

**National Park Service
U.S. Department of the Interior
Mount Rainier National Park**



**ENVIRONMENTAL ASSESSMENT
CARBON RIVER WONDERLAND TRAIL REROUTE**

September 16, 2008



Mount Rainier National Park 55210 238th Avenue East Ashford, WA 98304

Environmental Assessment Carbon River Wonderland Trail Reroute

Executive Summary

Mount Rainier National Park experienced severe flooding in November 2006, which resulted in extensive damage to park roads, campgrounds, and trails, including portions of the historic Wonderland Trail (WT) in the Carbon River Valley. Approximately one half mile of the WT was damaged two miles east of the Ipsut Creek Campground. The spur trail that crosses the Carbon River and connects the WT to the Northern Loop Trail (NLT) was also damaged (figures 1 and 2).

This Environmental Assessment (EA) describes the environmental impacts associated with three proposed alternatives to restore visitor access to the Carbon Glacier and backcountry areas via the WT. The No Action alternative (Alternative 1) describes the existing conditions and maintenance associated with continuing current use and management of the WT in the Carbon River Valley, including continuing to use the NLT to bypass the damaged section of WT. Actions described under the second alternative (Alternative 2) include abandoning the damaged section of the WT, formally rerouting the WT to the NLT, and upgrading this portion of the NLT to WT standards. The management preferred alternative (Alternative 3) would also abandon the damaged section, but would reroute it to higher ground above the washed out trail. Each alternative would occur in designated wilderness.

Alternative 1: No Action: This alternative describes current use and management associated with the damaged section of the historic WT. Under this alternative, hikers would continue to bypass the damaged section of the WT by crossing over to the NLT via an existing spur trail across the Carbon River. Under this alternative, approximately 0.8 miles of the WT would be abandoned. The NLT, from the spur to the Carbon River suspension bridge, would not be upgraded to WT standards. The spur access to the NLT under this alternative would continue to be vulnerable to outburst flooding and other geological hazards and pose potential serious risks to public and employee safety.

Alternative 2: Like Alternative 1, this alternative would detour the trail from the damaged section of the WT to the NLT via a spur trail that currently connects the two trails, and the damaged section (0.8 mile) of the WT would be closed and abandoned. Under Alternative 2, the NLT section from the spur to the Carbon River suspension bridge would be upgraded to WT construction standards. Tools and equipment needed to upgrade the NLT would include axes, rockbars, shovels, chain saws, pulaskis and McCleods. Chain saws would be required for removing logs and downed trees and constructing stream crossings. No explosives or helicopters would be required. Under Alternative 2, the WT would remain susceptible to flooding across the spur to the NLT.

Alternative 3 (Management Preferred and Environmentally Preferred Alternative): Under Alternative 3, about 1,500 feet (0.28 mile) of the WT would be rerouted to higher ground just above the washed out area. The rerouted section would tie into the undamaged segments of the trail. The reroute would require the use of single shot explosives in designated wilderness to open up approximately 500 feet of new trail through a hard rock area. Explosives would be placed in bore holes drilled into the rock. Tools and equipment necessary to construct the reroute would include rock drills, air compressor, small explosive charges, axes, rockbars, shovels, chain saws, pulaskis and McCleods. A type-III helicopter (Bell Jet Ranger or similar), would be used to transport blasting/drilling equipment to and from the project location under this alternative. This alternative would provide the safest and most sustainable

trail from Ipsut Creek to the Carbon Glacier, the Carbon River suspension bridge, the NLT, and the WT to the east. The new reroute would require less annual maintenance compared to Alternatives 1 and 2.

Alternatives 1-3 are based on the purpose and need for the project and conform to existing laws, policy, and planning documents. The EA analyzes the potential environmental impacts which could result from the three alternatives considered, including the No Action alternative. This Environmental Assessment has been prepared to satisfy the requirements of the National Environmental Policy Act (NEPA) of 1969 (Public Law 91-190, 42 USC 4321-4347, as amended), including the Council on Environmental Quality (CEQ) regulations found at 40 CFR 1500-1508 and other applicable laws, National Park Service Management Policies (2006), the NPS NEPA compliance guidance handbook (Director's Order 12, Conservation Planning, Environmental Impact Analysis, and Decision-making) and management directives. This Environmental Assessment facilitates compliance with Section 106 of the National Historic Preservation Act, Section 7 of the Endangered Species Act, Section 404 of the Clean Water Act, the Wilderness Act, and other applicable laws.

Early Coordination and Public Comment:

A 30-day public comment period was provided April 16 through May 15, 2008, as part of an early scoping process to identify issues, constraints, and other potential alternatives before formulation of the EA. Issues of concern included impacts to the backcountry experience in undeveloped areas, such as preserving opportunities for solitude and other wilderness values; habitat fragmentation; invasive weeds; increased predation; ensuring trail routes were out of the flood zone; and cumulative effects on the Carbon River watershed. All alternatives and associated issues raised during the early scoping process have been considered and/or evaluated in this document. Consultation with the State Historic Preservation Officer (SHPO) was initiated on August 6, 2008. On August 19 the SHPO concurred with park findings of no adverse effect on cultural resources.

This EA is being distributed to state and federal resource agencies, tribes, and the public for a 30-day review and comment period, including the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and affiliated tribes for review and comment as part of the consultation process.

Comments on this EA should be directed to:

Superintendent

Mount Rainier National Park

55210 238th Ave. East

Ashford, WA 98304

All necessary approvals and permits will be secured prior to initiating work. If reviewers do not identify significant environmental impacts, this EA may be used to prepare a Finding of No Significant Impact (FONSI), which would be sent to the National Park Service Pacific West Regional Director for signature, and the project as described would be implemented upon approval of the FONSI.

Contents

EXECUTIVE SUMMARY	2
CHAPTER 1: INTRODUCTION AND PURPOSE AND NEED FOR ACTION	6
INTRODUCTION	6
<i>Figure 1: Vicinity map of the proposed WT Reroute Alternatives</i>	7
PURPOSE OF AND NEED FOR ACTION	7
CHAPTER 2: ALTERNATIVES	9
ALTERNATIVE 1: NO ACTION	9
ALTERNATIVE 2: ABANDON THE DAMAGED SEGMENT OF TRAIL AND REROUTE THE WT TO THE NLT	10
ALTERNATIVE 3: REROUTE TRAIL TO HIGHER GROUND (MANAGEMENT PREFERRED AND ENVIRONMENTALLY PREFERRED ALTERNATIVE)	11
<i>Figure 2: Location of Alternatives 1-3</i>	13
<i>Figure 3: Aerial Photo of the Project Area</i>	14
<i>Figure 4: WT Flooding/reconstruction History Since the Early 1970s</i>	15
<i>Figure 5: Downstream View of Alternative 3 and Original Trail Location</i>	16
<i>Figure 6: Upstream View of Alternative 3 and Original Trail Location</i>	16
ALTERNATIVES CONSIDERED BUT DISMISSED FROM FURTHER REVIEW	17
<i>Alternative 4: Reconstruct the Damaged Trail Section in the Same Location and Alignment</i>	17
<i>Alternative 5: Construct a Permanent Bridge Over the Carbon River Lower Crossing to Replace the Foot Log Crossings</i>	17
MANAGEMENT PREFERRED ALTERNATIVE	18
<i>Table 1: Comparison of Alternatives and Project Purpose and Need</i>	18
<i>Table 2: Comparison of Alternatives and Environmental Consequences</i>	20
<i>Table 3: Comparison of Alternatives and Effect Determinations for Federally Listed and Special Status Wildlife Species</i>	24
ENVIRONMENTALLY PREFERRED ALTERNATIVE	25
RESOURCE IMPACT TOPICS SELECTED FOR ANALYSIS	26
<i>Table 4: Selected Resource Impact Topics and Relevant Laws, Regulations, and Policies</i>	27
<i>Table 5: Dismissed Impact Topics and Relevant Laws, Regulations, and Policies</i>	28
CHAPTER 3: AFFECTED ENVIRONMENT	30
AIR QUALITY	30
GEOLOGY/GEOLOGIC HAZARDS	30
SOILS	31
VEGETATION	31
WATER RESOURCES	32
WILDLIFE	33
SPECIAL STATUS WILDLIFE SPECIES AND CRITICAL HABITAT	33
<i>Table 6: Special Status Wildlife Species</i>	39
SPECIAL STATUS PLANTS	41
CULTURAL RESOURCES	42
WILDERNESS	43
<i>Table 7: Decibel (dBA) Levels of Ambient and Human-induced Sounds</i>	45
NATURAL SOUNDSCAPE	45
VISITOR USE AND EXPERIENCE	46
PARK OPERATIONS AND SAFETY	46
CHAPTER 4: ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES	48
METHODOLOGY OF EVALUATING IMPACTS	48
ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVE 1: NO ACTION	58
ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVE 2: ABANDON DAMAGED TRAIL SEGMENT AND REROUTE THE WT TO THE NLT	66
ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVE 3: REROUTE TRAIL TO HIGHER GROUND (MANAGEMENT PREFERRED AND ENVIRONMENTALLY PREFERRED ALTERNATIVE)	76
CHAPTER 5: CONSULTATION AND COORDINATION	88

