds of change for the intensity of impacts to special status species are defined in Table 15.

TABLE 15. FISH, WILDLIFE, AND SPECIAL STATUS WILDLIFE SPECIES IMPACT AND INTENSITY THRESHOLDS

Impact Intensity	Intensity Description
Negligible	The action would result in a change to a population or individuals of a species, but the change would not be of measurable or perceptible consequence, and would be well within natural variability. In the case of federally listed species, this impact intensity equates to a USFWS determination of "no effect."
Minor	The action would result in a change to a population or individuals of a species. The change would be measurable, but small and localized, and not outside the range of natural variability. Mitigation measures, if needed, would be simple and successful. In the case of federally listed species, this impact intensity equates to a USFWS determination of "may affect, not likely to adversely affect."
Moderate	Impacts on species, their habitats, or the natural processes sustaining them would be detectable and occur over a large area. Breeding animals of concern are present, animals are present during particularly vulnerable life stages; mortality or interference with activities necessary for survival would be expected on an occasional basis, but is not expected to threaten the continued existence of the species in the park unit or conservation zone. Mitigation measures would be extensive and likely successful. In the case of federally listed species, this impact intensity equates to a USFWS determination of "may affect, likely to adversely affect."
Major	The action would result in noticeable effects to the viability of the population or individuals of a species. Impacts on special status species or the natural processes sustaining them would be detectable, both inside and outside of the park. Loss of habitat might affect the viability of at least some special status species. Extensive mitigation measures would be needed to offset any adverse effects, and their success would not be guaranteed. In the case of federally listed species, the impact intensity equates to a USFWS determination of "may affect, likely to jeopardize the continued existence of a species."

Duration:
Short-term impact—following project completion, recovery takes less than one year.
Long-term impact—following project completion, recovery takes more than one year.

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts. There would be no new impacts to fish, wildlife, and special status wildlife species or critical habitat from the no action alternative. Existing impacts from traffic and human activity in the area would continue unchanged. Periodic road maintenance and repairs to deteriorating roads would result in local short-term minor adverse impacts to fish, wildlife, and special status wildlife species. Potential impacts to the northern spotted owl and marbled murrelet from unscheduled road work depend on the timing and nature of the required actions. A local short-term minor to moderate adverse impact to northern spotted owl and marbled murrelet would occur from the periodic repairs required to address deteriorating road conditions.

Cumulative Impacts. Past actions, such as road construction and maintenance activities, have resulted in the disturbance and loss of fish and wildlife habitat. Planned future hazard tree removal would result in a small loss in habitat for the northern spotted owl and marbled murrelets, and potential disturbance during tree removal. The current Stevens Canyon Road rehabilitation project may affect, but is unlikely to adversely affect the northern spotted owl, and would have no effect on the marbled murrelet. Planned streambank protection of the Nisqually River and periodic dredging on Tahoma Creek would introduce short-term adverse effects to the northern spotted owl and marbled murrelet during construction. Past, present, and reasonably foreseeable future projects would have a local short-term minor

adverse effect on fish, wildlife, and special status species. Those impacts, in combination with the local short-term minor to moderate adverse effects of the no action alternative, would result in local short-term minor to moderate adverse cumulative impacts.

Conclusion. The no action alternative would have no new impacts on fish, wildlife, and special status wildlife species or critical habitat, although periodic road maintenance and repair work to address deteriorating road conditions would have a short-term minor adverse impact on fish, wildlife, and special status species, and critical habitat. Impacts to the northern spotted owl and marbled murrelet would be local, short-term, minor to moderate, and adverse from the periodic repairs required to address deteriorating road conditions. Cumulative effects would be local, short-term, minor to moderate, and adverse.

Preferred Alternative—Repair Road

Terrestrial species

Direct and Indirect Impacts. Terrestrial wildlife could be temporarily disturbed or displaced by increased human activity and noise during construction. Impacts to wildlife habitat would be minimal since the majority of work would occur within existing areas of disturbance and because BMPs and conservation measures are integrated into the design of the project. Construction timing limitation for marbled murrelet also would benefit terrestrial wildlife species by limiting daytime construction work to two hours after sunrise and ceasing work two hours before sunset from April 1 to September 23 from MP 0.0 to MP 12.0. No night work would occur from April 1 and June 15 in murrelet habitat. Night work would be restricted from one hour after sunset to one hour prior to sunrise from June 15 to September 23 in murrelet habitat. These timing restriction also would reduce impacts to other wildlife species that are most active at dawn and dusk. Drainage work at New Tahoma Creek, Kautz Creek, and from embankment stabilization would affect about 1 acre of roadside vegetation and temporarily displace wildlife during construction. All temporarily disturbed natural areas would be revegetated with native plant species following construction. Temporary impacts to terrestrial wildlife during construction are expected to be minor because the Nisqually – Paradise Road is in an area of previous disturbance and high human activity and because BMPs and conservation measures are integrated into the design of the project.

Road excavation work that results in tree mortality would reduce available nesting habitat for birds and the overall forest canopy cover. An increase in disturbed forest edge along the road could increase the potential for nest robbing bird species, such as jays and ravens. This would affect breed vitality for some bird species. The resource protection measures for protecting large trees adjacent to the road as described page 42 would reduce the potential for tree mortality and impacts to breeding bird habitat.

The overall impact to terrestrial wildlife, including special status species would be local, short- and long-term, minor to moderate, and adverse under the preferred alternative as described below for individual species.

Northern spotted owls could be directly and indirectly affected by construction disturbance, collisions with vehicles, and habitat modification. The project would result in short-term adverse impacts from increased levels of human activity and increased noise levels

at specific construction sites as well as equipment and vehicle travel through habitat to reach construction areas outside of suitable habitat. As described previously, the project would overlap nearby roosting and nesting habitat for four northern spotted owl activity centers. Currently, noise and human activity in the project area occurs as a result of frequent automobile, bus, and motorcycle traffic; and visitor use of trails and pullouts. In addition, large trucks, snowplows, and other equipment periodically operate nearby to perform routine maintenance. Ambient noise levels in the project area likely range from about 50 to 70 decibels, and result from natural processes such as wind, from human activities such as vehicles traveling on the Nisqually – Paradise Road, and from human voices at parking areas. The project includes construction activities that generate considerably more noise disturbance than existing conditions. For example, pulverizing existing pavement prior to grading and overlaying new pavement would generate noise levels above current conditions. Construction activities would result in noise levels from 70 to 90 decibels or more.

Spotted owl responses to noise disturbance range from no apparent reaction, to an alert response where the owls are attentive for the duration of the activity; to a flush response (Delaney et al. 1999). Significant disturbance occurs when noise or project activity causes a spotted owl to become so agitated that it flushes away from an active nest site or aborts a feeding attempt during incubation or brooding of nestlings (USFWS 2003). Such events are considered significant because they have the potential to result in reduced hatching success, fitness, or survival of juveniles.

Over the course of the four years of project implementation, it is likely individual spotted owls that are foraging or roosting close to the road may occasionally be flushed away from a foraging perch or a roosting site by project noise and activity. Such flush responses that occur away from an active nest site are considered to be insignificant, because the owls are simply moving away from the source of disturbance, rather than being forced to flush away from an active nest site.

Impacts to spotted owls from heavy construction activities would be avoided by restricting construction work within a 0.7-mile radius around any known spotted owl activity center or in unsurveyed suitable habitat between March 15 and July 31. If ongoing surveys indicate that breeding is not occurring near the project area, there would be no timing restrictions on construction. Night construction work would be restricted to select locations where road closure is required to implement repairs and work would be conducted at times to avoid and reduce impacts to spotted owls and marbled murrelets. Impacts to spotted owls would be avoided by limiting night construction work until after July 31 for activities within spotted owl territories. Staging areas for night work would also be located outside of spotted owl territories or would not be used until after July 31 if within a territory. Night construction work zones would be restricted to those areas 100 meters from day construction work zones. In addition, no day work would be allowed in the same area where night work occurred. As a result of these proposed timing restrictions on construction, impacts to nesting northern spotted owls would be avoided.

Increased construction traffic would increase the risk of owl collisions with vehicles. Between 1998 and 2009, there were eight incidences of owls colliding with vehicles, including four northern spotted owls (NPS 2009b). This risk would be reduced by reducing travel speeds of construction vehicles within the construction zone.

Construction activities would not reduce available habitat for northern spotted owls because most work would occur in previously disturbed areas within the existing road prism. Where vegetation disturbance occurs adjacent to the road, it would not impact suitable spotted owl habitat. To reduce the potential for impacting tree roots from excavations within the roadway for deep patches and other work, excavations near trees larger than 18 inches would be limited to a depth of less than 1 foot within a 10-foot radius of the tree stem or the section of deep patch would be shortened to avoid excavation within 10 feet of the tree stem. Drainage work at Kautz Creek would place riprap in the roadside ditches and fill slopes. Placement of riprap would avoid trees. No trees that provide suitable nesting habitat for the northern spotted owl would be removed. Construction activities would be confined to the smallest area necessary to complete the work and all areas of temporary vegetation disturbance would be restored with native vegetation following construction. The project would not result in the reduction or adverse modification to spotted owl critical habitat because there is no critical habitat for this species in the project area.

With implementation of the proposed resource protection measures on page46 to restrict the timing of construction activities near owl territories avoid disturbance to owl habitat, the preferred alternative would have local short-term minor impacts to the northern spotted owl due to construction noise and activity. Thus, the preferred alternative may affect, but is not likely to adversely affect the northern spotted owl. The NPS submitted a biological assessment to the USFWS to document potential impacts and proposed mitigation measures to protect northern spotted owls.

Marbled murrelets occur in the Nisqually River drainage in low numbers; however, it is assumed they occupy areas below 3,800 feet in elevation (from MP 0.0 to about MP 12.0) due to the presence of suitable habitat. Direct and indirect effects of the project to marbled murrelets could result from construction disturbance and habitat modification. Project work would coincide with the murrelet nesting season (April 1 through September 23), and would continue into the early fall months after the nesting season has passed. Noise and activities associated with road rehabilitation have the potential to disturb murrelets nesting in the project area. Overall, it appears that murrelets are not easily disrupted from nesting attempts by human disturbance except when confronted at or very near the nest itself.

Marbled murrelets occur in the Nisqually River drainage in low numbers, and it is assumed they occupy areas below 3,800 feet in elevation (from MP 0.0 to approximately MP 12.0) due to the presence of suitable habitat. The project would result in short-term adverse impacts from increased levels of human activity and increased noise levels during construction. Construction activities would result in noise exceeding background levels within suitable murrelet habitat, including construction vehicle traffic through suitable murrelet habitat to reach construction areas outside of suitable habitat. The project includes construction activities that would generate considerably more noise disturbance than existing conditions within suitable marbled murrelet habitat during the breeding period from April 1 to September 23.

Based on the documented history of murrelet occupancy behaviors in the Nisqually – Paradise area, it is assumed that all suitable murrelet nesting habitat in the project area is occupied habitat (ABR 2011). All murrelets associated with nesting habitat adjacent to the Nisqually – Paradise Road corridor would be subjected to noise and activity of varying

degrees of intensity on a daily basis during the four-year construction period. No construction work would be allowed until two hours after sunrise and construction work would cease two hours before sunset in suitable marbled murrelet habitat during the nesting season (April 1 through September 23). This restriction avoids potential disruption to murrelets during their daily peak activity periods for feeding and incubation exchanges. Night work would not occur between April 1 and June 15 in marbled murrelet habitat and night construction would be restricted from one hour after sunset to one hour prior to sunrise from June 15 to September 23.

Construction activities would not reduce available habitat for marbled murrelets because most work would occur in previously disturbed areas within the existing road prism. Where vegetation disturbance occurs adjacent to the road, it would not impact suitable marbled murrelet habitat. To reduce the potential for impacting tree roots from excavations within the road for deep patches and other work, excavations near trees larger than 18 inches DBH would be limited to a depth of less than 1 foot within a 10-foot radius of the tree stem or the section of deep patch would be shortened to avoid excavation within 10 feet of the tree stem. Drainage work at Kautz Creek would place riprap in the roadside ditches and fill slopes. No trees that provide suitable nesting habitat for the marbled murrelet would be removed. Construction activities would be confined to the smallest area necessary to complete the work and all areas of temporary vegetation disturbance would be restored with native vegetation following construction. The project would not result in the reduction or adverse modification to marbled murrelet critical habitat because there is no critical habitat for this species in the project area.

Based on review of the murrelet disturbance literature, it is expected that murrelets nesting close to the Nisqually – Paradise Road would be exposed to prolonged disturbance that would result in a significant disruption of nesting behaviors, with implications for reduced individual fitness, reduced hatching success, and increased risk of nest predation for any murrelets nesting near the project area. Due to the prolonged exposure to construction activities during the nesting season, it is expected that murrelets associated with nesting habitat adjacent to the Nisqually – Paradise Road have an increased likelihood of nest failure as a result of project disturbance for a period of four years.

Timing restrictions for day and night work in marbled murrelet habitat as described in the resource mitigation measures described for Fish, Wildlife, and Special Status Species on page46 reduce potential impacts to marbled murrelets. However, even with implementation of the proposed mitigation measures, the preferred alternative would have local short-term moderate adverse impacts to marbled murrelets due to construction noise and activity during the sensitive breeding season. Thus, the preferred alternative may affect, and is likely to adversely affect, the marbled murrelet. This determination is based on the rationale that the timing and duration of project construction activities is likely to result in significant disturbance and disruption of marbled murrelet nesting behavior, and is likely to result in an increased potential for nest failure for murrelets associated with nesting habitat adjacent to Nisqually – Paradise Road for a period of three to four years. The NPS submitted a biological assessment to the USFWS to document potential impacts and proposed mitigation measures to protect marbled murrelets.

The preferred alternative would have no effects to other federally listed threatened or endangered terrestrial species including **fisher, gray wolf, Canada lynx, and grizzly bear** because these species are unlikely to occur in the project area.

Sensitive wildlife species such as the **golden eagle, peregrine falcon, northern goshawk, pileated woodpecker, Lewis' woodpecker, olive-sided flycatcher, and Vaux's swift** could be temporarily affected by increased noise and human activity during construction. There would be negligible effects to suitable habitat for these species from vegetation disturbance of about 1 acre. Mitigation measures to reduce noise disturbance and revegetation of temporary vegetation disturbances would reduce the potential for impacts to these species. Impacts to the golden eagle, peregrine falcon, northern goshawk, pileated woodpecker, Lewis' woodpecker, olive-sided flycatcher, and Vaux's swift would be local, short-term, minor, and adverse.

Long-eared myotis, long-legged myotis, and Pacific Townsend's big-eared bat may be present in the project area under bridges or roosting in trees. Noise and increased human activity could adversely affect the roosting or foraging behavior of these species. Although bat hibernacula are known to occur in the Longmire area, the preferred alternative would have no effect on the hibernacula. The preferred alternative would have local, short-term, minor adverse effects on the long-eared myotis, long-legged myotis, and Pacific Townsend's big-eared bat from construction disturbance.

The preferred alternative would have no effects to **bald eagle, merlin, Oregon vesper sparrow, California wolverine, and western toad,** because of the limited suitable habitat in the project area.

Pika could be disturbed by increased noise and human activity during construction near talus slopes that provide habitat. No work is planned in the talus and rocky slopes typically used by pikas; therefore, there would be no loss of pika habitat. The preferred alternative would result in local, short-term, minor adverse impacts to pika.

At least three **Cascade red fox** dens have been located immediately adjacent to roads. These foxes are severely habituated to people and conditioned to human food, and commonly rest on or adjacent to the road. Three foxes have been killed by vehicles in the last three years. In order to protect the foxes from vehicle injury and keep them from handouts from park visitors, park biologists began hazing the foxes at the den sites in 2010 to cause them to relocate more distant from road activity. Construction activities around den sites would likely cause the foxes to relocate away from the road, which should reduce the risk of the foxes being hit by faster-moving visitor traffic. Although the activity would be disruptive to denning, it may provide an overall beneficial effect in reducing road-associated mortality.

Aquatic species

Direct and Indirect Impacts. The proposed culvert replacement at New Tahoma Creek would have a local short-term minor adverse impact on **Coastal cutthroat trout**. Impacts would be reduced by limiting construction work to August 1 to September 15, which is outside of the spawning season. The new 11-foot diameter culvert would be constructed to provide fish passage, and would provide a local long-term benefit to cutthroat trout by providing a natural substrate and improved conditions for fish passage. Replacement of

existing culverts at MP 2.1 and MP 6.3 to provide fish passage also would have long term benefit to aquatic life. Short-term construction impacts would be reduced by diverting water during construction and conducting work during low flows. Project components, such as culvert cleaning or replacement throughout the project area, would result in a temporary increase in sediment entering drainages that could impact the cutthroat trout, but culvert work would have a long-term benefit by restoring or improving drainage functions. Resource protection measures as noted page 46 would reduce impacts to aquatic life. The preferred alternative would result in local short-term minor adverse effects and a long-term benefit to coastal cutthroat trout and other native fish species.