CHAPTER 6: REFERENCES	90
APPENDIX A: <i>DRAFT</i> MINIMUM REQUIREMENT WORKSHEETS	94
APPENDIX B: RESOURCE CONSERVATION MEASURES	103
APPENDIX C: RELATIONSHIP TO LAWS, POLICY, AND PARK PLANNING DOCUMENTS	105
<i>Table 8: Mount Rainier National Park General Management Plan Zones</i>	<i>108</i>
APPENDIX D: DEFINITIONS AND ACRONYMS	113
APPENDIX E: PARK PURPOSE AND SIGNIFICANCE	118

Chapter 1: Introduction and Purpose and Need for Action

Introduction

Mount Rainier National Park (MORA) encompasses 235,625 acres on the west side of the Cascade Range, about 65 miles southeast of Seattle and 65 miles west of Yakima. The park was established in 1899 “for the benefit and enjoyment of the people” (Mount Rainier National Park Organic Act). The park is managed to “provide for the preservation from injury or spoliation of all timber, mineral deposits, natural curiosities, or wonderful objects within said park, and their retention in their natural condition” (16 USC 92). The park’s outstanding wilderness values, natural and cultural resources, and remarkable scenic characteristics were and continue to be its signature features.

In 1988, approximately 97 percent of the park was designated as the Mount Rainier Wilderness, which is part of the National Wilderness Preservation System. Wilderness areas are administered for the use and enjoyment of the public in such manner as will leave them unimpaired for future use and enjoyment and to preserve their wilderness character. In accordance with the Wilderness Act, wilderness areas shall be devoted to the public purpose of recreational, scenic, scientific, educational, conservation, and historical use. In 1997, the Mount Rainier National Historic Landmark District (NHL) was listed on the National Register of Historic Places. This large and exceptional district includes approximately 1,700 acres, including nearly all of the park’s historic developed areas. The NHL is an outstanding example of early park planning and National Park Service rustic architecture of the 1920s and 1930s. The Wonderland Trail (WT) is a contributing element in the NHL. The WT is 93 miles long and is located within MORA wilderness in Pierce and Lewis Counties, Washington (Figure 1).

Encircling Mount Rainier, the WT is traversed by thousands each year, including those who hike it in sections, one weekend at a time.

“A bridle trail around the mountain just under the glacier line is absolutely essential to the proper policing of the park and very necessary for the convenience of tourists if they are to really have access to the attractions of the park. The trail should be so located that in time it may be enlarged into a wagon road.”

With this statement in 1907, Major Hiram M. Chittenden of the U.S. Army Corps of Engineers envisioned the creation of the WT. The trail was originally considered essential to enable ranger access to the backcountry for fire control and game preservation and to allow visitors the opportunity to view the mountain and its surrounding landscape in their entirety (Gilbert 1995).

By 1924, the WT started from Carbon River, traversed the moraines of the Carbon and Winthrop Glaciers, traveled up around Burroughs Mountain, down the White River to Fryingpan Creek, through Summerland, over Fryingpan Glacier to the Cowlitz Divide, then as before to Indian Henry’s, finally passing up Tahoma Creek to below St. Andrews Park, through Sunset park, past Golden Lakes, up to Mowich Lake and then through Spray Park, descending finally to meet the Carbon River again at Cataract Creek (Gilbert 1995).

Over the years, sections of trail and trail bridges were built, rebuilt, and built again. Although the trail was originally designed for both hiking and pack stock, most of the bridges which supported horses have long since been reconstructed as foot logs for hikers only. Many sections of the earlier trail, such as the Carbon River and Fryingpan Creek sections, have been reconstructed many times. As early as 1922, travelers

began to take the Ipsut Pass, rather than the Spray Park, route. Much later, in the late 1960s, the original trail through Spray Park was removed from the “official” WT route to discourage use in this fragile area (Gilbert 1995).

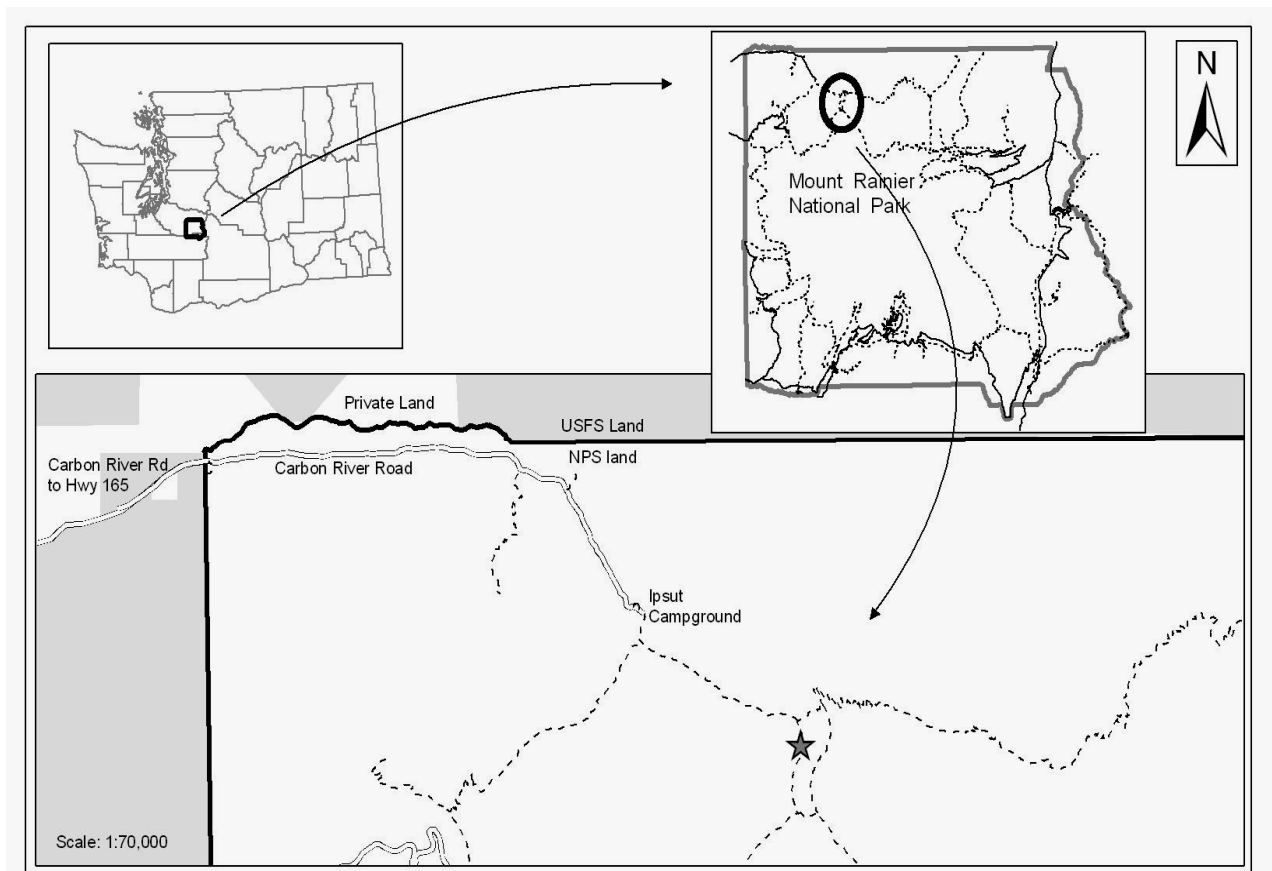


Figure 1: Vicinity map of the proposed WT Reroute Alternatives

Purpose of and Need for Action

The purpose of this proposal is to provide safe, reliable trail access to the Carbon Glacier and backcountry, to provide hiking opportunities within the historic WT corridor; to preserve the wilderness character; and to protect other natural and cultural resources under the park’s care.

A need for action has arisen as a result of severe flooding that occurred at MORA in November 2006. The flooding caused extensive damage to park roads, campgrounds, and trails, including portions of the historic WT in the Carbon River Valley. Approximately one half mile of the WT was washed away two miles east of the Ipsut Creek Campground. Since the early 1970s, this two mile section of the WT has been flooded, reconstructed, and rerouted numerous times. The current damage is located in the section that runs north-south along the west side of the Carbon River.

Trail conditions along the damaged segment of trail are unsafe for visitors and park staff because of missing trail tread, glacial river crossings, and lack of a defined route through forest. Trail users are being rerouted via a spur trail to the Northern Loop Trail, which parallels the damaged section of the WT on the east side of the Carbon River. However, the foot logs that provide passage over the Carbon

River via this spur trail generally wash out at least once per year. The park proposes to address the frequent washouts of the WT in this area for the purpose of providing safe, reliable trail access to the Carbon Glacier and backcountry, and to meet other long-term management objectives of the park, including:

- Provide a trail that is less susceptible to damage from flooding and geologic hazards in the Carbon River Valley and is a safe visitor experience for users of the WT.
- Protect natural and cultural resources under the park's care and minimize adverse environmental impacts.
- Maintain the historic alignment and character of the WT as closely as possible.
- Provide a sustainable trail design to minimize annual maintenance repairs.

In addition, the proposed project must be appropriate and necessary for administration of the area as wilderness, and carried out in a manner which minimizes impacts to wilderness resources and character.

Chapter 2: Alternatives

This section describes two action alternatives that meet the purpose and need for the project, a no action alternative, and action alternatives considered, but dismissed from further review. The NPS will use the analysis in the EA along with input from individuals, organizations, tribes, and agencies to reach a final decision. If reviewers do not identify significant environmental impacts, this EA may be used to prepare a Finding of No Significant Impact (FONSI), which would be sent to the National Park Service Pacific West Regional Director for approval. If a determination is made indicating a finding of significant impact(s), under NEPA, the National Park Service would be required to prepare an Environmental Impact Statement (EIS) for further analysis. Figures are provided at the end of this section. Figures 2 and 3 display a map and aerial photo of the proposed project alternatives, and Figure 4 displays a map comparing the alternatives with earlier flood damage, reconstruction, and reroute history within the same general area over approximately 30 years. Figures 5 and 6 depict upstream and downstream views of Alternative 3 within the forested segment.

Alternative 1: No Action

The No Action alternative describes the action of continuing the current use and management of bypassing the flood-damaged trail section. It does not imply discontinuing the present action or removing existing uses. The No Action alternative provides a basis for comparing the management direction and environmental consequences of all other alternatives (action alternatives).

Under Alternative 1, hikers accessing the WT from Ipsut Creek would continue to bypass the damaged section by crossing over to the Northern Loop Trail (NLT) via an existing spur trail. The route would cross the Carbon River at the lower crossing of the Carbon River via foot logs, would follow the NLT along the east side of the Carbon River, and would then rejoin the WT at the Carbon River suspension bridge just below the Carbon Glacier. The NLT would be used to access the Carbon Glacier area and points to the east on the WT and would also be used to complete the circuit of the Mother Mountain loop.

The NLT, from the spur trail junction south to the Carbon River suspension bridge, would not be upgraded to WT standards and no improvements would be implemented, other than those necessary for routine maintenance. Since the spur trail crosses unstable braided channels and river bars across the valley floor, sections of the spur trail would need to be annually realigned and delineated with river rock. These transitory, flood-prone areas of trail would be constructed to the minimum standard necessary to provide a relatively smooth and clear path for hikers, but there would be no attempt to provide a uniform grade or tread width.

There is at least one river-crossing on the spur trail, but if multiple stream channels have developed in any given year, two or three foot-log bridges may be installed. The foot logs generally wash out each year (usually more than once) and are replaced by the trail crew when needed and as time allows. Forging this section of the Carbon River is difficult and hazardous. A mile or so upstream, the Carbon River is spanned by a suspension bridge that is above the floodplain. In past years, when foot logs washed away during the summer and fall seasons, hikers accessing the Carbon River area from Ipsut Creek could travel the WT south to the suspension bridge to cross the Carbon River. Currently, however, this section of the WT is impassable, so when foot logs wash out, hikers traveling to and from Ipsut do not have access to a safe river-crossing. Under Alternative 1, trail crews would attempt to quickly replace missing foot logs in order to maintain trail access, but hikers could be stranded for 24 hours or more.

Under Alternative 1, the NLT and the spur trail would continue to be maintained using hand tools and chain saws (when chain saws have been determined to be the minimum tool necessary to open the trail because of the potential size and numbers of downed trees likely to occur).

Alternative 2: Abandon the Damaged Segment of Trail and Reroute the WT to the NLT

Under Alternative 2, as in Alternative 1, an 0.8-mile section of the WT would be abandoned (i.e., the section from the Carbon River lower crossing to Cataract Creek and the Carbon River suspension bridge crossing). The trail would be rerouted across the Carbon River via the existing spur trail and foot log crossings to the NLT. The reroute would follow the NLT on the east side of the river and would then rejoin the WT at the Carbon River suspension bridge below the Carbon Glacier.

The segment of the NLT that the WT would be rerouted onto does not currently meet WT standards (as defined in the National Historic Landmark District designation). Under Alternative 2, this 0.7-mile segment of the NLT would be upgraded to meet WT NHLHD standards (including a 24- to 36-inch-wide tread at a 5 to 15 percent grade) and would officially become part of the WT. The trail crew would improve the tread, widen the trail, and remove downed logs. Trail widening activities would result in removal of soil duff and organic layers as well as approximately 20 trees (all less than 20 inches in diameter) and 0.5 acre of vegetation to reach mineral soil. This method of construction would create a reasonably sustainable trail, and the improved trail section, which is located above the floodplain, would require minimal routine maintenance. A crew of six would be able to accomplish the work over the course of approximately four months. Construction would be expected to begin in fall 2008, and resume in the early summer of 2009, depending on snow conditions. Work would occur within designated wilderness.

Tools and equipment needed to improve the trail (digging through roots and duff to mineral soil, clearing downed logs, etc.) would likely include axes, rockbars, shovels, chain saws, pulaskis and McCleods. Chain saws would be the minimum tool required for removing trees and logs due to the number and size of the standing and down wood. (See Appendix A for the draft wilderness minimum requirement/minimum tool analysis.) The removal of logs and trees would require chain saw use of up to 3 hours per day for approximately 20 days. The felled trees would be used to build trail structures such as cribbing, as needed. Materials such as mineral soil required for constructing the new trail tread are expected to be available on site (i.e., the construction of the trail backslope would generate enough materials for the trail tread). Erosion control measures would include tread outslipping, drain dips, drain bars, check dams, and side ditches. Additional erosion control measures and best management practices (BMPs) would be implemented during trail construction. Where possible, vegetation would be salvaged and replanted in ecologically appropriate areas adjacent to the new trail.

Although the trail would be constructed to WT standards, major trail maintenance along the reroute would be expected to occur approximately every five years, and some activities, such as removing downed trees, would be done more frequently. Foot log replacement, re-delineation of the trail through the river bar, and minor maintenance, such as repair of drains and check dams, would be expected to occur annually.

River-crossings along the spur to the NLT are difficult and hazardous without foot logs. When the foot logs wash out, the trail crew needs at least 24 hours to replace the missing crossing structures and reestablish the route. As in Alternative 1, under this alternative, in the absence of foot logs, trail users wishing to return to the Ipsut Creek area from the east side of the river would be stranded until trail crews are able to replace the missing foot logs. Hikers experienced in cross-country route finding would have the option of crossing the Carbon River via the suspension bridge 1.1 miles to the south and

then traveling cross country to bypass the flood-damaged section of the Wonderland Trail to return to Ipsut Creek Campground/Carbon River Road. Cross-country travel in this area would require bushwhacking through heavy vegetation and traveling over steep and hazardous terrain. Alternatively, stranded hikers could return to the Campground/Road by hiking 14 miles via the Carbon River suspension bridge, the Spray Park Trail to Mowich Lake, and the Wonderland Trail to Ipsut Creek Campground. Normally the distance to Ipsut Creek Campground via the NLT spur would be about 3 miles, and many hikers would not be prepared to hike the additional 11 miles.

The Carbon River Wilderness Camp is located along the WT west of the Carbon River suspension bridge. Since Alternative 2 reroutes WT hikers onto the NLT, WT hikers wishing to camp at Carbon River Camp would cross the Carbon River via the suspension bridge and would then cross a foot log over Cataract Creek to reach the camp. To continue their trip along the WT, hikers would retrace the route across Cataract Creek and the Carbon River. This side trip would be about a quarter mile each way, a distance longer than the short spurs to trailside camps that are more typical of the WT.

Alternative 3: Reroute Trail to Higher Ground (Management Preferred and Environmentally Preferred Alternative)

Under this alternative, 1,500 feet (0.28 mile) of new trail would be constructed in designated wilderness to bypass the flood-damaged area and relocate the route to higher ground. The new alignment would generally run through forest and across open rock slopes and bedrock cliffs, beginning at an elevation of approximately 2,840 feet and ending at approximately 3,200 feet. New trail would be constructed to the same historic standards of the original trail, including a 24- to 36-inch-wide tread at a 5 to 15 percent grade. Backsloping would also be incorporated into the new trail with drain logs or drain dips as needed. Two switchbacks across a slope covered in vine maple would also be required. The trail would then follow the contours up the valley with a trail grade comparable to the former trail.