The preferred alternative would have no effects to federally listed threatened or endangered aquatic species including **Chinook salmon, bull trout, steelhead, Dolly Varden trout, or Coho salmon** because these species are unlikely to occur in the project area.

The Magnuson-Stevens Fishery Conservation and Management Act established procedures designed to identify, conserve, and enhance essential fish habitat (EFH) for those species regulated under a Federal fisheries management plan. The consultation requirements of §305(b) of the MSA provide that Federal agencies must notify NOAA Fisheries regarding an action that may adversely affect EFH (50 CFR 600.920(a)(3)) and provide NOAA Fisheries with an EFH Assessment (50 CFR 600.920(e). The objective of this EFH assessment is to determine whether or not the proposed action "may adversely affect" designated EFH for relevant commercially, federally-managed fisheries species within the proposed action area. Adverse effects include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH (50 CFR 600.810). Mandatory contents of an EFH Assessment are: a description of the proposed action; an analysis of the potential adverse effects of that action on EFH and the managed species; the Federal action agency's conclusions regarding the effects of the action on EFH; and proposed mitigation, if applicable (50 CFR 600.920 (e)).

EFH has been designated to protect waters and substrates necessary for fish spawning, breeding, feeding, or growth to maturity (MSA § 3(10)). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable artificial barriers, and longstanding, naturally-impassable barriers. The geographic extent of freshwater EFH is specifically inclusive of all aquatic habitats within entire watersheds. For this action, the Nisqually River basin is identified as EFH for Chinook salmon, coho salmon, and pink salmon.

The distribution of anadromous salmonids including Chinook salmon, coho salmon and pink salmon in the Nisqually River basin is limited to reaches and tributaries downstream of LaGrande Dam at MP 42.5. The LaGrande Hydroelectric Project was first constructed in 1910. There is considerable doubt that anadromous fish were able to migrate much further upstream of this project due to the presence of a now submerged natural barrier in LaGrande Canyon, which is located well below the project action area. Therefore, there would be no effect to EFH for Chinook salmon, coho salmon, or pink salmon.

Replacement of about 100 culverts, ditch grading, and culvert cleaning would result in a temporary disturbance to amphibian habitat for four species of concern — **Cascade frog, tailed frog, Van Dyke's salamander, and Larch Mountain**. These four species also could be directly affected by construction activities due to disturbance from increased noise and human activity, or through directly mortality from construction equipment. The preferred alternative would have no effect on **Columbia torrent salamander** because of the limited suitable habitat in the project area.

Night work for deep patches and construction of an MSE wall near Christine Falls would occur near known habitat for several sensitive amphibian species. Road and wall work would not directly impact amphibian habitat, but the noise and light from night construction activities may be disruptive to breeding activities depending on the timing of construction. To reduce the potential for amphibian impacts, no work would be conducted during May and June to avoid the typical breeding season and depending on the snowpack and the elevation of the site, work also may be delayed until later in the season. Amphibian surveys prior to construction, limiting ditch and culvert work to the dry season, and other timing restrictions would reduce the potential for adverse impacts to amphibians. Specific mitigation measures for amphibian species are described in resource protection measures on page 46 and in Table 2. Work would be restricted to daylight hours near amphibian habitat except for deep patches and MSE wall construction. All instream work would be conducted from July 15 to September 15 to reduce the potential for impacts. Coir logs and drift fencing would also be used to capture sediment from the work site and confine the limits of construction near amphibian habitat. Special protection measures may be used at locations where night work occurs near amphibian habitat to further reduce the potential for impact. Because of the potential for adverse effects to amphibians from night work, the preferred alternative would have a local short-term moderate adverse impact on sensitive amphibian species including, Cascade frog, tailed frog, Van Dyke's salamander, and Larch Mountain salamander.

Placing stones at the outlet of the culvert under the West Side Road near New Tahoma Creek would provide a long-term benefit to amphibians by improving conditions for passage through the culvert. **Fendler's soliperan stonefly** has been documented near New Tahoma Creek. The aquatic life stage of the stonefly could be affected by temporary increases in sediment entering drainages during and after construction. Restricting culvert replacement work at New Tahoma Creek to the period from August 1 to September 15 would reduce the potential for impacts to the Fendler's soliperan stonefly.

Resource protection measures are summarized beginning on page 36. Appendix D shows construction locations in relation to sensitive natural resources.

Cumulative Impacts. Past and ongoing actions, such as road construction and maintenance activities, have resulted in the disturbance and loss of fish and wildlife habitat immediately adjacent to and upstream of the road. Planned future hazard tree removal would result in a small loss in habitat for the northern spotted owl and marbled murrelet and potential disturbance. The future Stephens Canyon Road rehabilitation project may affect, but is unlikely to adversely affect, the northern spotted owl; and would have no effect on the marbled murrelet. Planned streambank protection of the Nisqually River and periodic dredging on Tahoma Creek would introduce short-term adverse effects to the northern

spotted owl and marbled murrelet during construction. Past, present, and reasonably foreseeable future projects would have a local short-term minor adverse effect on fish, wildlife, and special status species, and suitable habitat. Those impacts, in combination with the local short-term minor to moderate adverse effects of the preferred alternative, would result in local short-term minor to moderate adverse cumulative impacts.

Conclusion. The additional noise and disturbance during construction would result in temporary impacts to fish, amphibians, mammals, birds, and some special status wildlife species. The preferred alternative may affect, but is unlikely to adversely affect, the northern spotted owl. Mitigation measures would be implemented to restrict the timing of construction activities near northern spotted owl habitat until young owls have fledged. The preferred alternative may affect and is likely to adversely affect marbled murrelets because it is not feasible to limit construction to avoid the breeding season. Mitigation measures for northern spotted owls also would reduce impacts to marbled murrelets. Impacts to golden eagle, northern goshawk, peregrine falcon, pileated woodpecker, Lewis' woodpecker, olive-sided flycatcher, Vaux's swift, long-eared myotis, long-legged myotis, Pacific Townsend's big-eared bat, pika, coastal cutthroat and other native fish species, Cascades frog, tailed frog, Van Dyke's salamander, Larch Mountain salamander, and Fendler's soliperan stonefly would be local, short- to long-term, minor to moderate, and adverse from temporary disturbances during construction. Impacts to Cascade fox may be short-term and adverse, but may increase survival. Installation of a fish-passable culvert at New Tahoma Creek and other culvert replacements would be a long-term benefit to cutthroat trout and other aquatic species. There would be no effect to EFH for Chinook salmon, Coho salmon, or pink salmon. Cumulative effects would be local, long-term, minor to moderate, and adverse, with a local short- to long-term minor to moderate contribution from the preferred alternative.

CULTURAL LANDSCAPES

Affected Environment

According to the NPS DO-28: *Cultural Resource Management Guideline* (page 87), a cultural landscape is:

> ...a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined both by physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions.

The Mount Rainier NHLD was designated in 1997 and encompasses most of the roads, historic developed areas, and historic backcountry structures in the park. The boundaries of the NHLD form a contiguous corridor that overlies the park's road system, as well as some discontiguous backcountry features. The Nisqually – Paradise Road is an important contributing element to the NHLD.

The Nisqually – Paradise Road is significant for its design and construction, and for its association with the events of the American Park Movement and early NPS master planning. The road is an outstanding example of park landscape design, embodying the complimentary styles of rustic architecture and naturalistic landscape architecture. Although the initial build date for the road was 1905, the period of significance is 1925 to 1941 when many of the design characteristics and features were constructed. Stone guardwalls, culvert headwalls, and stone bridges were all built in the initial reconstruction from 1925 through 1929. The Civilian Conservation Corps (CCC), a national public works program, worked primarily on bank stabilization (log cribbing and rocks on embankments) and plantings. The incorporation of naturalistic elements in the road's design is considered archetypal, resulting from the first large-scale master planning endeavor within a park setting.

Like most road systems, the current Nisqually Road hailed from humble beginnings, first as the Longmire Wagon Road begun in 1883, and later as a government-financed road replete with considerable improvements. The Longmire Wagon Road was built by James Longmire from the park entrance to Longmire Springs. The next iteration was the Government Road that went from the entrance to Paradise and was built by the Army Corps between 1903 and 1911. The current road was a complete reconstruction beginning in 1925 by the NPS and Bureau of Public Roads (using contractors and park staff). Sections of both the Longmire Wagon Road and the Government Road are still intact outside of the current road prism (NPS 2012b).

The early road corridor was set at a 10- to 13-foot width with 3-foot shoulders. This first construction period was completed in 1910, and the entrance arch of peeled western red cedar logs was completed in 1911. Significant rehabilitation, including use of bituminous asphalt, occurred from the 1920s through the 1930s, with the alignment maintained generally within the same corridor. NPS initiatives included widening the road to 16 feet; enlarging some of the parking areas; constructing the Narada Cut-Off; and incorporating the rustic style of architecture in the design of bridges, tunnels, culverts, and guardrails using native cut stone and other natural materials. Several bridges have been replaced due to flooding, including the Christine Falls Bridge, Kautz Creek Bridge, and Nisqually River Bridge. A new road from Narada Falls to Paradise Valley was constructed in 1958. The entire road was repaved to a width of 24 feet in the 1960s, and several bridges were replaced (NPS 2004b).

Contributing resources to the NHLD designation are defined within the following five categories (NPS 1997).

Spatial Organization. Spatial organization refers to the composition and sequence of outdoor spaces within the NHLD. The contribution of visitor activities along the road corridor is a primary characteristic of the spatial organization of the NHLD, as is the zoning of appropriate levels of use to specific areas of the park. The park continues to limit automotive traffic to essentially the same corridors as envisioned in the 1920s.

Circulation. Circulation refers to the means and patterns of movement through the NHLD. The road system of the park provides a partial grand loop around the park, but does not circulate around all sides of the mountain. The Nisqually – Paradise Road, as with other primary park roads, is counted as one of the contributing structures to the NHLD. The NHLD boundary follows a corridor 30 feet from the centerline of the road on either side;

and includes ditches, swales, and all other historic structures associated with road construction such as bridges, retaining walls, and guardwalls.

Topography. Topography refers to the ways in which the landscape planning responds to the topographic features of the site, and also to modification of that topography. Views of Mount Rainier influenced the location and character of most of the roads and developed areas in the park. The Nisqually and Paradise rivers helped determine the overall pattern of development in the park, since the Nisqually – Paradise Road parallels these drainages.

Vegetation. Vegetation refers both to the response to existing vegetation and to the management of vegetation. The thick stands of massive Douglas-fir, western red cedar, and western hemlock characterize much of the lower elevations along the Nisqually – Paradise Road. Vegetation management in the NHLD has emphasized preservation of the old growth trees adjacent to roads, with the exception of maintaining open views at select locations.

Structures and Objects. Structures and objects include all of the contributing structures in the NHLD such as roads, trails, retaining walls, guardwalls, and buildings. Park roads, including Nisqually – Paradise, were designed to minimize the visual impact of construction and harmonize with the park scenery. The rustic style of construction was characterized by hand-laid masonry guardwalls and retaining walls, and concrete bridges typically veneered with masonry to match stone walls. Scenic pullouts also are a significant aspect of the road system that serve as viewing terraces, parking, and trailheads. The massive log entryway at the Nisqually Entrance is an example of another type of structure contributing to the NHLD (NPS 2004a).

Impact Intensity Threshold

Cultural landscapes are the result of the long interaction between people and the land, and the influence of human beliefs and actions over time on the natural landscape. The thresholds of change for the intensity of an impact on the cultural landscape are defined in Table 16.

TABLE 16. CULTURAL LANDSCAPE IMPACT AND INTENSITY THRESHOLDS

Impact Intensity	Intensity Description
Negligible	Impacts would be at the lowest levels of detection-barely perceptible and not measurable. There would be no change to defining features that contribute to the resource's National Register eligibility.
Minor	Impacts would not affect the character-defining features of a cultural landscape listed or eligible for the National Register. Impacts would be detectable but would not diminish the overall integrity of the resource.
Moderate	Impacts would alter character-defining features of a cultural landscape and result in measurable changes, and they could diminish the overall integrity of the resource to the extent that its National Register eligibility would be jeopardized.
Major	impacts would result from substantial and highly noticeable changes that would alter the character-defining features of a cultural landscape. These impacts would diminish the overall integrity of the resource to the extent that it would no longer be eligible to be listed on the National Register.

Duration:
Short-term impact—following project completion, effects would remain less than one year.
Long-term impact—following project completion, effects would remain more than one year.

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts. Under the no action alternative, continued routine maintenance of the road and associated features would occur, but rehabilitation of the road would not take place. Maintenance activities would temporarily introduce visual, audible, and atmospheric elements into the landscape setting of the Nisqually – Paradise Road. However, such intrusions would be short-term, lasting only as long as construction and repairs. Routine maintenance would have a beneficial impact by repairing and protecting important landscape features and characteristics (e.g., natural systems, features, land use, topography, vegetation, circulation, buildings and structures, views and vistas, and small-scale features).

Continued deterioration of the road from structural deficiencies could lead to adverse impacts to the road and associated features such as pullouts, guardwalls, retaining walls, and culvert headwalls. Damage to contributing elements of the road is difficult to predict, but could range from minor to moderate. Structural failures that lead to temporary road closure and associated repairs would affect the land use, topography, vegetation, and circulation patterns of the cultural landscape. Impacts to the cultural landscape and the NHLD are anticipated to be local, long-term, and beneficial based on the current level of maintenance; however, should there be a failure to a structural feature, adverse impacts to the cultural landscape would be local, short- to long-term, and minor to moderate.

Cumulative Impacts. Past actions such as vehicle traffic, road maintenance, and visitor use have affected the historic structures and features of the cultural landscape along the Nisqually – Paradise Road. Previous actions that have added new structural features or changes to the road also have contributed to the current condition of the cultural landscape. Planned flood control and streambank protection measures along the Nisqually River would have a beneficial effect to the cultural landscape by protecting the Nisqually – Paradise Road. The combined effects of past, present, and reasonably foreseeable future actions would result in long-term beneficial impacts to the cultural landscape and NHLD. The overall cumulative impacts to the cultural landscape and NHLD from the no action alternative, in combination with past, present, and reasonably foreseeable future actions, would be local, long-term, and beneficial, with a minor to moderate adverse contribution from the no action alternative.

Conclusions. Impacts to the cultural landscape and NHLD are anticipated to be local, long-term, and beneficial for typical maintenance work. However, should there be a failure to a structural feature of the road, adverse impacts to the cultural landscape and NHLD would be local, short- to long-term, and minor to moderate. Cumulative effects would be local, long-term, and beneficial.

Preferred Alternative—Repair Road

Direct and Indirect Impacts. Planned rehabilitation of the Nisqually – Paradise Road is intended to protect, restore, and repair the deteriorating structural components of the road. No alterations would be made to the historic width, alignment, guardwalls or bridges, or other historic features that convey the historic character of the road. All of the proposed work would be conducted to preserve the integrity, design characteristics, and craftsmanship

of structural features. Repair would meet the *Secretary of the Interior's Standards for Rehabilitation,* including reuse of original material, repairing and replacing features in-kind, and using compatible designs when adding new features. Road stabilization and paving would maintain the structural integrity and visual appearance of the road. Existing pullouts would be retained with minor adjustments to curbing and grade. The pullout at MP 6.1 would be narrowed and shortened, as needed, to protect the road and prevent further slumping; however, this pullout is not a contributing element to the NHLD.

Construction of embankment stabilization walls would add new elements to the landscape or reinforce existing structural features adjacent to the road, but design specifications call for constructing the walls to match the historic workmanship and design of existing structural elements. Historic stone guardwalls and stone curbing along the road would be cleaned, tuckpointed or repaired to retain the integrity of the historic design characteristics and craftsmanship.

Planned replacement of the non-historic culvert at New Tahoma Creek would add riprap to the outlet and would use a concrete headwall with a stone veneer of native material to blend with the existing character of the road. Drainage improvements at Kautz Creek from riprap armoring of the road shoulder and embankment would be designed to be compatible with the NHLD and would not impact the cultural landscape. The Kautz Creek parking area, which is a noncontributing feature within the NHLD, would be reconfigured within the existing footprint to improve safety. At locations where 18-inch culverts need to be replaced and the historic headwalls (cut stone masonry, dry-stacked, or rubble type) are in good condition, the 18-inch culvert would be replaced in-kind rather than upsizing to a larger culvert, which would not impact the historic headwalls. At one location where the historic headwall is in poor condition, an 18-inch culvert would be replaced with a 24-inch culvert and the headwall would be reconstructed in-kind.