Tools and equipment necessary to construct the trail through the forested area (digging through roots and duff to mineral soil, clearing downed logs, etc.) would likely include axes, rockbars, rock drills, shovels, chain saws, pulaskis, and McCleods. Tools and equipment necessary to construct the trail through the bedrock cliff (crossing approximately 500 feet of bedrock) would include an air compressor, pneumatic rock drill, and explosives. Because the drilling equipment is too heavy to transport by people or stock, a type-III helicopter (Bell Jet Ranger or similar) would be used to fly the air compressor, hoses, and pneumatic rock drill to and from the site. Helicopter flights, drilling, and blasting would occur only between August 6 and early November during the two years of construction to minimize effects on sensitive bird species during the breeding and nesting season. (See Appendix A for the draft wilderness minimum requirement/minimum tool analysis.)

Rerouting the trail to higher ground would require crossing a steep bedrock slope because there is no way to route the trail upslope above the floodplain without encountering bedrock. In order to create a ledge that is wide enough to hike along, removal of the bedrock or installation of a manufactured trail structure that could be bolted to the bedrock would be needed. The wilderness “minimum tools” required to remove the bedrock would be a pneumatic rock drill, an air compressor, and explosives because no known alternative to explosives is effective on bedrock (e.g., Boulder Blaster technology would not be effective) (Fabiani, pers comm.). Although it would be possible to avoid blasting by installing a manufactured trail structure (steel framework and tread) that could be bolted to the bedrock hillside, this solution would still require drilling into the bedrock, would require higher maintenance, would be incompatible with the park’s historic trail standards, and would be a more intrusive structure in wilderness. Therefore, blasting was determined to be the wilderness minimum tool.

Holes would be drilled into the bedrock using an air compressor and pneumatic rock drill. Explosive material would be placed into the holes, and the shot would be detonated (1 shot = approximately 2 pounds of explosive material placed in an array of 10-12 holes and detonated). Following each blast, crews would work the fractured rock apart with hand tools and clear the site by incorporating rock rubble into the trail and/or side casting unwanted rock above/below the trail route. Drilling is anticipated to last a maximum of three hours for each drill-blast-clear cycle. Based on park sound measurements taken during a previous project in the park (2007 Silver Falls bridge project), the level of noise generated during rock drilling is expected to range from 105 to 119 dBA at 0 feet; and noise from rock blasting is expected to be approximately 88 dBA at 500 feet.

All blasts would occur at least two hours after sunrise and no later than two hours before sunset. The drill-blast-clear cycle is expected to last from one to three days. There would be from two to six blasts per week. Thus, following a blast, a period of 24 to 72 hours would usually occur prior to the next blast. No more than two blasts would ever occur within a 24-hour period. Drilling/blasting (and other noise producing activities) would be initiated at the earliest in the fall of 2008, run to early November, resume the following season after August 5 (to minimize effects on marbled murrelets), and then continue until early November 2009. Overall, there would be an estimated total of 100 intermittent blasts conducted over a period of six months.

As noted, each shot would use two pounds or less of explosive. In order to reduce the noise impacts of the blasts, the shots would be detonated using Non-Electric Detonators (Non-el). Non-el reduces the level of noise compared to standard detonation cord. By design, the arrangement and depth of the bore holes and the use of the minimum effective amount of explosives would fracture the rock rather than scatter the material outwardly, although some flying debris (less than two inches in diameter) could still occur. The fractured rock material created by the blast would vary from two inches to two feet in diameter. This rock material would be incorporated into the trail or side-cast as scree above/below the trail.

Trail construction activities would result in removal of soil duff and organic layers as well as approximately ten trees and 0.2 acre of understory vegetation to reach mineral soil. This method of construction would provide a reasonably sustainable trail, requiring minimal routine maintenance. The minimum tool required for removal of standing and downed trees and roots would be a chain saw due to the number and size of the trees. Chain saw use would be required for up to two hours per day for approximately 30 days spread over an estimated six-month construction period carried over the 2008-2009 work seasons. The felled trees would be used to build trail structures such as cribbing. Materials such as mineral soil and crushed rock required for constructing the new trail tread are expected to be available on site (i.e., bedrock removal and the construction of the trail backslope would generate enough materials for the trail tread). Erosion control measures would include tread outslipping, drain dips, drain bars, check dams, and side ditches. Additional erosion control measures and best management practices (BMPs) would be implemented during trail construction. Where possible, vegetation would be salvaged and replanted adjacent to the new trail.

Trail construction would begin in the fall of 2008 with the removal of vegetation along the trail corridor. Trail tread construction would begin at the lower end of the trail, starting with the switchback, and would progress uphill. Any sections that require blasting would be scheduled after August 5 each year of construction. Required materials for constructing the new trail tread are available on site. Major trail maintenance along the reroute would be expected to occur approximately every ten years, and some activities, such as relocating downed trees, would be done more frequently. Annual minor maintenance (repair of drains, check dams, etc.) would also occur.