Improvements at historic Narada Falls parking area include cutting new scuppers in existing guardwalls, as needed for drainage and protection of the road and guardwalls. In addition, milling the pavement down at Narada Falls to reveal more of the guardwall that has been covered by successive layers of asphalt would restore the historic exposure of the guardwall. Miscellaneous culvert repairs, replacement, and new drainage would maintain the historic design and materials using original material whenever possible and would be implemented in a manner consistent with the *Secretary of the Interior's Standards for Rehabilitation.*

The Edith Creek Bridge on Paradise Valley Road would be repaired using original material or material that is visually compatible (e.g., similar in scale, massing and materials, texture, and orientation) with original material. The work would include placing riprap around the bridge footing to protect it from scour and undermining, replacing a curb to direct bridge runoff away from the abutment, patching the bridge surface, and replacing missing dry stacked stone from the bridge. Other non-historic bridge work including replacement of temporary concrete Jersey barriers with steel-backed timber guardrails at the Kautz Creek culvert crossing, and minor repairs and painting at the Tahoma Creek, Kautz Creek, and Nisqually River bridges, would not impact any structural features contributing to the NHLD.

Some small and medium-sized tree removal would be required for wall installation. Temporary vegetation disturbances would be restored with native species. The proposed rehabilitation would maintain the aesthetic quality, scenic viewsheds, and natural features along the road. The spatial orientation, circulation, and topography of the Nisqually – Paradise Road would not change. There would be localized short-term negligible to minor adverse impacts to the cultural landscape setting during project completion. Overall, the proposed rehabilitation work would have a long-term beneficial impact on the cultural landscape by addressing deteriorating road conditions and maintaining and protecting the historic features that contribute to the road's status as a component of the NHLD.

Cumulative Impacts. Past actions such as vehicle traffic, road maintenance, and visitor use have affected the historic structures and features of the cultural landscape along the Nisqually – Paradise Road. Previous actions that have added new structural features or changes to the road also have contributed to the current condition of the cultural landscape. Planned flood control and streambank protection measures along the Nisqually River would have beneficial impacts on the cultural landscape by protecting the Nisqually – Paradise Road.

The combined effects of past, present, and reasonably foreseeable future actions would result in local long-term beneficial impacts to the cultural landscape and NHLD. The overall cumulative impacts to the cultural landscape and NHLD from the preferred alternative, in combination with past, present, and reasonably foreseeable future actions, would be local, long-term, and beneficial, with a beneficial contribution from the preferred alternative.

Conclusions. Under the preferred alternative, there would be localized short-term negligible to minor adverse impacts to the cultural landscape setting during project construction. However, the proposed road rehabilitation would have a local long-term beneficial impact to the cultural landscape and associated historic structures from improvements designed to repair and replace deteriorating structural features that contribute to the integrity of the road. The proposed project would not alter any of the character defining features of the road. The park finds that the undertaking as described would have no adverse effect to historic properties including the Mount Rainier NHLD. Cumulative impacts would be local, long-term, and beneficial, with a beneficial contribution from the preferred alternative.

ARCHEOLOGICAL RESOURCES

Affected Environment

The Area of Potential Effect (APE) for archeological resources was originally identified as the entire Nisqually to Paradise Road prism, including the Ricksecker Point Loop Road and the Paradise Valley Road. The APE also included the Kautz Creek, Narada Falls, and upper and lower Paradise parking areas, and approximately 83 existing pullouts. The Washington Department of Archaeology and Historic Preservation (DAHP) concurred with the NPS determination of the APE on May 5, 2011.

Surveys of the APE from 2008 to 2011 have located and recorded 34 historic sites, 21 isolates, and one nonhistoric ethnographic site (NPS 2012b). All of these sites, except the

Government Road (45PI01149) and two sites documented prior to the Nisqually Road surveys, Longmire Historic District (45PI01041), and Paradise Developed Area (45PI00749) fall outside of the designated APE.

Impact Intensity Threshold

The thresholds of change for the intensity of impacts on archeological sites are defined in Table 17.

TABLE 17. ARCHEOLOGICAL RESOURCES IMPACT AND INTENSITY THRESHOLDS

Impact Intensity	Intensity Description
Negligible	Impact is at the lowest level of detection. An Impact would be measurable with no perceptible consequences and would usually be confined to archeological sites with low data potential.
Minor	Impacts would affect an archaeological site(s) with the potential to yield important information in prehistory or history. Impacts would be detectable and measurable, but would not diminish the overall integrity of the resource. The impact would not result in aspects of integrity that contribute to eligibility to the National Register.
Moderate	Impacts would affect an archeological site(s) with the potential to yield information, would be sufficient to cause a noticeable change, and would result in loss of overall integrity that would consequently jeopardize a site's National Register eligibility.
Major	Impacts would consist of substantial site disturbance that would be highly noticeable, and would result in the loss of most or all of the site and its potential to yield important information. Impacts would result in the loss of overall integrity to the extent that it would no longer be eligible for National Register listing.

Duration:
Short-term impact—during construction prior to project completion.
Long-term impact—following project completion, effects would remain more than one year.

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts. Known archeological sites in the area of potential effect near the Nisqually – Paradise Road would not be affected under the no action alternative because there would be no new disturbances.

Cumulative Impacts. Although other past, present, and reasonably foreseeable future actions may have affected, or could affect, archeological resources, the no action alternative would have no impacts and, therefore, would not contribute to the effects of other actions. Consequently, there would be no cumulative impacts to archeological resources under the no action alternative.

Conclusions. The no action alternative would have no new impacts on archeological resources and no cumulative effects.

Preferred Alternative—Repair Road

Direct and Indirect Impacts. All known archeological sites outside of the road prism would be avoided. Proposed rehabilitation within the road prism has the potential to impact areas deemed archaeologically sensitive. The Government Road, Longmire Historic District, and the Paradise Developed Area are within the APE and may be affected by rehabilitation

work, including deep excavation, utility trenching, and other road stabilization measures. To reduce the potential for impacts, the park archeologist would develop an archaeological monitoring plan that would determine sensitive areas requiring an archaeological monitor during ground disturbing activities. The proposed work on the Paradise Valley Road would be limited to paving within the footprint of the existing road and repairs to the Edith Creek Bridge. As currently designed and with appropriate monitoring, the preferred alternative would not impact archeological resources.

Cumulative Impacts. Past actions such as road construction, repairs, and maintenance may have impacted archeological resources along the road corridor. Planned future streambank stabilization projects along the Nisqually River could uncover archeological resources. The combined effects of past, present, and reasonably foreseeable future actions would result in local long-term negligible to minor adverse impacts to archeological resources. The overall cumulative impacts to archeological resources from the preferred alternative, in combination with past, present, and reasonably foreseeable future actions, would be local, long-term, minor, and adverse with a negligible to minor contribution from the preferred alternative.

Conclusions. The park determined that the preferred alternative would not adversely affect any known archaeological resources. Limiting the majority of the rehabilitation to the existing road prism, and monitoring by a park archeologist during ground disturbing activities in culturally sensitive areas, would reduce the potential for adverse impacts. Cumulative effects would be local, long-term, minor, and adverse.

VISITOR USE AND EXPERIENCE

Affected Environment

The park is one and one-half hours from metropolitan Puget Sound, within easy access of more about 4 million people. The park hosted more than one million visitors in 2011 (NPS 2012a). Park visitation is heavily influenced by weather and time of year. Occasionally, drops in visitation occur because of adverse weather conditions, such as flooding or unusually heavy snow pack, resulting in closure of roads into the park. About 80% of visitation occurs between May and October, with peak visitation occurring in July and August (NPS 2012a). Most visitors stay for one day.

The Nisqually Entrance provides the most convenient access to the park from metropolitan Puget Sound and is the most heavily used entrance to the park. About 54% of park traffic enters through the Nisqually Entrance. The road is open year-round and serves a majority of winter visitors. A 1993 traffic study found the highest traffic volumes occur near Paradise and the next highest traffic volumes are at the Nisqually Entrance (BRW 1995). The Paradise area receives the greatest visitor use of any area in the park; a 1990 visitor use survey found that 71% of visitors stopped at Paradise during their visit. The Longmire area also receives heavy visitor use.

Visitor facilities and attractions along the Nisqually – Paradise Road include the Ricksecker Point Loop Road; the Paradise Valley Loop Road; Kautz Creek (trailhead and picnic area); Longmire (National Park Inn, Longmire museum, wilderness information

center, and trails); Cougar Rock campground; Christine Falls; Ricksecker Point; Narada Falls; and Paradise (Paradise Inn, visitor center, ranger station, trail network, and winter snow play area). The Nisqually – Paradise Road, Ricksecker Loop Road, and Paradise Loop Road also are destinations in themselves because many visitors enjoy viewing scenery while driving along the roads and often stop at pullouts to take photographs and observe wildlife.

Recreational activities in the park include driving to view scenery, taking photographs, visiting visitor centers and museums, hiking, observing wildlife, viewing wildflowers, picnicking, souvenir shopping, camping, climbing, bicycling, and fishing (Johnson et al. 1991). A campground and several trailheads are accessed from the Nisqually – Paradise Road. The trails through the subalpine meadows at Paradise are known for wildflower displays during the summer and are popular destinations for day hikers. The Paradise area also provides staging for the most popular Muir climbing routes up Mount Rainier and is the most popular winter destination in the park. In winter, popular activities include cross-country skiing, snowshoeing, and snowboarding. A groomed area at Paradise is available for snow play (only inner-tubes, plastic sleds, saucers, or other soft sliding devices are permitted) in the winter.

Impact Intensity Threshold

NPS *Management Policies 2006* state that the enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all parks, and that the NPS is committed to providing appropriate high quality opportunities for visitors to enjoy the parks. Part of the purpose of the park is to offer opportunities for recreation, education, inspiration, and enjoyment. Consequently, one of the park's management goals is to ensure that visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities.

Public scoping input and observation of visitation patterns, combined with an assessment of amenities available to visitors under current park management, were used to estimate the effects of the alternatives. Impacts on the ability of visitors to experience a full range of park resources was analyzed by examining resources and objectives presented in the park significance statements, as derived from its enabling legislation. The potential for change in visitor experience proposed by the alternatives was evaluated by identifying projected increases or decreases in access and other visitor uses, and determining whether or how these projected changes would affect the desired visitor experience, to what degree, and for how long. The thresholds of change for the intensity of an impact to visitor experience and recreation resources are described in Table 18.

TABLE 18. VISITOR USE AND EXPERIENCE IMPACT AND INTENSITY THRESHOLDS

Impact Intensity	Intensity Description
Negligible	Changes in visitor use and experience would be below or at an imperceptible level of detection. The visitor would not likely be aware of the effects associated with the action.
Minor	Changes in visitor use and experience would be detectable, although the changes would be slight. The visitor would be aware of the effects associated with the action, but the effects would be slight.
Moderate	Changes in visitor use and experience would be readily apparent. The visitor would be aware of the effects associated with the action and would likely express an opinion about the changes.
Major	Changes in visitor use and experience would be readily apparent, and severely adverse or exceptionally beneficial. The visitor would be aware of the effects associated with the action and would likely express a strong opinion about the changes.

Duration:
Short-term impact—effects occur only during project implementation activities.
Long-term impact—effects extend beyond the project implementation activities.

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts. There would be no change in the fundamental nature and quality of the visitor experience or recreational opportunities along the Nisqually – Paradise Road under the no action alternative. The road would remain open and visitors would continue to have access to park resources. As road conditions continue to deteriorate, periodic maintenance projects would require traffic delays at random times and locations, which would inconvenience visitors. Road conditions would deteriorate to the point that the quality of the visitor experience is diminished from a visibly damaged road, failed substructure, or deterioration of other structural features. The quality of recreational experiences from driving the road would decline due to the poor condition of the road surface. The potential for road failure, flood damage, and road closure for repairs would increase. The effects on visitor use and experience under the no action alternative would be local, long-term, minor to moderate, and adverse.

Cumulative Impacts. Construction of the Nisqually – Paradise Road provided visitors an opportunity to explore the southern side of the park and access other destinations. Past and ongoing road maintenance, and other improvement projects have allowed visitors to enjoy this portion of the park year-round. Construction of the Henry M. Jackson Memorial Visitor Center at Paradise from June 2006 to October 2008, and past construction of facilities at Longmire, Cougar Rock campground, pullouts, and parking areas improved the visitor experience and increased access to recreation resources in the park. Planned future streambank protection projects would provide a long-term benefit by reducing the risk of road failure. Rehabilitation of the Stevens Canyon Road would improve the safety and travel conditions for visitors. Implementation of the improvements to Stevens Canyon Road would result in traffic delays for visitors, but long-term effects would be beneficial to the quality of the visitor experience. Past, present, and reasonably foreseeable future projects would have a long-term beneficial effect on the visitor experience and recreation resources. The overall cumulative effects to visitor use and experience from the no action alternative, in combination with past, present, and reasonably foreseeable future actions, would remain

long-term and beneficial, but the no action alternative would contribute long-term minor to moderate adverse effects.

Conclusion. The no action alternative would have local long-term minor to moderate adverse effects on visitor use and experience from ongoing deterioration of the road and structural features that contribute to the quality of the visitor experience, and that provide access to recreation resources. Although the road would remain open to visitor access, as road conditions deteriorate, periodic maintenance projects or road failure would require traffic delays or road closure at random times and locations, which would inconvenience visitors. Cumulative effects would be long-term and beneficial with a minor to moderate adverse contribution from the no action alternative.

Preferred Alternative—Repair Road

Direct and Indirect Impacts. The visitor experience and access to recreation resources would be temporarily impacted by construction activities required to repair the Nisqually – Paradise Road. At times, traffic delays and suspensions would inconvenience visitors traveling along the road, but road improvements also would improve the quality of the visitor experience over the long term.

Road work is scheduled to occur between spring and fall, subject to weather conditions. During construction one lane may be closed 24 hours per day during the week. Traffic delays during the day would be limited to a single delay of 20 minutes, with a total accumulated delay of no more than 30 minutes to minimize impacts to park visitors. No work would occur on weekends (5 p.m. Friday evenings to 10:30 p.m. Sunday evening and 5 p.m. Friday evenings to 10:30 p.m. Monday evening on Monday holidays). Road would be open to two lane traffic on weekends. Night construction for work at deep patches, construction of a MSE wall near Christine Falls, and for utility installation would require closure of the road to visitor access Sunday through Thursday. Public traffic during this time is typically low, but some visitors may be inconvenienced. Construction sites for night work would be located more than 1 mile from Cougar Rock campground and Longmire; therefore, no adverse effect to visitors from noise or lighting impacts is anticipated.

Construction work would cause some visitors to avoid the park or avoid using the Nisqually – Paradise Road when traffic delays are expected. Visitors may choose to visit other areas of the park, leading to increased crowding at other park attractions.

Visitors traveling to the Paradise area may enter Stevens Canyon Road via SR 410 or SR 123 to avoid traffic delays, except in 2013 when work will be finishing up on the Stevens Canyon Road and delays should be expected. Visitor use of attractions along the Nisqually – Paradise Road, including the Kautz Creek trailhead, Longmire, Cougar Rock campground, Christine Falls, Ricksecker Point, Narada Falls, and Paradise may decrease as visitors attempt to avoid traffic delays.

The park, in cooperation with the FHWA, has developed a preliminary schedule below to help communicate night work closure times to park visitors, park staff, and concessioners. These times may change over the course of construction, but would be posted in advance.

- June 15 - 30: 10:00 p.m. to 4:00 a.m.
- July: 10:00 p.m. to 4:00 a.m.
- August: 9:30 p.m. to 4:30 a.m.
- September: 9:00 p.m. to 5:00 a.m.
- October: 9:00 p.m. to 5:00 a.m.
- November: 9:00 p.m. to 5:00 a.m. (subject to lower level snow conditions and need for plowing below Longmire – probably mid to late November)

As described in resource protection measures on page 53, the park would implement a number of measures to reduce visitor impacts, and maintain the quality of the visitor experience and access to recreation resources during construction. The park would provide clear and concise information on the status of rehabilitation work and any traffic delays or closures. To facilitate visitor planning, the status of roadwork and traffic delays would be advertised two weeks in advance and would be updated daily. The status of road construction and travel restrictions would be communicated via a number of outlets—the park website, newspapers, radio, entrance stations, visitor centers, news releases, media outlets, postings in local businesses, and other locations.

A short-term moderate adverse effect on the quality of the visitor experience would occur at the local and parkwide level during periods of construction. Construction related noise would diminish the wilderness experience for some visitors while exploring wilderness areas near the road. While construction activities and traffic delays would temporarily inconvenience visitors, substantial changes in the number of visitors to the park are not expected. Improvements to the Kautz Creek parking area, Narada Falls parking and picnic area, Paradise parking lots, and multiple pullouts would have local long-term beneficial effect on visitor facilities and the visitor experience. Over the long term, the proposed improvements to the condition of the road, pullouts, and parking areas would provide a beneficial effect on the quality of the visitor experience, and ensure protection of the road's structural features for visitor enjoyment and safe travel for many years.

Cumulative Impacts. Construction of the Nisqually – Paradise Road provided visitors an opportunity to explore the southern side of the park and access other destinations. Past and ongoing road maintenance and other improvement projects have allowed visitors to enjoy this portion of the park year-round. Construction of the Henry M. Jackson Memorial Visitor Center at Paradise June 2006 to October 2008, and past construction of facilities at Longmire, Cougar Rock campground, pullouts, and parking areas improved the visitor experience and increased access to recreation resources in the park. Planned future streambank protection projects would provide a long-term benefit by reducing the risk of road failure. Rehabilitation of the Stevens Canyon Road would improve the safety and travel conditions for visitors. Implementation of the improvements to Stevens Canyon Road would result in traffic delays for visitors, but long-term effects would be beneficial to the quality of the visitor experience. Planned construction work in 2013 for the Stevens Canyon Road and the Nisqually – Paradise Road would result in simultaneous traffic delays at both of the projects. Flood control work on SR-410 also may contribute to cumulative traffic delays in 2013. Delays would inconvenience visitors, but construction activities would be coordinated to

minimize disruption to visitor travel, and the park would clearly communicate scheduled construction and delays. Past, present, and reasonably foreseeable future projects would have a parkwide long-term beneficial effect on the visitor experience and recreation resources. The overall cumulative effects to the visitor experience and recreation resources from the preferred alternative in combination with past, present, and reasonably foreseeable future actions would remain long-term and beneficial, but the preferred alternative would contribute short-term moderate adverse effects to the quality of the visitor experience during construction.

Conclusion. Traffic delays would inconvenience visitors traveling along the Nisqually – Paradise Road during construction. In response to construction activities, some visitors may avoid the park, visit other portions of the park, or choose alternate routes for regional travel connections. The park would inform visitors in advance of construction via a number of sources so visitors can best plan their schedule and activities and minimize impacts. The effect on visitor experience and recreation resources would be short-term, moderate, and adverse at the local and parkwide level during construction. The preferred alternative would provide local long-term beneficial effects on the quality of the visitor experience following construction by improving the quality and condition of the road, parking areas, and pullouts. Cumulative impacts would be local and parkwide, long-term, and beneficial.

VISUAL RESOURCES

Affected Environment

The Nisqually – Paradise Road provides a scenic winding road from the old growth forests at the southwest park entrance up to the alpine environment at Paradise. The road was designed to minimize the visual and environmental impacts of construction. This included preservation of roadside vegetation with large trees protected up to the paved surface of the road. The rustic nature of the road is accented by guardwalls, retaining walls, and many bridges constructed using native stone to match the color and texture of exposed road cuts. Scenic pullouts and overlooks were constructed to provide views of the spectacular scenery throughout the road corridor. As described previously in the *Cultural Landscape* section, the visual quality of the road is an important characteristic contributing to the NHLD.

Impact Intensity Threshold

Visual resources are the features that define the visual character of an area. Features that define the visual character of an area could include natural features, vistas, viewsheds, and architecture. The thresholds of change for the intensity of impacts to visual resources are described in Table 19.

TABLE 19. VISUAL RESOURCES IMPACT AND INTENSITY THRESHOLDS

Impact Intensity	Intensity Description
Negligible	Effects would result in barely perceptible changes to existing views.
Minor	Effects would result in slightly detectable changes to views in a small area, or would introduce a compatible human-made feature to an existing developed area.
Moderate	Effects would be readily apparent and would change the character of visual resources in the area. The visitor would be aware of the effects associated with the alternative and would likely express a neutral to negative opinion about the changes.
Major	Effects would be highly noticeable and visible from a considerable distance or over a large area. The character of visual resources would change substantially. The visitor would be aware of the effects associated with the alternative and would likely express a strong negative opinion about the changes.

Duration:
Short-term impact—following project completion, recovery would take less than three years.
Long-term impact—following project completion, recovery would take more than three years.

Environmental Consequences

No Action Alternative

Direct and Indirect Effects of the Alternative. Under the no action alternative, there would be no immediate change in the visual character of the Nisqually – Paradise Road. However, not addressing the deteriorating condition of the road and adjacent drainage, embankment, and infrastructure problems would lead to further deterioration. Surface slumps, pavement warping and cracking, and the general deterioration in the condition of the pavement surface would detract from the scenic quality of the road corridor. The no action alternative would have a local long-term minor to moderate adverse impact of the visual character of the road if structural deficiencies and other proposed rehabilitation work is not implemented.

Cumulative Impacts. The original construction of the Nisqually – Paradise Road was conducted to minimize the visual intrusion to the landscape. Past and ongoing road maintenance and other improvement projects have resulted in periodic disturbances and changes to the visual quality. Construction of the Henry M. Jackson Memorial Visitor Center at Paradise from June 2006 to October 2008, and past construction of facilities at Longmire, Cougar Rock campground, pullouts, and parking areas have contributed to the visual character along the road corridor. Planned future streambank protection projects would provide a long-term benefit by reducing the risk of road failure. Rehabilitation of the Stevens Canyon Road would introduce short-term impacts, but would protect the scenic character of the road. These past, present, and reasonably foreseeable future projects would have local short-term minor adverse effects on visual quality, but would have a long-term beneficial effect by protecting park resources. The overall cumulative effects to visual quality from past, present, and reasonably foreseeable future actions would be local, long-term, and beneficial, with the no action alternative contributing long-term minor to moderate adverse impacts.

Conclusion. The no action alternative would have a local long-term minor to moderate adverse effect on the visual character of the road corridor if deteriorating road infrastructure is not repaired. Past, present, and reasonably foreseeable projects would result in local long-

term beneficial impacts to visual resources. Cumulative effects would be local long-term, and beneficial.

Preferred Alternative—Repair Road

Direct and Indirect Impacts of the Alternative. Visual impacts would occur during construction from construction equipment, materials, and ground disturbance. Construction activities and construction-related disturbances such as cleaning out vegetated roadside drainage ditches, riprap placement on road sideslopes for drainage improvements at New Tahoma Creek and Kautz Creek, placing aggregate/topsoil on road shoulders, and adding new pavement and striping would provide a short-term visual contrast from current conditions. Any disturbances to existing structural features or new structural features, such as culverts, guardwalls, retaining walls, and curbs, would be constructed with material that matches the color, texture, and character of existing facilities. Rehabilitation of damaged and deteriorating sections of the road would have a long-term beneficial effect to the visual quality of the road by protecting the scenic views for which the park is renowned. Road rehabilitation would have a local short-term minor adverse impact to visual quality during and immediately following construction work, but would have a long-term beneficial effect by protecting and preserving the scenic and visual character of the road.

Cumulative Impacts. The original construction of the Nisqually – Paradise Road was conducted to minimize the visual intrusion to the landscape. Past and ongoing road maintenance and other improvement projects have resulted in periodic disturbances and changes to the visual quality. Construction of the Henry M. Jackson Memorial Visitor Center at Paradise from June 2006 to October 2008, and past construction of facilities at Longmire, Cougar Rock campground, pullouts, and parking areas have contributed to the visual character along the road corridor. Planned future streambank protection projects would provide a long-term benefit by reducing the risk of road failure. Rehabilitation of the Stevens Canyon Road would introduce short-term impacts, but would protect the scenic character of the road. These past, present, and reasonably foreseeable future projects would have local short-term minor adverse effects on visual quality, but would have a long-term beneficial effect by protecting park resources. The overall cumulative effects to visual quality from the preferred alternative in combination with past, present, and reasonably foreseeable future actions would be local, short-term, and adverse with a long-term beneficial effect. The preferred alternative would contribute short-term minor adverse impacts and long-term beneficial effects to visual resources.

Conclusion. Road rehabilitation would have a local short-term minor adverse impact to visual quality during and immediately following construction work, but would have a long-term beneficial effect by protecting and preserving the scenic and visual character of the road. Cumulative effects would be local, short-term, minor, and adverse with a long-term beneficial effect.

PUBLIC HEALTH AND SAFETY

Affected Environment

The park has an extensive history of geologic activity that could pose a safety risk to park staff and visitors including eruptions, avalanches, and debris or mudflows. Most of the project area is within hazard zones identified as potentially affected by debris flows or pyroclastic flows in the event of a major eruption. The extreme weather that frequently occurs in the park, combined with steep terrain, occasionally results in rock slides, debris flow, and flooding that presents a safety hazard to visitors. Other geologic hazards include avalanches, rock falls, and glacial outburst floods. Additional discussion of geologic hazards is found in the discussion of Geology and Geologic Hazards (page 13) and Floodplains (page 82).

Road conditions that influence safe vehicle travel also are a concern in the park. The traffic accident rate along the Nisqually – Paradise Road ranges from 2.9 to 10.5 accidents per million vehicle miles traveled compared to 1.25 accidents per million vehicle miles traveled for similar rural highways in the area (Lee Engineering 1993). The highest accident rates were recorded in the first mile of the project area from the Nisqually Entrance to Westside Road, and in the 2-mile segment from Longmire to Cougar Rock campground.

Impact Intensity Threshold

Public health and safety refers to the ability of the NPS to provide a healthy and safe environment for visitors and park staff, to protect human life, and to provide for injury-free visits and appropriate responses when accidents and injuries occur. The thresholds of change for the intensity of an impact to public health and safety are described in Table 20.

TABLE 20. PUBLIC HEALTH AND SAFETY IMPACT AND INTENSITY THRESHOLDS

Impact Intensity	Intensity Description
Negligible	The effects would be at low levels of detection and would not have appreciable effects on public health and safety.
Minor	The effects would be detectable and would be of a magnitude that would not have appreciable effects on public health and safety. If mitigation is needed to offset adverse effects, it would be simple and likely successful.
Moderate	The effects would be readily apparent and result in a change in public health and safety that would be noticeable to park staff and the public. Mitigation measures would be necessary to offset adverse effects and would likely be successful.
Major	The effects would be readily apparent; would result in a substantial change in public health and safety in a manner noticeable to park staff and the public; and would be markedly different from existing operations. Mitigation measures to offset adverse effects would be needed and extensive, and success could not be guaranteed.

Duration:
Short-term impact—effects occur only during project implementation activities.
Long-term impact—effects extend beyond the project implementation activities.

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts. The park would continue with ongoing road maintenance, traffic control, and response to climatic or geologic events that may affect public health and safety under the no action alternative. Public safety concerns on the Nisqually – Paradise Road associated with deteriorating road pavement, structural failure, and sight distance at the Kautz Creek parking area would not be addressed. The potential for accidents would be similar to existing conditions and may increase as the road continues to deteriorate. The potential for flooding at the road crossing of New Tahoma Creek and Kautz Creek would not be addressed. The no action alternative would result in local long-term minor to moderate adverse effects on public health and safety if road rehabilitation is not implemented.

Cumulative Impacts. Measures previously implemented to improve public health and safety included ongoing maintenance and construction of pullouts, guardrails, and guardwalls. Planned future implementation of a hazard tree management plan would improve safety by removing trees that could fall on visitors or park staff. Future streambank protection projects would reduce the risk of road failure, which could pose a safety hazard. Rehabilitation of the Stevens Canyon Road would improve the safety and travel conditions for visitors. Past, present, and reasonably foreseeable future projects would have local long-term beneficial effects on public health and safety. The overall cumulative impacts to public health and safety from the no action alternative in combination with past, present, and reasonably foreseeable future actions would be local, long-term, and beneficial, with a long-term minor to moderate adverse contribution from the no action alternative.

Conclusion. The no action alternative would result in local long-term minor to moderate adverse effects on public health and safety by not addressing safety issues and needed road rehabilitation and repairs. The potential for accidents would be similar to existing conditions and may increase as the road continues to deteriorate and the need for maintenance increases. Cumulative effects would be beneficial with a long-term minor to moderate adverse contribution from the no action alternative.

Preferred Alternative—Repair Road

Direct and Indirect Impacts. Proposed road rehabilitation and improvements would address safety and road maintenance concerns associated with deterioration of the Nisqually – Paradise Road. Improvements to road pavement, center line striping, increased sight distance at the Kautz Creek parking area, and drainage work would improve safety and driving conditions. Pavement milling and grading work to lower the pavement elevation near guardwalls would improve the effectiveness of guardwalls. The potential for traffic accidents would be reduced. Drainage improvements would reduce the risk of the road flooding at New Tahoma Creek and Kautz Creek. Maintaining a safe environment for park staff, contractors, and visitors during and after construction would be a primary objective. A variety of resource protection measures would be used during construction to inform and direct visitors through construction zones, and to protect contractors and park staff. Upon completion of construction work, local long-term beneficial effects on public health and safety are expected from road improvements.

Cumulative Impacts. Measures previously implemented to improve public health and safety included ongoing maintenance and construction of pullouts, guardrails, and guardwalls. Planned future implementation of a hazard tree management plan would improve safety by removing trees that could fall on visitors or park staff. Future streambank protection projects would reduce the risk of road failure, which could pose a safety hazard. Rehabilitation of the Stevens Canyon Road would improve the safety and travel conditions for visitors. Past, present, and reasonably foreseeable future projects would have local long-term beneficial effects on public health and safety. The overall cumulative impacts to public health and safety from the preferred alternative in combination with past, present, and reasonably foreseeable future actions would be local, long-term, and beneficial, with a local long-term beneficial contribution from the preferred alternative.

Conclusion. Proposed rehabilitation and improvements would address public health safety concerns associated with the Nisqually – Paradise Road. Improvements to road pavement, visibility, sight distance at the Kautz Creek parking area, and drainage would improve safety and driving conditions. The preferred alternative would result in local long-term beneficial effects on public health and safety from improvements to the structural features of the road and safety measures that reduce the potential for accidents. Cumulative effects would be local, long-term, and beneficial.

PARK OPERATIONS

Affected Environment

Park staff is responsible for the day-to-day maintenance of the Nisqually – Paradise Road, and other roads and park facilities in the project area to provide a safe environment for park visitors. Roadwork and maintenance along the road includes patching, striping, and shoulder work, and culvert and ditch maintenance. The Nisqually – Paradise Road is vital to park operations. Park staff use the road to access portions of the park for visitor services, maintenance, law enforcement, search and rescue, resource management, and emergency vehicle access. Snowplowing allows the road to Paradise remain open throughout most of the winter. On days with heavy snow, the road may be closed above Longmire until snowplows are able to clear the road to Paradise.

Structural and design deficiencies, as well as normal wear from traffic and weather have resulted in deterioration in the condition of the road and increasing maintenance. Problems requiring attention include clogged culverts and ditches, inadequate drainage, surface slumps, soft spots, pavement warping and cracking, slope instability and deterioration of other road infrastructure. Road maintenance is an ongoing park operation, but the increasing rate of deterioration of the road makes it difficult to adequately address needed repairs. Most of the needed rehabilitation work is beyond what can be done through the park maintenance program.

Impact Intensity Threshold

Park operations, for the purposes of this EA, refers to the quality and effectiveness of the infrastructure, and the ability of park staff to maintain the infrastructure used in the

operation of the park to protect and preserve vital resources and provide for a high quality visitor experience. Facilities included in the analysis include the Nisqually – Paradise Road, Ricksecker Point Road, Paradise Valley Road, pullouts, roadside parking areas, and the upper and lower Paradise parking lots. The thresholds of change for the intensity of an impact to park operations use are described in Table 21.

TABLE 21. PARK OPERATIONS IMPACT AND INTENSITY THRESHOLDS

Impact Intensity	Intensity Description
Negligible	The effects would be at low levels of detection and would not have appreciable effects on park operations.
Minor	The effects would be detectable and would be of a magnitude that would not have appreciable effects on park operations. If mitigation is needed to offset adverse effects, it would be simple and likely successful.
Moderate	The effects would be readily apparent and result in a change in park operations that would be noticeable to park staff and the public. Mitigation measures would be necessary to offset adverse effects and would likely be successful.
Major	The effects would be readily apparent, would result in a substantial change in park operations in a manner noticeable to staff and the public, and would be markedly different from existing operations. Mitigation measures to offset adverse effects would be needed and extensive, and success could not be guaranteed.

Duration:
Short-term impact—effects last for the duration of the treatment action.
Long-term impact—effects continue after the treatment action.

Environmental Consequences

No Action Alternative

Direct and Indirect Impacts. The park would continue ongoing maintenance, traffic control, and administrative operations under the no action alternative. Maintenance work would increase as the condition of the road deteriorates. Underlying structural problems that result in increased maintenance would not be addressed. Road failure leading to closure of a portion of the park is a possibility at some locations if structural issues are not addressed. The cost for maintaining the road and addressing periodic structural failures would increase. The no action alternative would result in local long-term minor to moderate adverse effects on park operations.

Cumulative Impacts. Past and ongoing maintenance and repair of the Nisqually – Paradise Road, and other park facilities along the road corridor, have been implemented to improve park operations. Construction of the Henry M. Jackson Memorial Visitor Center at Paradise June 2006 to October 2008, demolition of the old visitor center, and parking lot improvements have improved the quality of visitor services and the efficiency of park operations. The current rehabilitation of the Stevens Canyon Road (to be completed in September 2013) would benefit park operations by improving travel conditions and reducing maintenance. Past, present, and reasonably foreseeable future projects would have local long-term beneficial effects on park operations. The overall cumulative impacts to park operations from the no action alternative in combination with past, present, and reasonably foreseeable future actions would be local, long-term, and beneficial with a minor to moderate adverse contribution from the no action alternative.