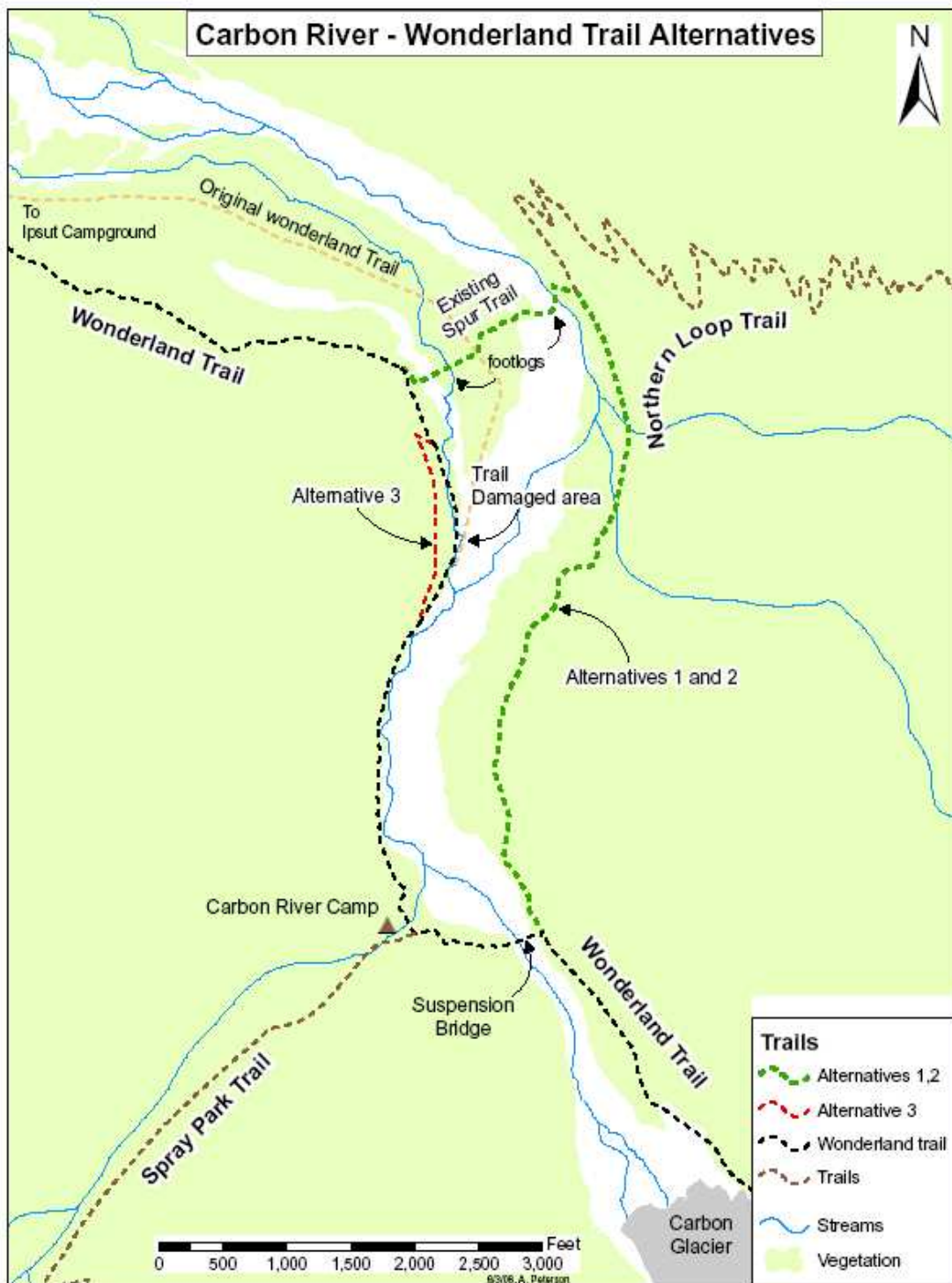


Figure 2: Location of Alternatives 1-3

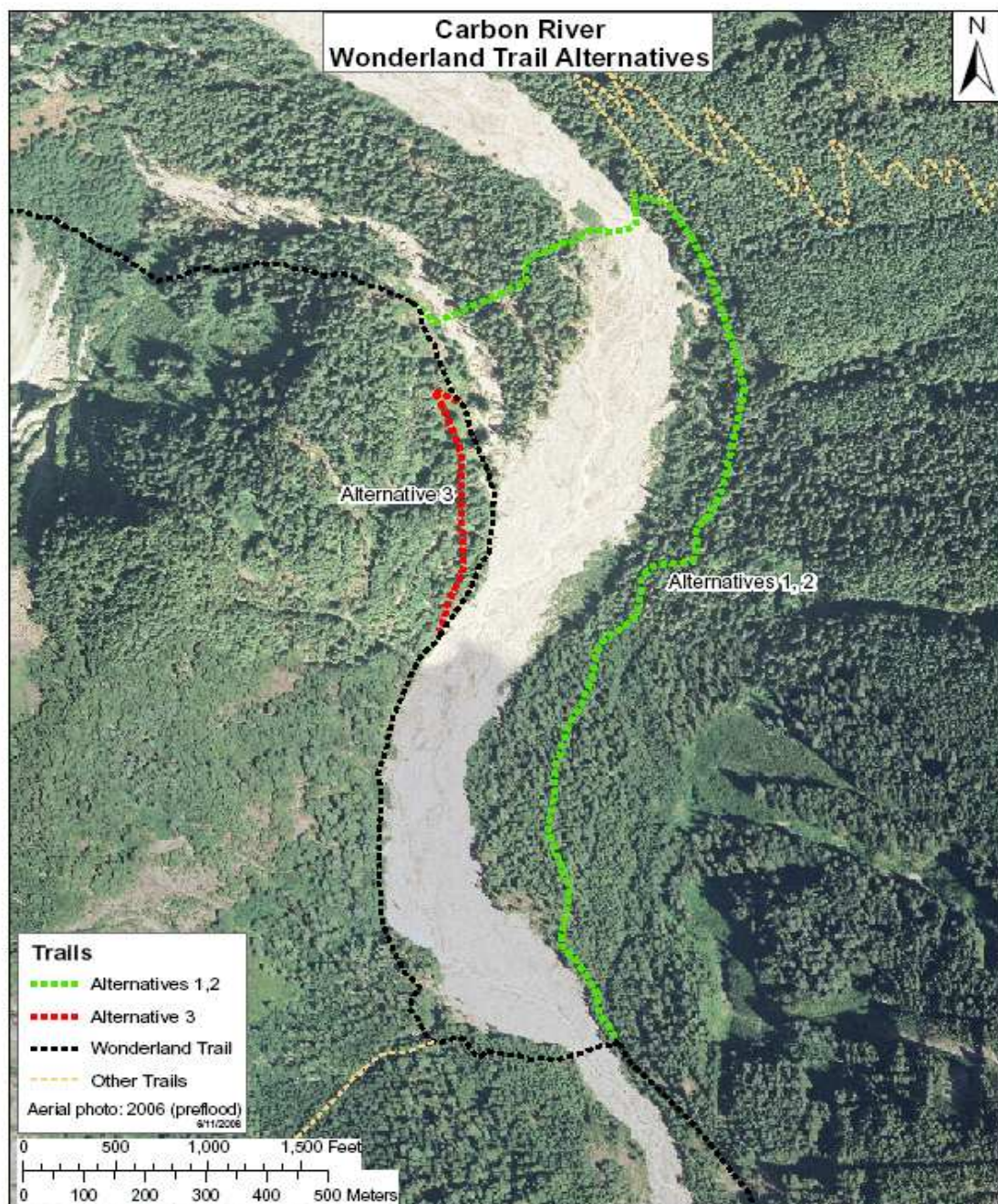


Figure 3: Aerial Photo of the Project Area

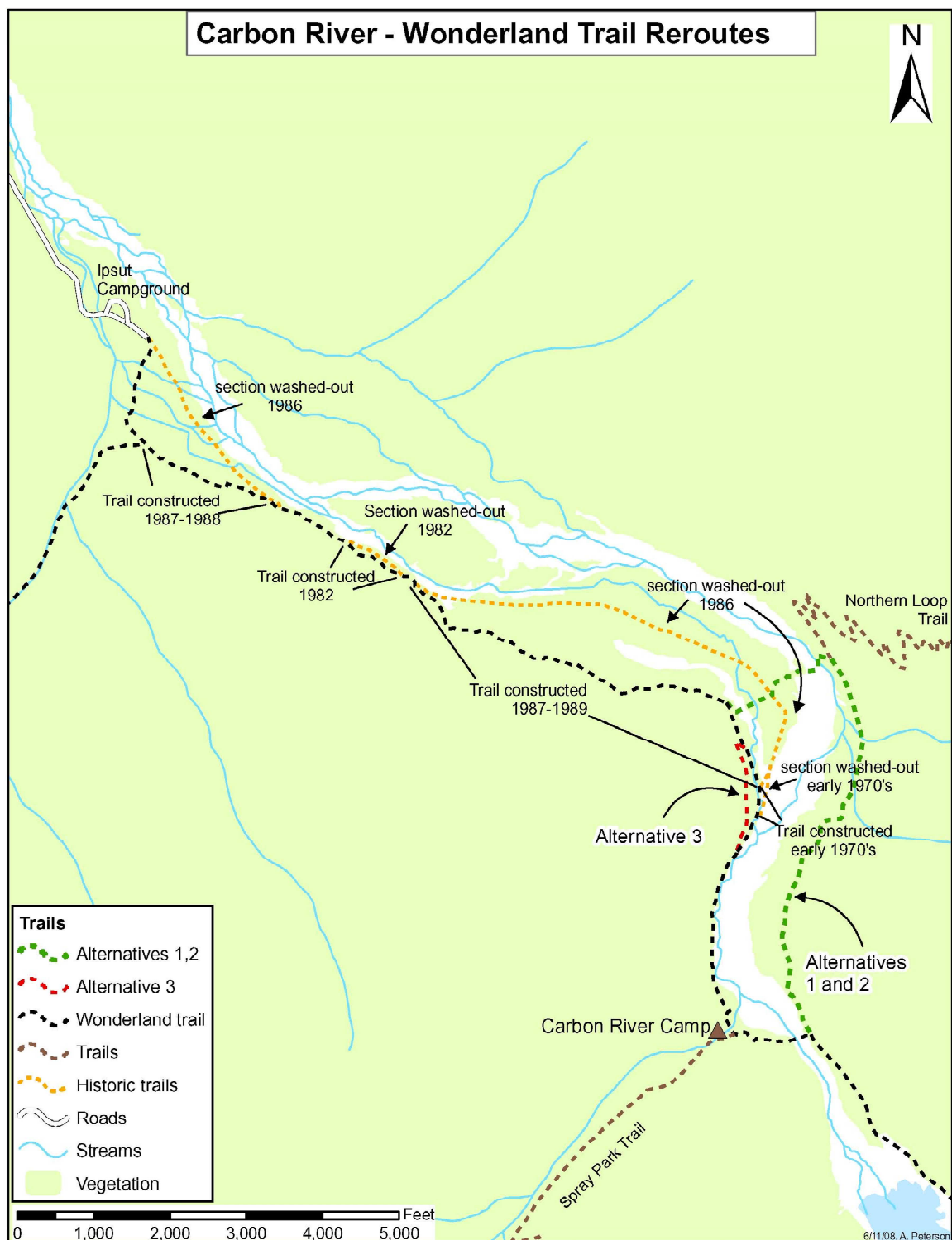


Figure 4: WT Flooding/reconstruction History Since the Early 1970s



Figure 5: Downstream View of Alternative 3 and Original Trail Location



Figure 6: Upstream View of Alternative 3 and Original Trail Location

Alternatives Considered But Dismissed From Further Review

Under the National Environmental Policy Act (NEPA) alternatives may be eliminated from detailed study based on the following criteria [40 CFR 1504.14 (a)]:

- Technical or economic infeasibility;
- Inability to meet project objectives or resolve need for the project;
- Duplication of other less environmentally damaging alternatives;
- Conflicts with an up-to-date valid plan, statement of purpose and significance, or other policy; and therefore, would require a major change in that plan or policy to implement; and
- Environmental impacts too great.

The following alternative was considered during the planning phase of the project but was dismissed from further review following public scoping and based upon the above criteria.

Alternative 4: Reconstruct the Damaged Trail Section in the Same Location and Alignment

Under this alternative, approximately 2,000 feet (0.4 mile) of new trail in the damaged section would be reconstructed in approximately the same pre-flood location before it was washed away in 2006 (Figure 2, trail-damaged area). The Carbon River is currently flowing through this segment. In order to reconstruct this section, fill materials would need to be imported to the project area. Reconstruction would take place in the streambed at the base of steep eroded slopes and bedrock cliffs. It is likely the trail would need to be reconstructed either on an annual or periodic basis due to expected future flood events.