Conclusion. The no action alternative would result in local long-term minor to moderate adverse effects on park operations by not addressing safety issues and needed road repairs. Maintenance requirements and costs would increase as the road and associated infrastructure continues to deteriorate. Cumulative effects would be local, long-term, and beneficial with a minor to moderate adverse contribution from the no action alternative.

Preferred Alternative—Repair Road

Direct and Indirect Impacts. Proposed road rehabilitation and improvements would reduce maintenance requirements and costs. Improvements to road pavement, embankments, and drainage would improve driving conditions and reduce the risk of future road failure. Milling and grading work to lower the pavement surface near guardwalls would improve the effectiveness of guardwalls. Deep patching would correct problems with settling of inadequately compacted fill and associated subsidence. Modified road repairs around large tree roots may reduce the service life of the pavement in those areas. Park maintenance operations would be substantially improved by implementation of road repairs that reduce the need for continual repairs to deteriorating infrastructure. The service life of the roads, pullouts, parking lots, guardwalls, culverts, and other structural features would be extended by several decades. Additional demands would be placed on the park staff during construction to coordinate construction activities and visitor use. Construction work and traffic delays would cause a disruption in normal traffic patterns, parking, and visitor activities in the park. The park would take special measures to notify visitors of the status of the road and potential traffic delays. The preferred alternative would have local and parkwide short-term moderate adverse impacts to park operations during construction. Traffic-control measures would be implemented to protect visitors. Upon completion of construction work, local long-term beneficial effects on park operations are expected from road improvements.

Cumulative Impacts. Past and ongoing maintenance and repair of the Nisqually – Paradise Road, and other park facilities along the road corridor, have been implemented to improve park operations. Construction of the Henry M. Jackson Memorial Visitor Center at Paradise from June 2006 to October 2008, demolition of the old visitor center, and parking lot improvements have improved the quality of visitor services and the efficiency of park operations. The current rehabilitation of the Stevens Canyon Road (to be completed in September 2013) would benefit park operations by improving travel conditions and reducing maintenance. Past, present, and reasonably foreseeable future projects would have local short-term moderate adverse impacts and long-term beneficial effects on park operations. Those impacts, in combination with the local short-term moderate adverse impacts and long-term beneficial impacts of the preferred alternative, would result in local long-term beneficial effects.

Conclusion. The proposed road rehabilitation and improvements would address road maintenance concerns in the project area. Improvements to road pavement, embankments, and drainage would improve safety and driving conditions, reduce maintenance requirements, and reduce the risk of future road failure. Construction work and associated traffic delays would cause a disruption in normal traffic patterns, parking, and visitor activities in the park; and place a greater demand on park staff. The preferred alternative would result in local and parkwide short-term moderate adverse impacts to park operations

during construction. Completion of the preferred alternative would result in local short-term moderate adverse impacts during and construction and local long-term beneficial effects to park operations by improving the road surface and decreasing maintenance requirements. Cumulative effects would be short-term moderate and adverse and long-term and beneficial.

CONSULTATION AND COORDINATION

INTERNAL SCOPING

Internal scoping was conducted by an interdisciplinary team of professionals from Mount Rainier National Park, Denver Service Center staff, FHWA, and consultants. Team members met multiple times between 2009 and 2012 to discuss the purpose and need for the project, various treatment options for road rehabilitation, potential environmental impacts, reasonably foreseeable actions that may have cumulative effects, and resource protection measures and BMPs.

EXTERNAL SCOPING

External scoping began with a public scoping notice released on November 5, 2009 describing the preferred alternative and soliciting comments or comments on the proposal to resurface, restore, and rehabilitate about 18 miles of Nisqually to Paradise Road (Appendix A). The park sent letters describing the proposed project and asking for comments to more than 200 media outlets and interested individuals; organizations; state, county, and local governments; federal agencies; local businesses; and media outlets The results of scoping are discussed in the "Scoping" section in the "Purpose and Need" chapter.

AGENCY CONSULTATION

The documents related to the National Historic Preservation Act (NHPA), in accordance with the Advisory Council on Historic Preservation's regulations implementing Section 106 (36 CFR Part 800) have been completed as a separate submittal to the Washington State Historic Preservation Office (SHPO). The park finds that the proposal would not alter any of the character defining features of the road, or disturb known archaeological resources. The SHPO, in a letter dated April 26, 2012, has concurred that the proposed project would have no adverse effect on national register eligible or listed historic and cultural resources. This EA also was forwarded to the Washington SHPO for review and comment.

In accordance with the Endangered Species Act, the NPS contacted the Fish and Wildlife Service regarding federally listed special status species and the NOAA-National Marine Fisheries Service regarding essential fish habitat. As part of the Section 7 Consultation process under the ESA, the park submitted a biological assessment (BA) to the Fish and Wildlife Service on March 16, 2012 for their review. The BA includes the park's finding that the preferred alternative may affect, but is not likely to adversely affect, the northern spotted owl; and that the preferred alternative may affect, and is likely to adversely affect, the marbled murrelet. The BA also indicates the preferred alternative would have no effect on these federally listed species, or their listed habitat: Canada lynx, gray wolf, grizzly bear, Chinook salmon, bull trout, steelhead, Dolly Varden, or coho salmon.

On May 4, 2012, the USFWS provided comments on the BA and requested additional information. The NPS provided responses to USFWS comments on June 1, 2012. The USFWS will review the BA and EA and will issue a biological opinion regarding the proposed project. The biological opinion may include additional conservation measures for protection of listed species. The National Marine Fisheries Service will review the park's determination that the preferred alternative would have no effect on essential fish habitat.

AMERICAN INDIAN CONSULTATION

Six federally recognized Native American tribes associated with the park were sent a scoping letter on November 5, 2009, notifying them of the proposed project. These tribes included the Confederated Tribes and Bands of the Yakama Nation, Cowlitz Indian Tribe, Muckleshoot Indian Tribe, Nisqually Indian Tribe, Puyallup Tribe of Indians, and Squaxin Island Tribe. In addition, the park discussed the project in their annual tribal meeting. To date, no comments have been received in response to the scoping letter. Each tribe will receive copies of this document for their review and comment. If subsequent issues or concerns are identified, appropriate consultations will be undertaken.

ENVIRONMENTAL ASSESSMENT REVIEW AND LIST OF RECIPIENTS

The EA will be released for a 30-day public comment period. To inform the public of the availability of the EA, the NPS will publish and distribute a letter to the parks' general mailing list; area media; Native American tribes; and federal, state, and local agencies; and elected officials.

COMPLIANCE WITH FEDERAL AND STATE REGULATIONS

The NPS and FHWA would comply with all applicable federal and state regulations when implementing the preferred alternative to repair the Nisqually – Paradise Road. Permitting and regulatory requirements for the preferred alternative are listed in Table 22.

TABLE 22. ENVIRONMENTAL COMPLIANCE REQUIREMENTS

Agency	Statute, Regulation, or Order	Purpose	Project Application
Federal			
National Park Service	National Environmental Policy Act	Applies to federal actions that may significantly affect the quality of the environment	Environmental review of proposed action and decision to prepare a FONSI or EIS.
	National Historic Preservation Act, Section 106	Protection of historic and cultural resources	The park is consulting with the Washington state historic preservation officer to address anticipated effects and mitigation for cultural resources.
	EO 11990, "Protection of Wetlands"	Requires avoidance of adverse wetland impacts where practicable and mitigation, if necessary	Construction activities would result in mostly temporary wetland disturbances.
	EO 11988, "Floodplain Management"	Requires avoidance of adverse floodplain impacts where practicable and mitigation, if necessary	Floodplain statement of findings was prepared.
	DO-77-2: *Floodplain Management*	Protection of natural resources and floodplains	Floodplain statement of findings was prepared.
U.S. Army Corps of Engineers (Corps)	Clean Water Act – Section 404 Permit to discharge dredge and fill material	Authorizes placement of fill or dredge material in waters of the U.S. including wetlands	FHWA would seek a Nationwide 404 Permit for work that would impact wetlands or waters of the U.S.
U.S. Fish and Wildlife Service	Endangered Species Act	Protection of federally listed threatened or endangered species	The park prepared and submitted a biological assessment to the U.S. Fish and Wildlife Service as part of the consultation process.
National Oceanic and Atmospheric Administration (NOAA) – National Marine Fisheries Service	Magnuson-Stevens Fishery Conservation Management Act and Sustainable Fisheries Act	Protection of EFH	The park consulted with the National Marine Fisheries Service.

Agency	Statute, Regulation, or Order	Purpose	Project Application
State of Washington			
Washington Department of Fish and Wildlife, and Department of Ecology	Joint federal and state permit application for activities in aquatic habitat; addresses habitat protection, 401 water quality certification, and 404 permitting	Protection of aquatic habitat	A Joint Aquatic Resource Permit Application Form for a Nationwide Permit for work in aquatic environments would be submitted.
Washington Department of Ecology	National Pollutant Discharge Elimination System Waste Discharge Permit	Water quality protection associated with discharge of intercepted ground water	A permit application would be submitted if excavation activities anticipate interception and discharge of ground water.
	Construction Stormwater General Permit - Pollution Discharge Elimination System for construction activities	Water quality protection associated with clearing, grading and/or excavation that results in the disturbance of one or more acres and discharges stormwater to surface waters of the State	A permit application would be submitted prior to construction.

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Craig Sanders, Construction Operations Engineer
Kirk Loftsgaarden, Engineer

ERO Resources Corporation

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Steve Butler, Ecologist
Sean Larmore, Archeologist
Dave Hesker, Graphic Designer
Kay Wall, Technical Editor

REFERENCES

ABR, Inc. (ABR). 2005, 2008, 2009. Mount Rainer National Park contracted marbled murrelet field survey results.

ABR, Inc. 2011. Radar surveys for marbled murrelets, Mount Rainier National Park, Washington. ABR, Inc., Forest Grove, OR.

Anthony, R.G., E.D. Forsman, A.B. Franklin, and others. 2006. Status and trends in demography of northern spotted owls, 1985-2003. Wildlife Monographs 163:2-68.Bagnall, K. 2011. Spotted owl monitoring in Mount Rainier National Park. Unpublished report, Longmire, WA. 11 pp.

Bloomberg, W.J. and A.A. Hall. 1986. Effects of laminated root rot on relationships between stem growth and root-system size, morphology, and spatial distribution in Douglas-fir. Forest Science 32:202-219.

BRW, Inc. 1995. Transportation Feasibility Study, Mount Rainier National Park: Final Report Prepared for the National Park Service. On file at National Park Service, Denver Service Center, Denver, CO.

Clow, D. and D.H. Campbell. 2008. Atmospheric Deposition and Surface-Water Chemistry in Mount Rainier and North Cascades National Parks, U.S.A., Water Years 2000 and 2005–2006. Scientific Investigations Report 2008–5152. U.S. Geological Survey.

Delaney, D.K., T.G. Grubb, P. Beier, L.L. Pater, and M.H. Reiser. 1999. Effects of helicopter noise on Mexican Spotted Owls. Journal of Wildlife Management 63:60-76.

Eis, S. 1973. Root system morphology of western hemlock, western red cedar, and Douglas-fir. Canadian Journal of Forest Research 4:28-38.

Eis, S. 1987. Root systems of older immature hemlock, cedar, and Douglas-fir. Canadian Journal of Forest Research. 17:1348-1354.

ERO Resources Corporation. 2011. Wetlands, Other Waters, Riparian Areas, and Culvert Assessment Nisqually to Paradise Road Rehabilitation. Prepared for National Park Service.

FHWA (Federal Highway Administration). 2008. Bridge Inspection Report. Edith Creek Bridge. Paradise Connection over Edith Creek, Mount Rainier National Park. Federal Lands Bridge Office, Sterling, VA.

Formichella, C. 2009. Mount Rainier National Park Acoustical Monitoring 2006-2007 Natural Resource Report NPS/NRPC/NRTR—2009/001. Natural Sounds Program, Fort Collins, CO.

Franklin, J.F., W.H. Moir, M.A. Hemstrom, S.A. Greene, and B.G. Smith. 1988. The Forest Communities of Mount Rainier National Park. Scientific Monograph Series No. 19. U.S. Department of the Interior, National Park Service. Washington, DC. Available at: http://www.nps.gov/history/history/online_books/science/19/contents.htm.

Hadfield, J. 2010. Personal communication regarding guidelines for Protecting Pacific Northwest Conifers from Detrimental Effects Associated with Road Construction Activities. Forest Pathologist, Wenatchee Forest Insect & Disease Service Center, Okanogan-Wenatchee National Forest.

Hamer, T.E. and S.K. Nelson. 1995. Characteristics of Marbled Murrelet Nest Trees and Nesting Stands. Pp. 69-82 in Ecology and Conservation of the Marbled Murrelet (C.J. Ralph, F.L. Hunt, Jr., M.G. Raphael, and J.F. Piatt, eds.). USDA Forest Service, General Technical Report, PSW-152, Albany, California.

Hamer Environmental. 2000. Mount Rainer National Park contracted marbled murrelet field survey results.

Harpel, J.A. 2010. Mt. Rainier National Park Nisqually to Paradise Road Project, Bryophyte Survey Results. Survey conducted for Mt. Rainier National Park by University of British Columbia, Beaty Biodiversity Museum, Herbarium.

Johnson, D.R., K.P. Foster, and K.L. Kerr. 1991. "Mount Rainier National Park 1990 Visitor Survey." Prepared for the National Park Service. Seattle, WA: Cooperative Park Study Unit, College of Forest Resources, University of Washington.

Jones, L.L.C. and M.G. Raphael. 1992. Ecology and Management of Marten in Fragmented Habitats in the Pacific Northwest. Progress Report: Fiscal Year 1991. Olympia, WA: Pacific Northwest Research Station.

Kennard. P. 2009. Memo from Paul Kennard, Regional Fluvial Geomorphologist, MORA to Karen Vaage, Landscape Architect, Pacific West Regional Office, NPS. November 23.

Lee Engineering. 1993. Washington State Highway Accident Report.

McMinn, R.G. 1963. Characteristics of Douglas-fir root systems. Canadian Journal of Botany. 41:105-121.

NatureServe. 2010. http://www.natureserve.org/explorer.

NMFS (National Marine Fisheries Service). 1999. Endangered and Threatened Species; Threatened Status for Three Chinook Salmon Evolutionarily Significant Units (ESUs) in Washington and Oregon; and Endangered Status of One Chinook Salmon ESU in Washington. Federal Register. 64(56):14308-14328.

NPS (National Park Service)

1984. Park Road Standards. U.S. Department of Interior. National Park Service.

1997. National Register of Historic Places Registration Form, "National Historic Landmark District Nomination" by Stephanie Toothman, Susan Begley, and Ethan Carr.

2000. Mount Rainier National Park Wetlands Survey. Prepared by B. Samora and R.M. Rochefort. On file at Mount Rainier National Park, Ashford, WA.

2001. Final General Management Plan Environmental Impact Statement for Mount Rainier National Park. October. Ashford, WA.

2004a. Cultural Landscape Inventory, Nisqually East Entrance. Mount Rainier National Park.

2004b. Cultural Landscape Inventory, Road to Paradise. Mount Rainier National Park.

2005. Mount Rainier Bird Checklist. Last updated: April 2005.

2006. National Park Service Management Policies.

2008a. Mount Rainier National Park Northern Spotted Owl Demographic Monitoring – 2007 Progress Report. Prepared by: Myers, E. and J. Schaberl. Unpublished Report. Mount Rainier National Park. Ashford, WA.

2008b. United States Department of Interior. Environmental Assessment (EA) for the Carbon River Wonderland Trail Reroute. Mount Rainier National Park. Ashford, Washington.

2009a. Plant Survey Report of Findings, Nisqually Paradise Road Repair Project, Phases 1-3. Prepared by Michael Clegg. Mount Rainier National Park, December 30.

2009b. Mount Rainier National Park Northern Spotted Owl Demographic Monitoring, Draft 2009 Progress Report. Prepared by: Myers, E. Unpublished Report prepared for the National Park Service and Cooperative Agencies.

2009c. Pika Surveys, Mount Rainier National Park. Prepared by Nystrum, S., G. Mallari, and M.B. Albrechtsen.

2009d. Nisqually to Paradise Road Federal Highways Project, Survey and Recommendations Associated with Amphibian, Fish, and Aquatic Invertebrate Species of Concern. Prepared by B. Samora, B. Wright, A. Anderson, and J. Anhalt. Mount Rainier National Park. Technical Report.

2012a. Public Use Statistics Office: Monthly Public Use Report, Mount Rainier National Park. Available at: http://www.nature.nps.gov/stats/viewReport.cfm. Last accessed: March 1, 2010.

2012b. Survey and testing of archeological sites along the Nisqually to Paradise Road Rehabilitation. Fiscal Year 2011. Prepared by Benjamin M. Diaz. March.

Reid, M., J. Petterson, and J. Schaberl. 2010. A Survey of Forest Carnivores in Mount Rainier National Park, Washington. Natural Resource Technical Report NPS/NCCN/NRTR—2010. National Park Service, Fort Collins, CO.

Stinson, D.W. 2001. Washington State recovery plan for the lynx. Washington Department of Fish and Wildlife, Olympia, Washington. 78 pp. + 5 maps.

USFWS (U.S. Fish and Wildlife Service, U.S. Department of the Interior).
1984. National Wetlands Inventory maps. Washington, DC.

2003. Biological Opinion and letter of concurrence for effects to bald eagles, marbled murrelets, northern spotted owls, bull trout, and designated critical habitat for marbled murrelets and northern spotted owls from Olympic National Forest program of activities for August 5, 2003, to December 31, 2008. FWS Reference 1-3-03-F-0833. U.S. Fish and Wildlife Service, Lacey, Washington.

2006. Estimating Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California. Arcata, California.

2008. Final recovery plan for the northern spotted owl, *Strix occidentalis caurina*. U.S. Fish and Wildlife Service, Portland, Oregon. xii + 142 pp.2010. Washington Fish and Wildlife Office list of Endangered, Threatened, and Candidate Species. Available at: http://www.fws.gov/wafwo/species_WA.html.

WDFW (Washington Department of Fish and Wildlife). 2010. Washington State Species of Concern List. Available at: http://wdfw.wa.gov/conservation/endangered/.

APPENDIXES

Appendix A Scoping Announcement
Appendix B Agency Comments
Appendix C Floodplain Statement of Findings
Appendix D Construction Details and Sensitive Natural Resource Maps

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APPENDIX A
Scoping Announcement

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National Park Service
U.S. Department of the Interior

Mount Rainier National Park
Superintendent's Office

55210 238th Avenue E.
Ashford, WA 98304-9751

360-569-2211 phone
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Mount Rainier National Park News Release

For Immediate Release
Karen Thompson, Environmental Protection Specialist, 360-569-2211, x2376

Mount Rainier National Park Seeks Public Comments on Nisqually Entrance to Paradise Road Repair and Rehabilitation

Mount Rainier National Park Acting Superintendent Randy King has announced that the park is initiating the preparation of an Environmental Assessment (EA) for proposed road rehabilitation work along the Nisqually to Paradise Road. In accordance with the National Environmental Policy Act (NEPA) and Section106 of the National Historic Preservation Act (NHPA), the EA will present alternatives for the work and analyze and disclose potential environmental impacts.

The roadway begins at the Nisqually Entrance and continues for 17.6 miles to Paradise. The road work would take place in three phases. Phase 1 includes repair and rehabilitation of the first 6.2 miles, which extends from the Nisqually Entrance to Longmire. Phase 2 extends from Longmire to milepost 11.5 (Glacier Bridge), and Phase 3 finishes the project at Paradise, MP 17.6. The upper and lower parking lots at Paradise, the Narada Falls Parking Area, and the 1.03 mile-long Ricksecker Point scenic loop and related pullouts (located at the Miller Cutoff) would be completed during Phase 3 of the proposed project.

Proposed activities include removal and/or stabilization of the road subsurface and surface elements, fill reinforcement, slope stabilization and repair, trenching and installation of utility conduit and associated vaults, some scaling treatment of rock fall areas, resurfacing, rehabilitation of turnouts and reduction of width to historic proportions if necessary, improvement of drainage in existing culverts and repair as needed, repair and rehabilitation of historic guard walls and culvert headwalls, reconfiguration and repair of Kautz Creek parking area, revegetation of disturbed sites with native plants, striping, and sign replacement. Water withdrawal from park waters, needed for dust control, would be required as well. If approved, construction activities would occur in 2012-2013.

The 17.6 mile Nisqually to Paradise Road provides the only year-round access to the park and popular Paradise area, including the Henry M. Jackson Memorial Visitor Center. The road also provides access to numerous day-use areas and trailheads, with access points to the historically significant Wonderland Trail. As with most features within the park, the road and stone masonry walls are contributing elements to the National Historic Landmark District. The current character of the road and the visitor

driving experience are key considerations when evaluating possible alternatives for road rehabilitation. The road crosses several major tributaries, including debris flow areas. Much of the road lies within riparian and old growth habitat that are home to the Northern spotted owl and marbled murrelet. Potential impacts to these resources and to the visitor experience would be avoided or minimized to the best of our ability.
An early step in the NPS planning process is to involve the public. The park is inviting comments from individuals, organizations and other agencies to help identify the range of issues to be addressed in the EA, as well as potential alternatives for reducing impacts to park resources, visitor access and safety. Those wishing to provide comments should submit them in writing to: Superintendent, Mount Rainier National Park, 55210 238th Ave. E., Ashford, Washington 98304; or electronically at http://parkplanning.nps.gov, choosing Mount Rainier National Park from the drop down menu. The original notice asked for comments by November 21, 2009, we will accept comments that are postmarked or electronically date stamped no later than December 5, 2009. Additional opportunities for public review and comment on the EA will be announced in the spring of 2010.

Your comments, including your personal identifying information (name, address, telephone, e-mail address) – may be made publicly available at any time, if requested under the Freedom of Information Act. While you can request your personal identifying information (name, address, telephone, email address) be withheld from public review, we cannot guarantee that we will be able to do so.

-NPS-

APPENDIX B
Agency Comments

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STATE OF WASHINGTON

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
Mailing address: PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 • Fax Number (360) 586-3067 • Website: www.dahp.wa.gov

RECEIVED
APR 30 2012
Mount Rainier
National Park

April 26, 2012

Mr. Randy King
Superintendent
Mount Rainier National Park
55210 238th Avenue East
Ashford, Washington 98304-9751

In future correspondence please refer to:
Log: 050311-01-NPS
Property: Nisqually to Paradise Road Rehabilitation
Re: NO Adverse Effect

Dear Mr. King:

Thank you for contacting the Washington State Department of Archaeology and Historic Preservation (DAHP). The above referenced project has been reviewed on behalf of the State Historic Preservation Officer under provisions of Section 106 of the National Historic Preservation Act of 1966 (as amended) and 36 CFR Part 800. My review is based upon documentation contained in your communication.

Thank you for providing the draft report, Inadvertent Discovery Policy, and Tribal meeting materials related to this project. We agree with the survey recommendations, and concur that the current project as proposed will have "NO ADVERSE EFFECT" on National Register eligible or listed historic and cultural resources. If additional information on the project becomes available, please contact DAHP for further consultation.

We note that in his report, Mr. Diaz recommends development of a monitoring plan for archaeologically sensitive areas in addition to the inadvertent discovery protocol you included. In addition to a final copy of Mr Diaz's report, we ask that you provide us with a copy of the monitoring plan when available.

Thank you for the opportunity to review and comment. If you have any questions, please contact me.

Sincerely,

Lance Wollwage

Lance Wollwage, Ph.D.
Transportation Archaeologist
(360) 586-3536
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APPENDIX C
Floodplain Statement of Findings

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DRAFT FLOODPLAIN STATEMENT OF FINDINGS

Nisqually – Paradise Road Rehabilitation Environmental Assessment
Mount Rainier National Park
Washington

Recommended:_____
Superintendent, Mount Rainier National Park Date

Concurred:_____
Chief, Water Resources Division Date

Concurred:_____
Regional Safety Officer, Pacific West Region Date

The above signatures certify that this document is technically adequate and consistent with NPS policy.

Approved:_____
Director, Pacific West Region Date

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INTRODUCTION

Executive Order (EO) 11988 ("Floodplain Management") requires the National Park Service (NPS) and other agencies to evaluate the likely impacts of actions in floodplains. It is NPS policy to preserve floodplain values and minimize potentially hazardous conditions associated with flooding. If a proposed action is in an applicable regulatory floodplain, then flood conditions and associated hazards must be quantified, and a formal Statement of Findings (SOF) must be prepared. The NPS Procedural Manual #77-2, Floodplain Management provides direction for the preparation of a floodplain SOF. This SOF has been prepared for proposed work on the Nisqually to Paradise Road in Mount Rainier National Park in compliance with EO 11988 and with Procedural Manual #77-2.

PROPOSED ACTION

The NPS is proposing resurfacing, restoration, and repairing 17.6 miles of the Nisqually – Paradise Road (road) between the Nisqually Entrance and the developed area at Paradise. Rehabilitation of the road is needed because structural and design deficiencies in the road are accelerating deterioration. Deficiencies include inadequate drainage, surface slumps, soft spots, pavement warping and cracking, slope instability, and other structural problems that require attention. The proposed project also includes paving the 1.0-mile Ricksecker Point spur loop and the 2.2-mile Paradise Valley Road.

In addition, rehabilitation work includes replacement of an existing concrete culvert in New Tahoma Creek with a larger culvert and improving the ability to pass flood flows at Kautz Creek. Both of these activities would occur within the estimated floodplain of Tahoma Creek and Kautz Creek. The Federal Emergency Management Agency maintains Flood Insurance Rate Maps for floodplains, but no floodplain maps have been developed for the project area. The proposed work at these drainages is needed to better protect the road from future damage due to high streamflows by developing more sustainable protective measures. Following are descriptions of the locations, proposed work, and flood risk.

New Tahoma Creek

Existing Conditions

The New Tahoma Creek crossing of the Nisqually – Paradise Road is about 1 mile east of the Nisqually Entrance near the intersection with the West Side Road. Tahoma Creek crosses the road about 750 feet east of New Tahoma Creek. Under normal flow conditions, New Tahoma Creek carries flow from small steep hillside drainages, but following a flood event in 2006, it now carries a portion of the flow from Tahoma Creek at high flows.

The Tahoma Creek headwaters begin at Tahoma Glacier, located on the southwest flank of Mount Rainier. Tahoma Creek has experienced glacial outbursts and the recent flood event in 2006 that lead to a debris flows that closed the West Side Road and washed out portions of the Nisqually – Paradise Road. The 2006 flood reactivated a flood channel that had not had flow for hundreds of years and redirected about 20% of Tahoma Creek flow

to the New Tahoma channel (Kennard 2009). The flood significantly damaged the Nisqually – Paradise Road and overwhelmed the 170 cubic feet per second (cfs) capacity of the existing culvert on New Tahoma Creek. The road was repaired following the flood, but the culvert was not replaced. A small Veteran's Day flood event in 2008 also directed flow into New Tahoma Creek, but did not result in damage to the road. Tahoma Creek and New Tahoma Creek are currently separated by a small deposit of unconsolidated alluvium, which is highly erodible during flood events. Further erosion of this material in the future would likely direct more flows to New Tahoma Creek.

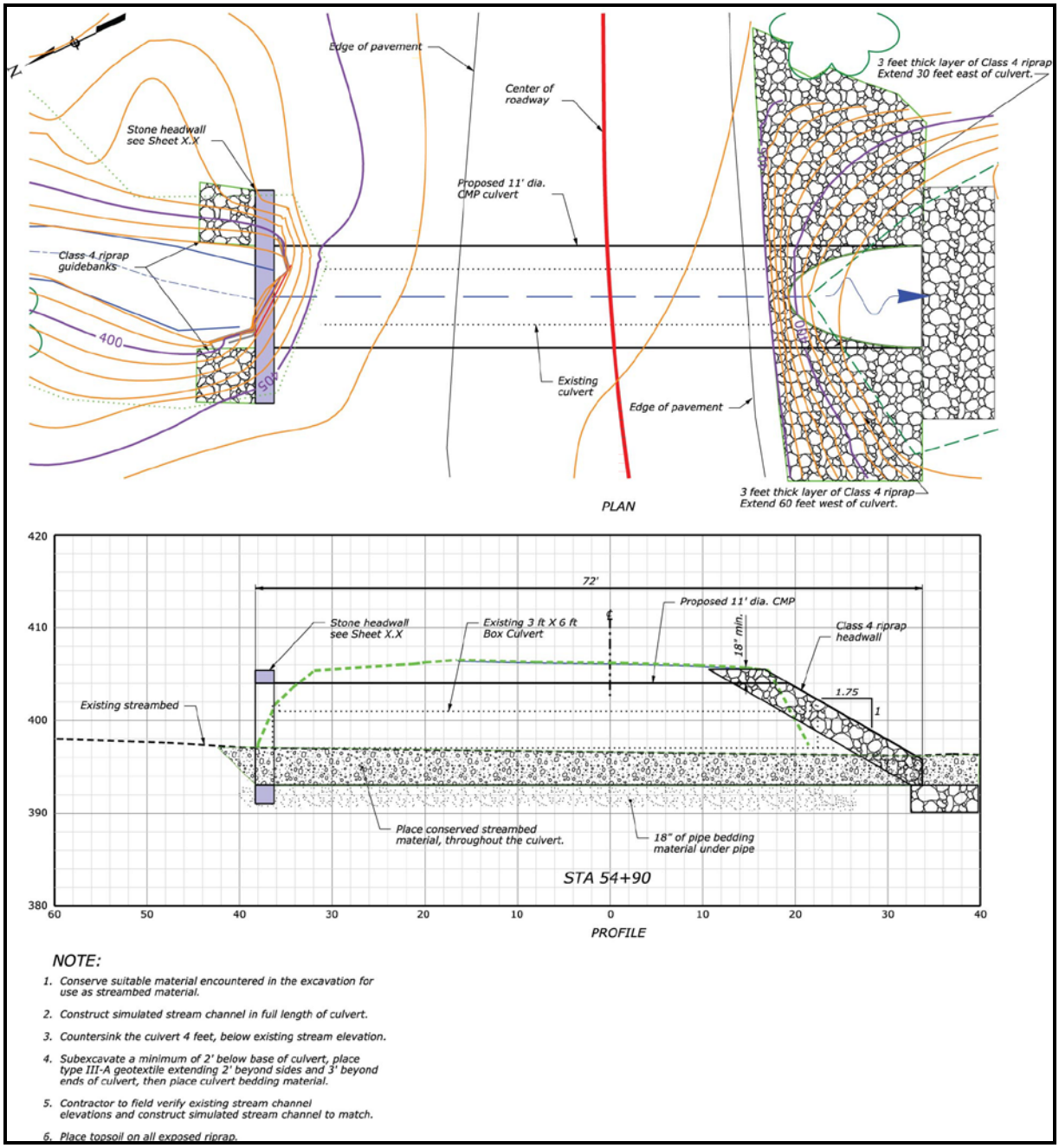
Preferred Alternative

The preferred alternative includes the replacement of the existing 3-feet-high by 6-feet-wide concrete box culvert that carries New Tahoma Creek flows under the road. A new 11-foot-diameter corrugated metal pipe (CMP), with a capacity of 700 cfs, would be constructed at this location to provide improved streamflow conveyance for flows from periodic flood events (Figure 10). About 3 feet of the culvert would be buried to provide a natural stream bottom. The culvert would be designed to provide for fish passage pursuant to state of Washington culvert regulations (WAC 222-110-070). The culvert inlet would be protected with a reinforced concrete headwall with a stone veneer using existing native material. The culvert outlet would be protected by placing large riprap rock from the pavement edge to the road embankment toe and extending the riprap along the embankment about 60 feet west of the new culvert to 30 feet east of the new culvert. The proposed culvert replacement is needed to protect the road from flood damage and maintain a primary access route into the park for visitors, staff, and emergency vehicles.

Flood Risk

Estimates indicate that it would take only 4% of the flow from Tahoma Creek to exceed the existing culvert capacity of 170 cfs at New Tahoma Creek. At projected 2050 flows, the proposed new culvert with a capacity of 700 cfs would be able to pass 63% of a two-year flood flow and 18% of a 100-year flood event (Kennard 2009). This estimate assumes a completely unobstructed culvert opening and no culvert filling during the storm. However, a more conservative estimate indicates the proposed new culvert would likely pass 13% of the 100-year flood flow, and flood flows for a 10- to 25-year flood event based on the following assumptions: (1) the existence of a debris flow surge (which raises stream level a few feet above flood levels associated with precipitation solely); (2) continuing aggradation of Tahoma Creek at the split between it and the New Tahoma Creek; (3) ongoing erosion of the "barrier" between the creeks; (4) underestimation of flood flows in the Tahoma Creek (the U.S. Geological Survey (USGS) methodology does not account for the glacier source); and (5) some level of culvert blockage by rafted wood, and deposition as the stream backs up.