This alternative was dismissed from further review for the following reasons:

- Frequent maintenance or reconstruction over the long term would not meet the park's goal for a sustainable trail;
- Reconstruction would not meet the long-term management objective to provide a safe trail route for hikers and backpackers because of frequent flooding that is expected in the future;
- Annual or periodic maintenance and/or reconstruction would likely require importing large amounts of materials and extensive helicopter use in wilderness; and
- Frequent reconstruction over the long term could significantly impact wilderness characteristics and values in this area of the park and could have cumulative impacts to other natural and cultural resources along the trail corridor.

The following alternative was considered as a result of public comments received during the scoping period but was dismissed from further review based on the NEPA criteria noted above.

Alternative 5: Construct a Permanent Bridge Over the Carbon River Lower Crossing to Replace the Foot Log Crossings

Under this alternative, a permanent structure (suspension bridge) would be built to span the Carbon River valley floor in the location of the current foot log crossing. The bridge would be above the floodplain and would eliminate the need to frequently repair the spur trail and replace foot logs. Like alternatives 1 and 2, the WT would be rerouted to the NLT to bypass the damaged section of the WT. In order to anchor the bridge footings in appropriate substrate and to span the dynamic braided river system in this location, the bridge would need to be approximately 500 to 700 feet long. The park's two existing wilderness trail suspension bridges are about 200 feet long and required extensive effort and cost to build. These two bridges were already in place at the time of wilderness designation.

This alternative was dismissed from further review for the following reasons:

- This alternative would be technically and economically infeasible because of the length of span required.
- Installation of the bridge would require a substantial construction effort, including extensive helicopter use. This alternative would have greater adverse impacts on sensitive resources, including wilderness resources and values, than other viable alternatives.

Management Preferred Alternative

To identify the management preferred alternative, an interdisciplinary planning team of park specialists evaluated each alternative based on its ability to meet the project purpose and need (Table 1) and potential impacts on the environment (Table 2, Comparison of Alternatives and Environmental Consequences, and Table 3, Comparison of Alternatives and Effects on Federally Listed and Special Status Species). Alternatives 1 and 2 do not fully meet the project needs and objectives. While there may be some temporary and minor impacts to some wildlife species, Alternative 3 best meets the four project needs and objectives. Alternative 3 was, therefore, identified as the management preferred alternative.

Table 1: Comparison of Alternatives and Project Purpose and Need

Project Purpose and Need	Alternative 1 No Action	Alternative 2 Reroute to NLT	Alternative 3 Reroute to Higher Ground
Provide a trail that is less susceptible to damage from flooding and geologic hazards in the Carbon River Valley and is a safe visitor experience for users of the WT.	Does not meet needs Spur trail to the unimproved NLT would remain subject to flooding and would remain in a Case III Debris Flow Zone (1-100 year occurrence time interval).	Partially meets needs Reroute would provide a safer improved route, but spur trail would remain in floodplain and be subject to flooding; spur trail would also remain in a Case III Debris Flow Zone (1-100 year occurrence time interval).	Fully meets needs The new reroute would be above floodplain, offering a safe and reliable route for hikers. The rerouted trail would be in a Case I Debris Flow Zone (500-1000 year occurrence time interval).
Protect natural and cultural resources and minimize environmental impacts.	Partially meets Because there would be no new construction or trail-widening, some short-term impacts to natural resources would be avoided. However, emergency replacement of foot logs and re-delineation of the trail in the river bar after flood events may adversely affect bull trout/bull trout habitat because work might be done before August 6 and after August 31.	Partially meets Trail-widening would disturb 0.5 acre of soil/vegetation, but construction methods would avoid or minimize impacts to natural/cultural resources to the extent practicable. Emergency replacement of foot logs and re-delineation of the trail in the river bar after flood events may adversely affect bull trout/bull trout	Best meets The new reroute would be above the floodplain and would not be subject to flooding, reducing the need for future repairs and related impacts. The reroute would disturb 0.2 acre of soil and vegetation, and intermittent blasting would temporarily disturb wildlife in the area, but construction methods would avoid

	Alternative 1 would not fully protect cultural resources (a segment of the WT would be lost).	habitat because work might be done before August 6 and after August 31. Alternative 2 would not fully protect cultural resources (a segment of the WT would be lost).	or minimize impacts to natural/cultural resources to the extent practicable. Alternative 3 would retain 0.5 mile of undamaged WT, and the 0.28 mile reroute section would be just upslope of the original alignment.
Maintain historic alignment and character of the WT as closely as possible.	Does not meet Historical alignment would not be repaired and damaged segment of WT would continue to deteriorate. Section rerouted to the NLT would not meet WT standards.	Partially meets (adopts WT design characteristics) Historical alignment would not be repaired and damaged segment would continue to deteriorate. Section rerouted to the NLT would be upgraded to WT standards.	Fully meets (adopts WT design characteristics and remains close to original alignment) Damaged segment of WT would not be repaired but would closely parallel the historic alignment; would be constructed to WT standards.
Provide a sustainable trail to minimize annual maintenance.	Partially meets Spur trail would remain in floodplain and would likely require annual foot log replacements and re-delineation of trail through the river bar; however, an unimproved NLT would require little annual maintenance.	Partially meets Spur trail would remain in floodplain and would likely require annual foot log replacements and re-delineation of trail through the river bar; upgraded NLT would require minimal annual maintenance.	Fully meets Trail would be out of the floodplain and would require minimal annual maintenance.

Table 2: Comparison of Alternatives and Environmental Consequences

Impact Topic	Alternative 1 No Action	Alternative 2: Reroute Trail to NLT	Alternative 3 Reroute Trail to Higher Ground
Air Quality and Greenhouse Gas Emissions	There would be negligible to minor short-term impacts and no impairment of air quality under this alternative.	There would be short-term minor impacts to local air quality. There would be no impairment of air quality.	There would be short-term minor impacts to local air quality. There would be no impairment of air quality.
Geology and Exposure to Geologic Hazards	The trail and hikers would be exposed to geologic hazards, including Case III debris flows (1-100 year occurrence time interval). Exposure would be intermittent and limited to a relatively short stretch of trail. There would be no impairment as a result of geologic hazards. There would be no impairment of geology.	The trail and hikers would be exposed to geologic hazards, including Case III debris flows (1-100 year occurrence time interval). Exposure would be intermittent and limited to a relatively short stretch of trail. There would be no impairment as a result of geologic hazards. There would be no impairment of geology.	The trail and hikers would be out of the floodplain in the Case I Debris Flow Zone (500-1000 year occurrence time interval), reducing exposure to geologic hazards. There would be no impairment as a result of geologic hazards. There would be minor long-term adverse impacts on geology from blasting bedrock. There would be no impairment of geology.
Soil	There would be negligible long-term impacts to soil; there would be no impairment of soils.	There would be long-term minor and short-term moderate adverse impacts to 0.5 acre of soil. There would be no impairment of soils.	There would be long-term minor and short-term moderate adverse impacts to 0.2 acre soil. There would be no impairment of soils.
Vegetation	There would be localized negligible long-term and minor short-term impacts to vegetation from routine trail maintenance; there would be no impairment of vegetation.	There would be short-term moderate and long-term minor adverse impacts to 0.5 acre of vegetation. There would be no impairment of vegetation.	There would be short-term minor to moderate and long-term minor adverse impacts to 0.2 acre of vegetation. There would be no impairment of vegetation.
Water Resources	There would be negligible to minor impacts to water resources from annual	There would be minor impacts to water resources from widening of the trail	There would be short-term negligible to minor impacts on water resources from potential blasting debris/fly

Impact Topic	Alternative 1 No Action	Alternative 2: Reroute Trail to NLT	Alternative 3 Reroute Trail to Higher Ground
	replacements of foot logs and re-delineation of the trail through the river bar; there would be no impairment of water resources.	and from annual replacements of foot logs and re-delineation of the trail through the river bar; there would be no impairment of water resources.	rock. There would be no impairment of water resources.
Floodplain	A portion of the trail would remain in the floodplain. There would be minor impacts to floodplain functions, and trail infrastructure and hikers would be exposed to flood risks. There would be no impairment of floodplains.	A portion of the trail would remain in the floodplain. There would be minor impacts to floodplain functions, and trail infrastructure and hikers would be exposed to flood risks. There would be no impairment of floodplains.	There would be long-term beneficial minor impacts from rerouting the trail above the Carbon River floodplain, and short-term negligible impacts from fly rock created from blasting. There would be no impairment of the floodplain.
Wetlands	There would be negligible impacts on wetlands. There would be no impairment of wetlands.	There would be negligible impacts on wetlands. There would be no impairment of wetlands.	There would be negligible impacts on wetlands. There would be no impairment of wetlands.
Wildlife	There would be negligible to minor, short- and long-term, beneficial and adverse impacts on wildlife from increased human use of the NLT and decreased human use of the damaged section of the WT. There would be no impairment of wildlife resources.	There would be short-term moderate and long-term minor impacts on wildlife species. There would be no impairment of wildlife resources.	There would be short-term moderate and long-term minor impacts on wildlife species. There would be no impairment of wildlife resources.
Special Status Species	The alternative “may affect, is likely to adversely affect” bull trout and “may affect, but is not likely to adversely affect” 4 other federally listed species (assuming no	The alternative “may affect, is likely to adversely affect” bull trout and “may affect, but is not likely to adversely affect” 4 other federally listed species (assuming no	The project “may affect, but is not likely to adversely affect” 5 federally listed species. 12 state/federal species of concern may be affected, but are not likely to be adversely affected. Two bird species listed as