FIGURE 10. NEW TAHOMA CREEK CULVERT REPLACEMENT



Kautz Creek

Existing Conditions

Kautz Creek drains the Kautz Glacier and surrounding lands in the watershed on the southwest side of Mount Rainier. Deposits from a debris flow during a November 2006 flood event resulted in the avulsion (the creation of a new channel) of Kautz Creek to a historic channel about 0.25 of a mile east of the existing Kautz Creek Bridge. The new channel now carries the majority of Kautz Creek flow. In 2007, two 12-foot-diameter CMP culverts were installed at the Kautz Creek road crossing to provide conveyance capacity for the streamflow from the shifted channel. In addition, a riprap-armored overflow ditch was constructed for conveying excess floodwater along the uphill side of the road east about 0.2 miles toward a sag in the road profile. Three 30-inch diameter CMP culverts were installed in the road sag to provide additional capacity for conveying flood flows. The uphill and downhill faces of the road embankment were armored for reducing erosion from floodwater overtopping the road. The new channel and culvert crossings are still vulnerable to failure from future hydrologic events that exceed the capacity of existing structures. Although damage was minimal, the road was inundated again by a relatively small flood in 2008. Failure of the existing culvert is possible from additional channel shifting even during small storms or from blockage of the culverts by rafted wood. Ongoing incision of the river channel also may contribute to failure of the existing system.

Preferred Alternative

Existing drainage structures (two 12-foot CMP's, three 30-inch CMP, and overflow ditch) have a combined maximum capacity to carry about 2,290 cfs (a 40-year storm event) before the road would be overtopped by flood water, possibly damaging the road pavement and eroding the road shoulder. There is a high potential for more and possibly all of the Kautz Creek flow to be conveyed across the alluvial fan surface to the overflow ditch. The ditch lacks the capacity needed for effectively capturing and redirecting the flow to the road profile sag. While the recently installed conveyance system has improved drainage, this area remains vulnerable to failure during high flow events because of a lack of hydraulic capacity. Thus, the park determined that additional improvements are needed to protect the road and better convey flows during flood events. Because of the high potential for the active channel flow to shift to another location on the alluvial fan, it is difficult to define flood flow volumes, locations of flows, and the best structures and drainages to protect the road. Overflow ditch capacity can be increased by raising the road and/or increasing the size of the ditch; however, environmental and funding limitations do not allow modifications that would be cost-effective.

The proposed improvements to the site include filling in the existing overflow ditch and armoring each side of the road embankment (Figure 11). The existing 12-foot and 30-inch-diameter culverts would be retained. Kautz Creek flood flows flow conveyed across the alluvial fan surface that exceed the capacity of the 12-foot diameter culverts would be conveyed as sheet flow across the filled-in overflow ditch and over the road. Filling in the overflow ditch allows the Kautz Creek flow to randomly access alluvial fan areas, in a more natural, unrestrained manner. The grade control established by the riprap-filled ditch reduces the potential for a new large primary active channel developing. The riprap

armoring protects the road from substantial damage during flood events, while minimizing resource impacts.

Proposed armoring of the north side of the road includes filling in the existing deep drainage ditch with riprap to form a shallow swale that would convey normal stormwater runoff from the road to the three existing 30-inch-diameter culverts. Riprap also would be placed along north and south side of the road west of Kautz Creek for about 300 feet. Existing 24-inch culverts would be left in place and filled over with riprap. Riprap also would be placed on the south side of the road about 700 feet east of the Kautz Creek channel. In total, about 0.62 of an acre of riprap would be placed on existing fill slopes and below the toe of the fill slope. Riprap on top of the road shoulder would be covered with aggregate/topsoil blended material and revegetated. Impact to trees would minimized by selectively placing riprap to avoid tree at the toe of the fill slope embankment. Guardrail would be added on both sides of the road about 25 to 30 feet on either side of the Kautz Creek channel.

Total conveyance capacity from existing culverts would be about 2,200 cfs, or a 25-year flood event. Flood flows above this volume would begin to flow over the road, but with proposed armoring, structural impacts to the road are expected to be minor. The road would be closed to vehicle travel and public access when flows are anticipated to overtop the road.

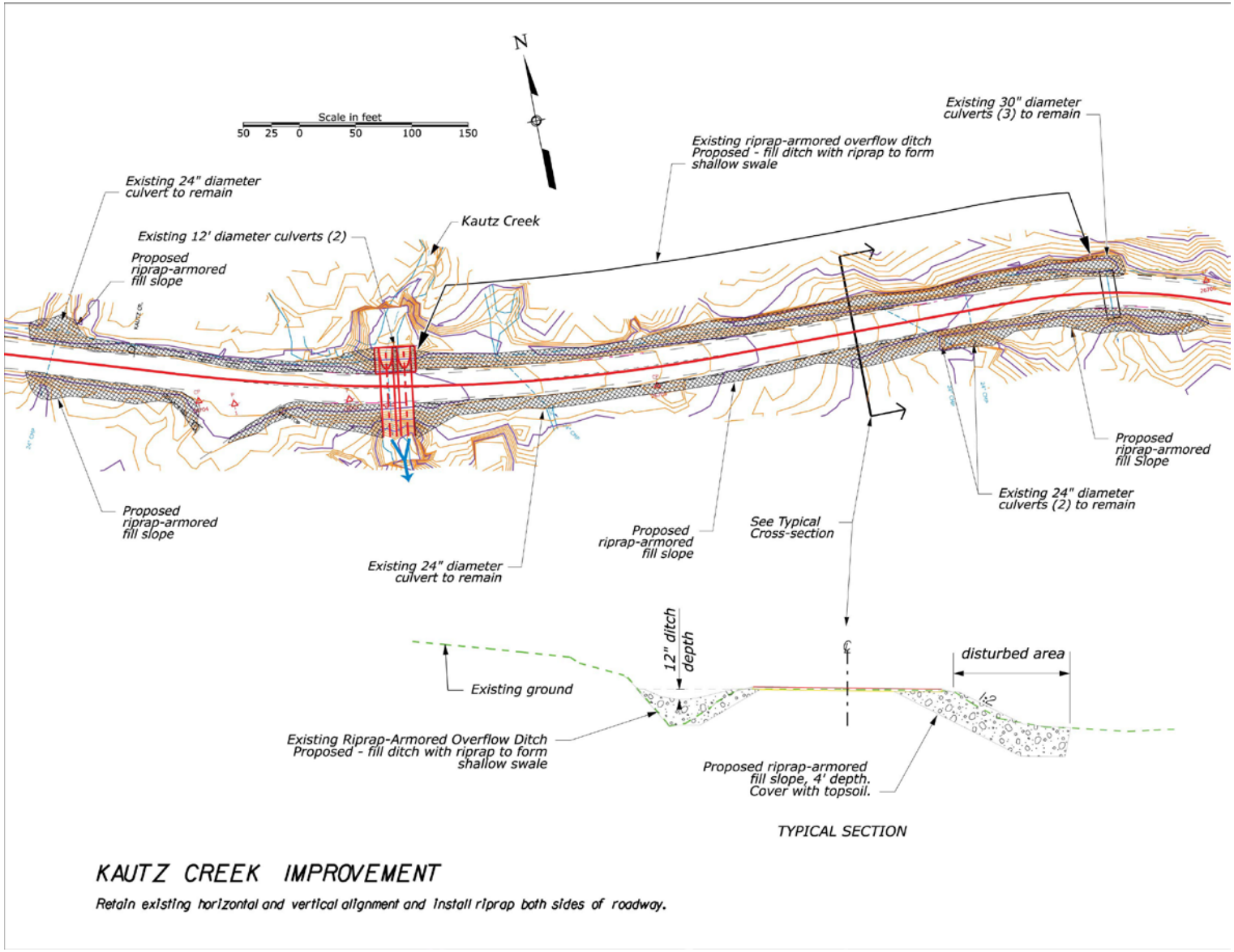
Flood Risk

Channel incision, bank erosion, and woody debris recruitment is occurring upstream and downstream of the culverts installed in 2007. The active channel upstream of the road appears to be migrating east. Woody debris placement and sediment deposition in the active channel could result in an increased frequency of overbank flow traveling down the alluvial fan surface toward the road. The risk of channel avulsion occurring between the culverts at the road and the sag in the road to the east is high. Blockage of the 12-foot culverts by rafted wood (especially since the stream is incising and the adjacent forest is immature) also increases the flood risk and potential failure of the existing drainage system. The risk of flood waters exceeding the capacity of the existing drainage structures and overtopping and damaging the road is high, without improvements to the drainage capacity.

JUSTIFICATION FOR USE OF THE FLOODPLAINS

The Nisqually – Paradise Road currently crosses New Tahoma Creek and Tahoma Creek about ½ mile upstream from the where Tahoma Creek enters the Nisqually River and Kautz Creek about 1 mile upstream from the confluence with the Nisqually River. There is no place to relocate the road that would not require crossing these streams and work in the floodplain.

FIGURE 11. KAUTZ CREEK DRAINAGE IMPROVEMENTS



RESOURCE PROTECTION MEASURES

The following mitigation measures would be implemented in accordance with the NPS floodplain guidelines and EO 11988 ("Floodplain Management"):

- Minimal placement of fill on floodplains is anticipated; except as needed to protect culvert inlets and outlets at New Tahoma Creek and to armor the road side slopes at Kautz Creek. Free natural drainage and natural contours would be preserved to the extent practicable when designing and completing improvements. Previously vegetated areas that are disturbed would be revegetated when construction is complete.
- The New Tahoma Creek culvert would be designed to provide fish passage.
- Natural and cultural resources in the construction area would be protected during construction using best management practices (Table 2 in Environmental Assessment).
- Instream work would be conducted from July 15 to September 15 and for culvert replacement on New Tahoma Creek work would be completed between August 1 and September 15 to protect aquatic resources and Fender's soliperlan stonefly.
- Construction would be halted if high precipitation event resulting in at least a 2-yer stormwater runoff peak rate occurs
- Flood hazard mitigation would be provided by incorporating improved flood conveyance capacity for protecting life and minimizing damage to the road and natural resources.
- Mitigation of flood hazards to road users would be accomplished by improved drainage and closure of the road during periods of very high flows if flooding is anticipated.

COMPLIANCE

The proposed drainage improvements would accommodate natural streamflows, as well as improved capacity for carrying flood flows. Improvements would not restrict the ability of the floodplains to convey and store floodwaters, and would not contribute to flooding during or after construction.

Section 401 of the Clean Water Act requires a permit for any activity that may result in any discharge into the navigable waters of the United States. Pursuant to the U.S. Army Corps of Engineers, work on New Tahoma Creek would likely fall under Section 404 of the Clean Water Act Nationwide Permit 14 (Linear Transportation Projects). Therefore, Section 401 and 404 permits would be required. Less than about 0.01 acres of riprap placement on Kautz Creek near the existing culverts inlet/outlet would occur within the ordinary high water mark and may require Section 404 or 401 permitting.

Section 401 and 404 permits, plus the Environmental Assessment, this SOF for EO 11988 and Procedural Manual #77-2, Section 106 compliance, and the finding of no significant impact (FONSI), when signed, would complete the NEPA requirements for this project.

CONCLUSION

The protection of people and property is of high priority to the park. The NPS concludes that the preferred alternative would reduce the potential impact to the Nisqually – Paradise Road from flooding. In addition, the Park Service concludes that there is no other practicable alternative for the location of the proposed project. With the roads designed to reduce future flood damage, the risk to life and property would be minimized. There would be no significant adverse effects on natural or beneficial floodplain values.

Mitigation would include good design through sustainable design principles, appropriate siting, and best management practices during and after construction. The Park Service finds the proposal to be consistent with EO 11990.

REFERENCES

Kennard, P. 2009. Comments on MORA 14(6) 30% Western Federal Lands Highway Division Draft Review Notes. Memo from Regional Fluvial Geomorphologist, Mount Rainer National Park to Karen Vaage, Landscape Architect, Pacific West Regional Office. November 23.

Leon, S. 2009. Preliminary Hydraulic Design Report – Nisqually to Paradise Road. Federal Highway Administration, Western Federal Lands Highway Division. Vancouver, WA. October 29.

APPENDIX D
Construction Details and Sensitive Natural Resource Maps

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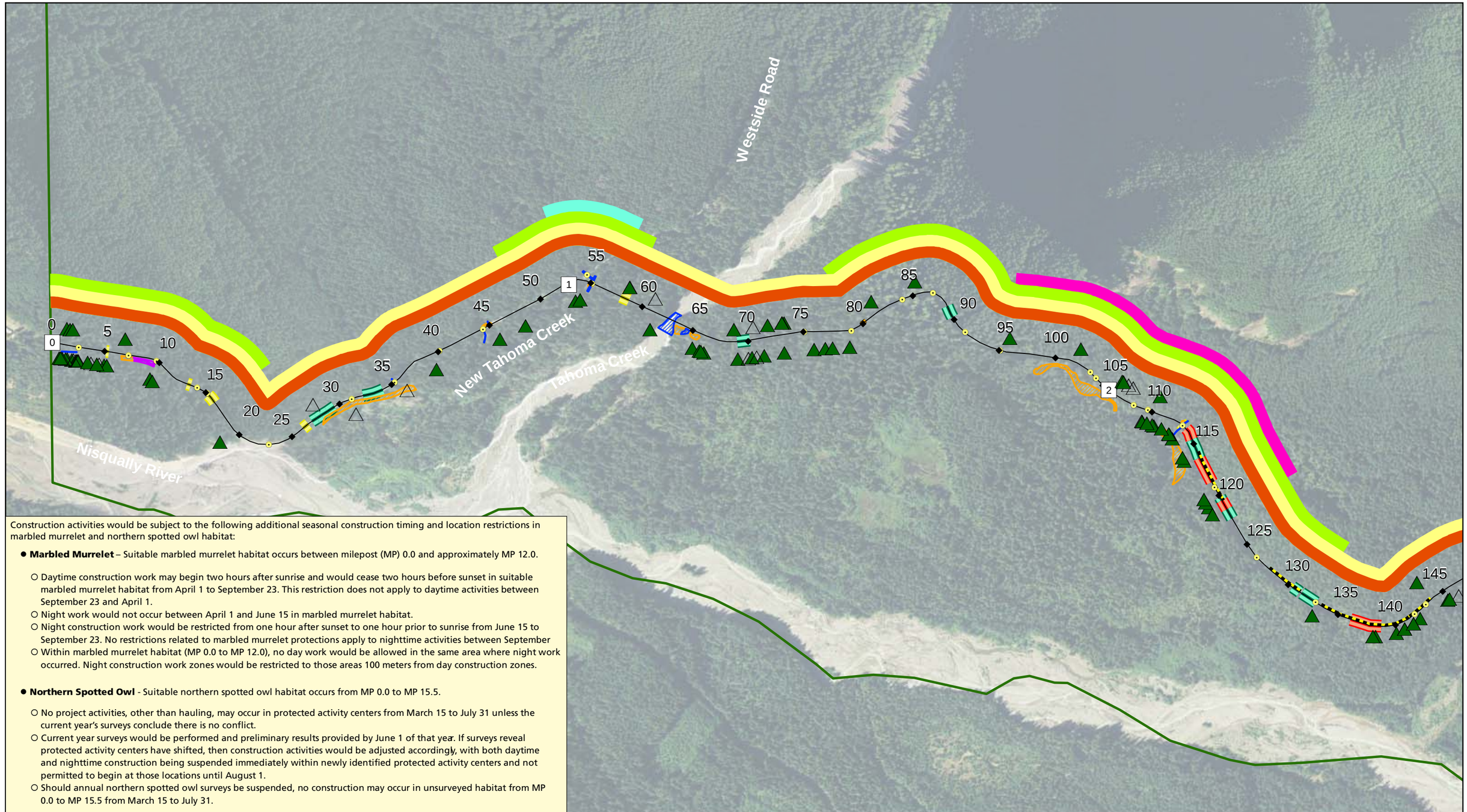

Construction activities would be subject to the following additional seasonal construction timing and location restrictions in marbled murrelet and northern spotted owl habitat:

- **Marbled Murrelet** – Suitable marbled murrelet habitat occurs between milepost (MP) 0.0 and approximately MP 12.0.
  - Daytime construction work may begin two hours after sunrise and would cease two hours before sunset in suitable marbled murrelet habitat from April 1 to September 23. This restriction does not apply to daytime activities between September 23 and April 1.
  - Night work would not occur between April 1 and June 15 in marbled murrelet habitat.
  - Night construction work would be restricted from one hour after sunset to one hour prior to sunrise from June 15 to September 23. No restrictions related to marbled murrelet protections apply to nighttime activities between September
  - Within marbled murrelet habitat (MP 0.0 to MP 12.0), no day work would be allowed in the same area where night work occurred. Night construction work zones would be restricted to those areas 100 meters from day construction zones.

- **Northern Spotted Owl** - Suitable northern spotted owl habitat occurs from MP 0.0 to MP 15.5.
  - No project activities, other than hauling, may occur in protected activity centers from March 15 to July 31 unless the current year's surveys conclude there is no conflict.
  - Current year surveys would be performed and preliminary results provided by June 1 of that year. If surveys reveal protected activity centers have shifted, then construction activities would be adjusted accordingly, with both daytime and nighttime construction being suspended immediately within newly identified protected activity centers and not permitted to begin at those locations until August 1.
  - Should annual northern spotted owl surveys be suspended, no construction may occur in unsurveyed habitat from MP 0.0 to MP 15.5 from March 15 to July 31.