Impact Topic	Alternative 1 No Action	Alternative 2: Reroute Trail to NLT	Alternative 3 Reroute Trail to Higher Ground
	use of chain saws during early nesting period). Federal “species of concern” coastal cutthroat trout may be adversely affected and Coho salmon may be affected but is not likely to be adversely affected. There would be no impairment of sensitive and/or federally threatened and endangered species.	use of chain saws during early nesting season). 12 state or federal “species of concern” may be affected but are not likely to be adversely affected. One federal species of concern (coastal cutthroat trout) may be adversely affected. There would be no impairment of sensitive and/or federally threatened and endangered species.	“special concern” and two “special concern” bat species could be adversely affected. There would be no impairment of sensitive and/or federally listed threatened and endangered species.
Designated Critical Habitat	Periodic replacement of foot logs “may affect, is likely to adversely affect” bull trout critical habitat. There would be no impairment of designated critical habitat.	Periodic replacement of foot logs “may affect, is likely to adversely affect” bull trout critical habitat. There would be no impairment of designated critical habitat.	The reroute to higher ground “may affect, but is not likely to adversely affect” bull trout critical habitat. There would be no impairment of designated critical habitat.
Cultural Resources	About 0.8 miles of the historic WT would be abandoned. For the purposes of Section 106 of the National Historic Preservation Act, the determination of effect would be <i>no adverse effect</i> . There would be no impairment of cultural resources.	About 0.8 miles of the historic WT would be abandoned, and 0.7 miles of the NLT would be upgraded to WT standards. For the purposes of Section 106 of the National Historic Preservation Act, the determination of effect would be <i>no adverse effect</i> . There would be no impairment of cultural resources.	About 0.28 miles of the WT would be rerouted to higher ground. For the purposes of Section 106 of the National Historic Preservation Act, the determination of effect would be <i>no adverse effect</i> . There would be no impairment of cultural resources.
Wilderness	There would be negligible to minor impacts on wilderness	There would be long-term minor impacts and short-term	There would be long-term minor beneficial and minor adverse impacts and short-

Impact Topic	Alternative 1 No Action	Alternative 2: Reroute Trail to NLT	Alternative 3 Reroute Trail to Higher Ground
	from increased use of the NLT, annual trail maintenance activities, and loss of access when foot logs are washed out. There would be no impairment of wilderness resources and values.	moderate impacts on wilderness values. There would be no impairment of wilderness resources and values.	term moderate adverse impacts on wilderness values. There would be no impairment of wilderness resources and values.
Natural Soundscape	There would be negligible to minor impacts from trail use and maintenance. There would be no impairment of the natural soundscape.	There would be short-term minor to moderate impacts from trail work (including chain saw use), and there would be no impairment of the natural soundscape.	There would be short-term moderate impacts from blasting. There would be no impairment of the natural soundscape.
Visitor Use and Experience	There would be short- and long-term minor adverse impacts on visitor use and experience from abandonment of a section of the WT and loss of access to the Carbon Glacier area when foot logs are washed out.	There would be long-term minor beneficial impacts from having a trail to access Carbon Glacier. There would be short-term minor adverse impacts during construction and whenever foot logs are washed out.	There would be moderate long-term beneficial impacts from having a safe and stable trail to access Carbon Glacier. There would be short-term minor adverse impacts during construction.
Park Operations and Safety	There would be minor adverse short- and long-term impacts on park operations and safety from abandonment of a section of the WT and loss of access to the Carbon Glacier area when foot logs are washed out.	There would be minor long-term beneficial impacts from having a trail to access Carbon Glacier and short-term minor adverse impacts during construction and whenever foot logs are washed out.	There would be moderate long-term beneficial impacts from having a safe and stable trail to access Carbon Glacier. There would be short-term minor adverse impacts during construction.

Table 3:¹ Comparison of Alternatives and Effect Determinations for Federally Listed and Special Status Wildlife Species

Bold = Federally Listed Endangered, Threatened, or Proposed Species or Designated Critical Habitat
 NE = No Effect
 NLAA = May Affect, Not Likely to Adversely Affect
 LAA = May Affect, Likely to Adversely Affect

Wildlife Species	Alternative 1	Alternative 2	Alternative 3
Northern Spotted Owl	NLAA or LAA*	NLAA or LAA*	NLAA
Marbled Murrelet	NLAA or LAA*	NLAA or LAA*	NLAA
Bull Trout	LAA	LAA	NLAA
Bull Trout Critical Habitat	LAA	LAA	NLAA
Dolly Varden	NE	NE	NE
Chinook Salmon	NLAA	NLAA	NLAA
Steelhead	NLAA	NLAA	NLAA
Canada Lynx	NE	NE	NE
Grizzly Bear	NE	NE	NE
Gray Wolf	NE	NE	NE
Federal “Species of Concern” and/or State Listed Species			
Northern Goshawk	NE	NLAA	NLAA
Golden Eagle	NE	NE	NLAA
Peregrine Falcon	NE	NE	NLAA
Pileated Woodpecker	NE	NLAA	LAA
Olive-sided Flycatcher	NE	NLAA	LAA
Lewis’s Woodpecker	NE	NLAA	NLAA
Vaux’s Swift	NE	NE	NLAA
Long-eared Myotis	NE	NLAA	LAA
Long-legged Myotis	NE	NLAA	LAA
Pacific Townsend’s Big-eared Bat	NE	NLAA	NLAA
Cascades Frog	NE	NLAA	NLAA
Western Toad	NE	NLAA	NLAA
Larch Mountain Salamander	NE	NLAA	NLAA
Van Dyke’s Salamander	NE	NLAA	NLAA
Coho Salmon	NLAA	NLAA	NLAA
Coastal Cutthroat	LAA	LAA	NLAA

*If chain saws were determined to be the minimum tool required to remove downed trees during routine maintenance, and if the work could not be done before or after the early nesting period, the determination in this case would be “likely to adversely affect.”

¹ Species of concern that may be affected under one or more alternatives are listed in Table 3. Federally threatened, endangered, or proposed listed species are listed in Table 3 even if there would be “no effect” under all alternatives.

Environmentally Preferred Alternative

In accordance with NPS Director's Order 12, *Conservation Planning, Environmental Impact Analysis, and Decision-making*, the NPS is required to identify the "Environmentally Preferred Alternative" in environmental planning documents. The Environmentally Preferred Alternative is determined by applying the criteria suggested in the National Environmental Policy Act (NEPA) of 1969, which is guided by the Council on Environmental Quality (CEQ). The CEQ (46 FR 18026- 46 FR 18038) provides direction that "[t]he environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in NEPA's Section 101," which considers:

1. fulfilling the responsibilities of each generation as trustee of the environment for succeeding generations;
2. assuring for all generations safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
3. attaining the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
4. preserving important historic, cultural and natural aspects of our national heritage and maintaining, wherever possible, an environment that supports diversity and variety of individual choice;
5. achieving a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
6. enhancing the quality of renewable resources and approaching the maximum attainable recycling of depletable resources (NEPA Section 101(b)).

The Council on Environmental Quality states that the environmentally preferable alternative is "the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources (46 FR 18026 – 46 FR 18038)." According to NPS NEPA Handbook (DO-12), through identification of the Environmentally Preferred Alternative, the NPS decision-makers and the public are clearly faced with the relative merits of choices and must clearly state through the decision-making process the values and policies used in reaching final decisions.