Page 1

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- Storage Areas
- >18" DBH
- Specimen Tree
- Northern Spotted Owl Protected Activity Center
- NSO restriction
- Murrelet restriction

Northern Spotted Owls (2010 and 2012 data)

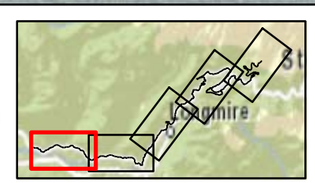
- Amphibian restriction
- Bryophyte restriction
- In-water work restriction

Wetland Delineation

- Wetland ditch
- Wetland ditch - unvegetated
- Other waters/Cowardin wetland
- Wetland
- Riparian

Construction Details

- Deep Patch
- Subexcavation
- Subgrade Reinforcement
- MSE Wall
- Drainage Improvement



Aerial Photography: USDA NAIP Washington 2011
NAD 1983 UTM Zone 10N
Projection: Transverse Mercator

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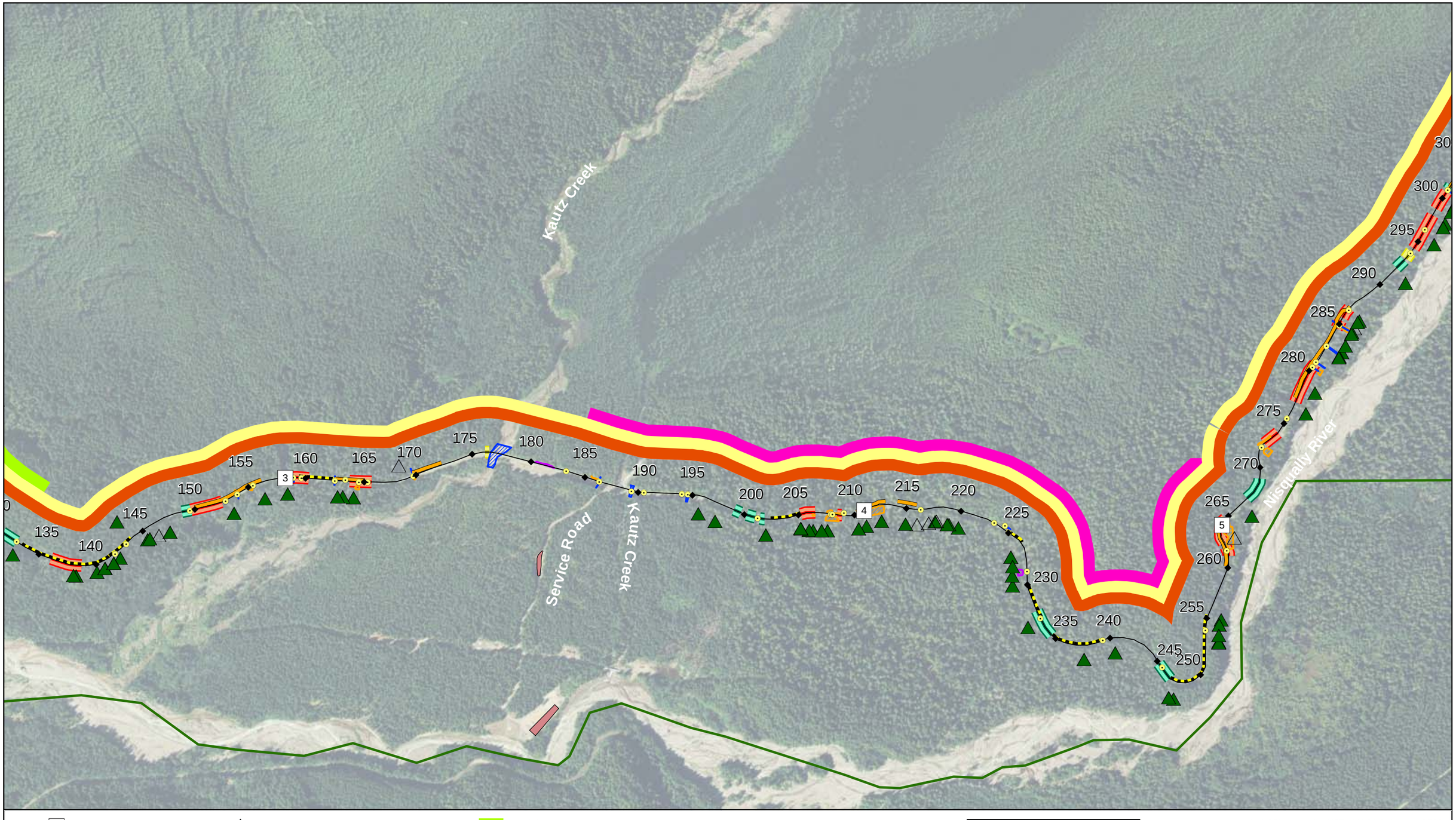

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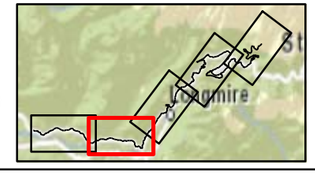

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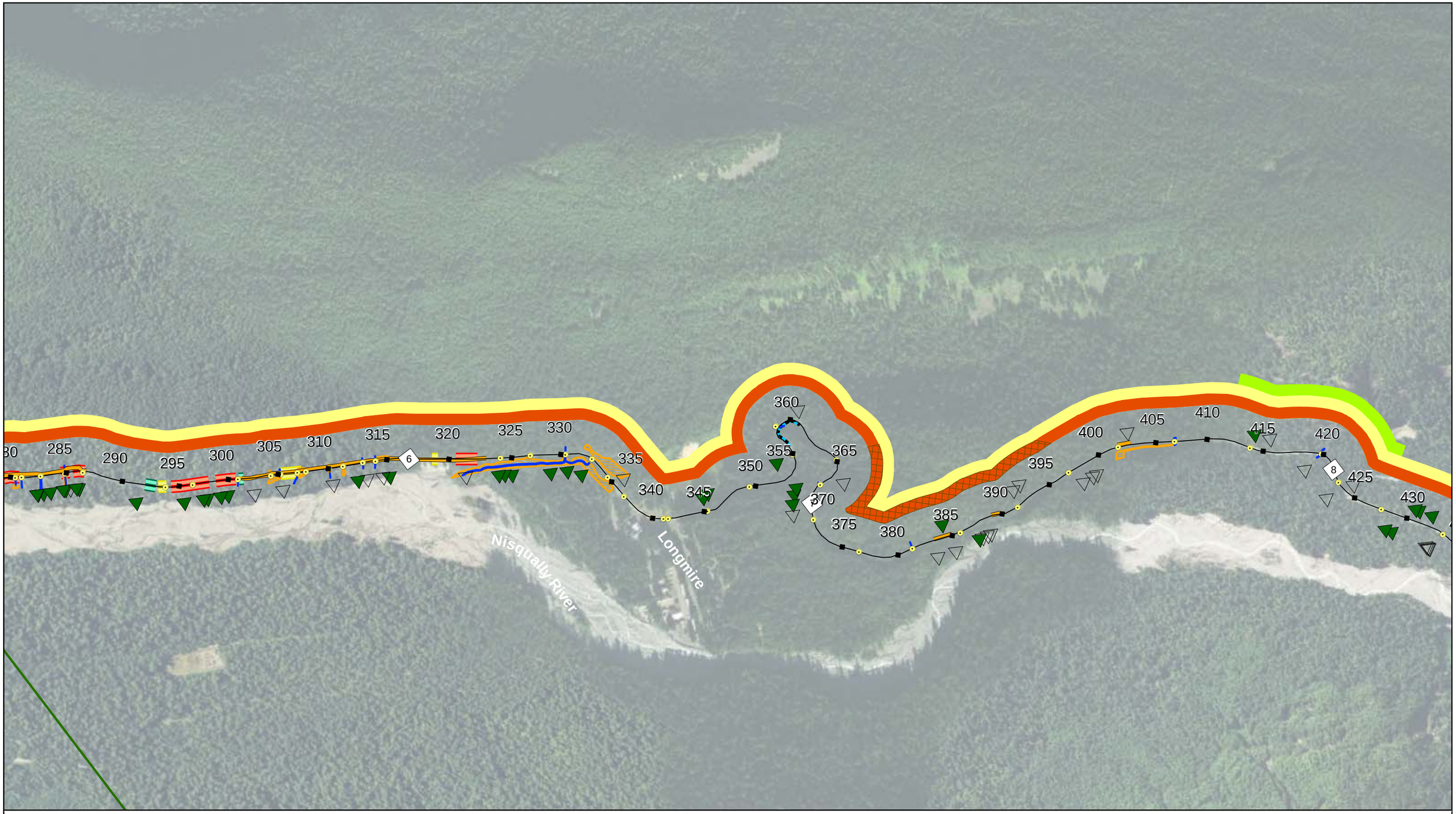

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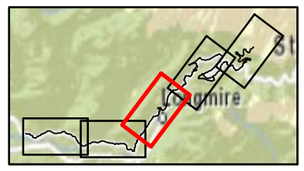

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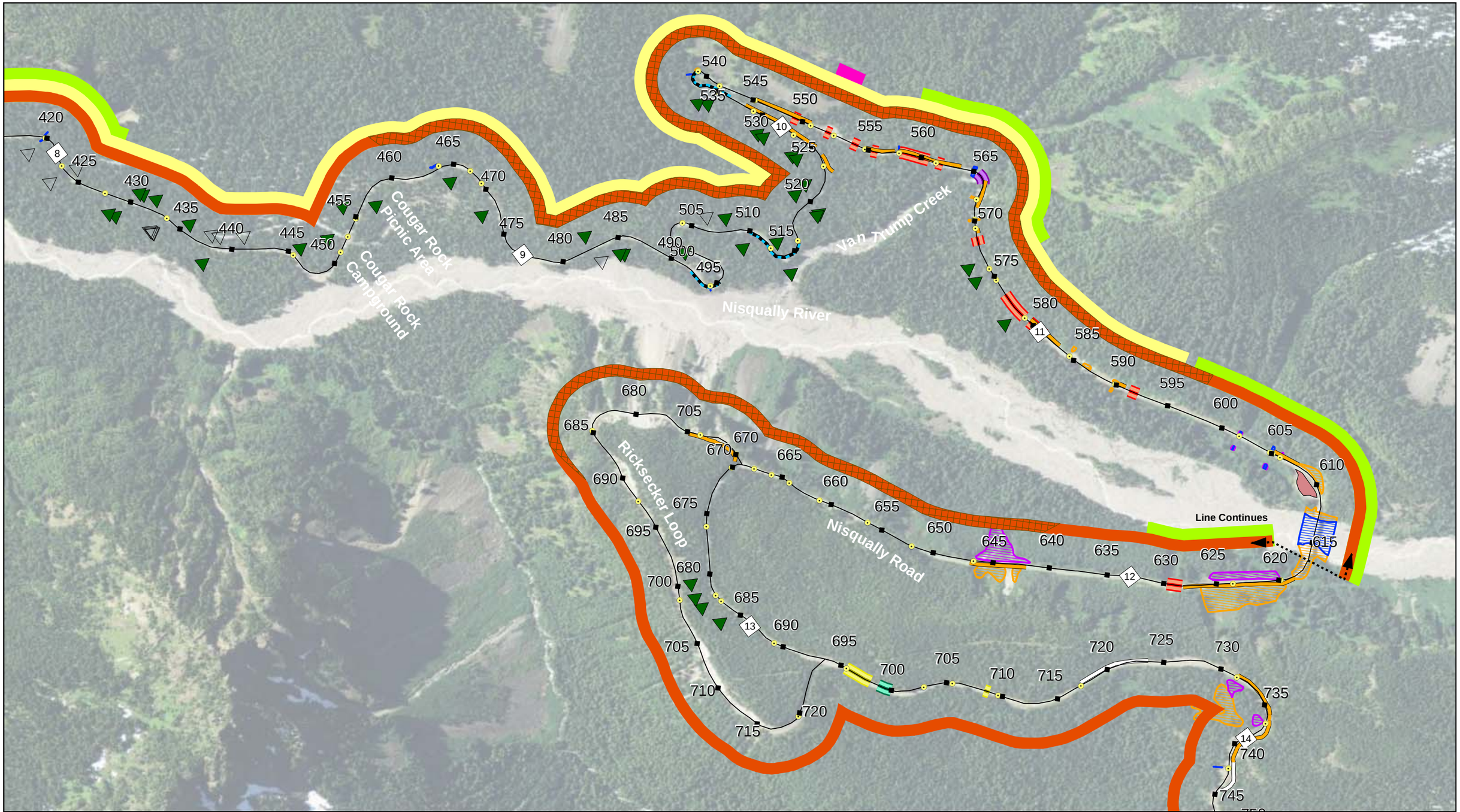

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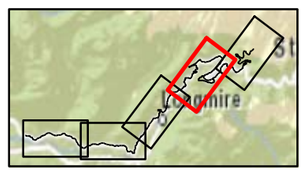

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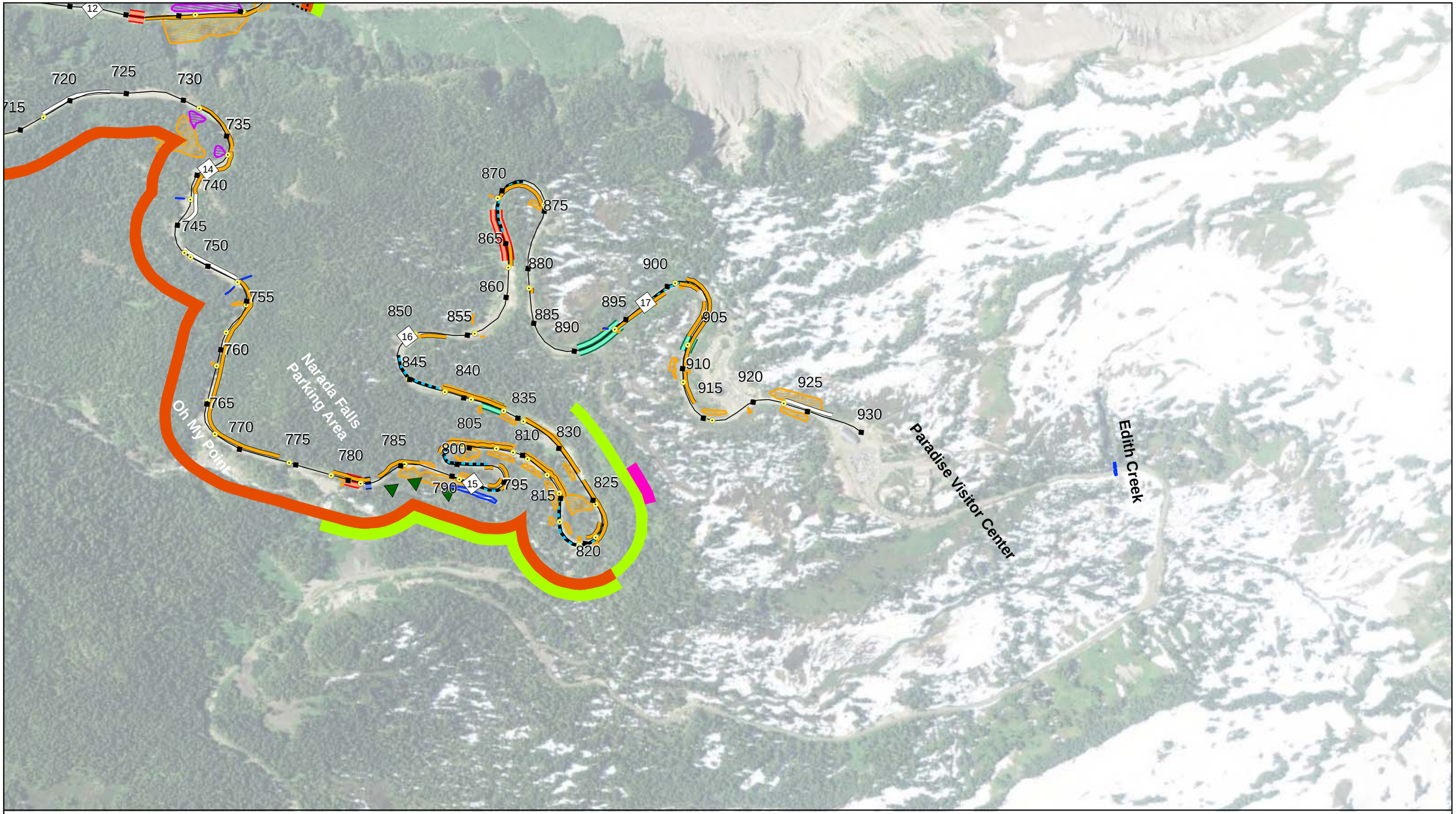

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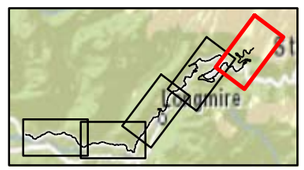

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As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting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

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National Park Service
U.S. Department of the Interior

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