The management preferred alternative, Alternative 3, is consistent with NEPA criteria 1 through 6, particularly over the long term. Of the three alternatives, Alternative 3 best meets the criteria for the environmentally preferred alternative over the long term. Although this alternative creates short-term noise impacts from blasting and short- and long-term local impacts to vegetation and soils in the footprint of the reroute, these impacts are not likely to adversely affect species or habitat on a larger scale. This alternative minimizes the need for future major repairs; provides long-term safe and reliable access because it removes the trail from the floodplain and does not rely on the foot log crossing of the flood-prone Carbon River; and best preserves the trail alignment and character of the historic Wonderland Trail. Under this alternative, the rerouted segment would be relatively short (0.28 mile), and the alignment of the trail would remain within or close to the historic corridor. New trail construction would disturb about 0.2 acre of soil and vegetation in habitat that is not suitable for spotted owl or marbled murrelet nesting. Trail maintenance impacts on natural resources would be minimized because of the sustainable trail design used, such that under normal circumstances, more extensive repair work on the rerouted section would only be required every ten years. Although there would be short-term impacts on wilderness resources and values and there may be short-term impacts on listed species, conservation measures are included in the project that would minimize, and possibly avoid, these effects (Table 3: Comparison of Effect Determinations; Appendix B: Resource Conservation Measures). Special concern species (e.g., birds and bats) may be disrupted by noise from blasting or

chain saws and from habitat fragmentation; however these impacts would be short-term or localized. On balance, Alternative 3, Reroute the Trail to Higher Ground, is the alternative which best meets the criteria for the environmentally preferred alternative because it provides long-term cultural and natural resource protection and preservation and long-term benefits to visitor experience.

Alternative 1 would avoid impacts associated with new trail construction in an undisturbed area. However, because keeping the spur trail open would be critical to maintaining Wonderland Trail access, trail workers would immediately need to repair the portion of trail within the river bar and replace the foot log(s) after each damaging high water event, events that occur up to four times per year. Although annual replacement of the foot logs and repair of the spur trail to the Northern Loop Trail would also occur under Alternative 3 (because the NLT is part of the existing trail system, not because it is a component of Alternative 3), Alternative 1 requires more frequent repairs and an immediate response time because hikers would not be able to use the trail on the west side of the river as an alternative after wash outs. Consequently, over the long term, Alternative 1 would result in greater adverse impacts to floodplains and bull trout streams (spawning and rearing habitat) than Alternative 3. In addition, although Alternative 1 provides a generally safe trail and achieves a balance between population and resource use, during trail outages, hikers could be left stranded, would face a long hike out, or would need to ford the Carbon River or travel cross country in steep, hazardous terrain. Alternative 1 would also fail to ensure the preservation of the characteristics and alignment of this section of the historic Wonderland Trail. Alternative 1 does not meet all the criteria for the environmentally preferred alternative because it fails to provide long-term cultural and natural resource protection and preservation and it incurs greater risks to visitor health and safety than Alternative 3.

Similar to Alternative 1, Alternative 2 would require frequent trail reconstruction within the river flood zone, potentially affecting floodplains and bull trout streams. Likewise, trail and foot log outages could leave hikers stranded and exposed to hazardous conditions. In addition, upgrading the Northern Loop Trail to the standards of the Wonderland Trail would disturb 0.5 acre of vegetation and soil (more than twice the acreage that would be disturbed under Alternative 3) in habitat suitable for spotted owl and marbled murrelet nesting. Alternative 2 would preserve the characteristics of the Wonderland Trail by upgrading the Northern Loop Trail to WT standards but would fail to preserve the original alignment of the WT. Alternative 1 does not meet all the criteria for the environmentally preferred alternative because it fails to provide long-term cultural and natural resource protection and preservation and it incurs greater risks to visitor health and safety than Alternative 3.

Resource Impact Topics Selected For Analysis

The resource impact topics listed in Tables 4 and 5 were selected for detailed analysis or eliminated from further analysis based on internal review and external scoping; federal laws, regulations, and executive orders; NPS *Management Policies* (2006); and site visits. The NPS selected specific issues for further analysis and eliminated others from evaluation. A brief description of each of the potential environmental issues and the rationale for retaining or dismissing the topic for further analysis is included here. Impact topics retained for further analysis are discussed more fully in Chapter 4, “Environmental Consequences of the Alternatives.”

Table 4: Selected Resource Impact Topics and Relevant Laws, Regulations, and Policies

Impact Topics	Reasons for Selecting Impact Topic	Relevant Laws, Regulations, and Policies
Air Quality and Greenhouse Gas Emissions	The alternatives may create short-term impacts to air quality and greenhouse gases from construction activities.	Clean Air Act of 1977 (as amended, Sec. 160-169); NPS Management Policies (2006)
Geology and Geologic Hazards	The WT is in a Geologic Hazard Zone.	NPS Management Policies (2006)
Soil and Vegetation	The proposed action alternatives would result in the removal or compaction of vegetation and soil. There is also the potential of introducing invasive non-native weeds.	NPS Organic Act; NPS Management Policies (2006); Resource Management Guideline (NPS-77); Federal Noxious Weed Control Act; Executive Order 13112: Invasive Species (1999)
Water Resources	The alternatives may affect water resources.	1972 Federal Water Pollution Control Act, as Amended by the 1977 Clean Water Act; NPS Management Policies (2006)
Wetlands and Floodplains	The alternatives may affect wetlands and floodplains.	Executive Order 11988: Floodplain Management and Executive Order 11990: Wetlands require analysis of impacts on floodplains and regulated wetlands
Wildlife and Habitat	Wildlife may be temporarily and/or permanently disturbed and habitat may be removed by the alternatives.	NPS Organic Act; NPS Mgt. Policies (2006); NPS-77; Migratory Bird Treaty Act
Special Status Species	Special status species may be impacted by the alternatives. The park would consult with the U.S. Fish & Wildlife Service & National Marine Fisheries Service as required under Section 7 of the Endangered Species Act.	Endangered Species Act; 16 USC 1535 Section 7(a)(2); NPS Management Policies (2006)
Designated Critical Habitat	Bull Trout Critical Habitat occurs in the vicinity of the project and may be affected by the alternatives.	Endangered Species Act; 16 USC 1535 Section 7(a)(2); NPS Management Policies (2006)
Cultural Resources	There is the potential for adverse and/or beneficial effects to cultural resources and a park district listed in the National Register of Historic Places.	NPS Management Policies (2006); Historic Sites Act of 1935; National Historic Preservation Act of 1966.
Ethnographic Resources	Mount Rainier National Park and the surrounding area have a long history	National Historic Preservation Act; DO 28: Cultural Resource

Impact Topics	Reasons for Selecting Impact Topic	Relevant Laws, Regulations, and Policies
	of use by prehistoric and contemporary Native American tribes affiliated with the park.	Management Guideline
Wilderness	The alternatives may impact wilderness values. All park management activities proposed within wilderness are subject to wilderness minimum requirement analysis and minimum tool justification.	The Wilderness Act of 1964; Director's Order #41: Wilderness Preservation And Management (1999); Management Policies (2006)
Soundscapes	Construction activities would impact the ambient soundscape.	NPS Management Policies (2006); Sound Preservation and Noise Management (DO 47)
Visitor Use and Experience	The alternatives may temporarily impact visitor use and experience in the Carbon Glacier area. Visitors may experience some temporary trail closure during construction and construction noise.	NPS Management Policies (2006)
Park Operations and Safety	The alternatives would affect park operations in both the short and long term by affecting access to the Carbon Glacier area.	NPS Management Policies (2006)

Table 5: Dismissed Impact Topics and Relevant Laws, Regulations, and Policies

Impact Topics	Topics Dismissed from Further Review	Laws, Regulations, and Policies
Environmental Justice	None of the alternatives would affect socially or economically disadvantaged populations.	Executive Order 12898
Socioeconomics	The local and regional economy and most business of the communities surrounding the park are based on tourism and resource use. There would be no measurable effects to regional or gateway community economies, or changes in visitor attendance or visitor spending patterns as a result of the implementation of any of the alternatives.	NPS Management Policies (2006)
Prime and Unique Farmland	No unique agricultural soils exist in this area due to the steep, mountainous terrain and high elevations.	In 1980, the Council on Environmental Quality directed federal agencies to

		<p>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.</p>
Energy Consumption	<p>The alternatives would not cause measurable impacts of overall consumption of electricity, propane, wood, fuel oil, gas or diesel associated with visitation or for park operations and maintenance.</p>	<p>NPS Management Policies (2006)</p>

Chapter 3: Affected Environment

This section describes the current condition of the resources which would be affected if any of the alternatives were implemented. More detailed information on resources in Mount Rainier National Park may be found in the *Mount Rainier National Park General Management Plan* and *Environmental Impact Statement* (NPS 2002). The *Natural and Cultural Resources Management Plan* (1993), the *Wilderness Management Plan* (1989), and the *Fire Management Plan* (2004) also provide additional resource information.

Air Quality

Mount Rainier National Park is designated one of fourteen National Park Service Class I areas under the Interagency Monitoring of Protected Visual Environments (IMPROVE) program. Class I areas are afforded the highest degree of protection under the Clean Air Act (1977). Any potential impacts to Class I areas are considered detrimental. National Park Service air quality resource management efforts are directed at controlling, mitigating, or eliminating adverse alteration of air quality by anthropogenic (human-caused) sources.

Air quality information within the park has been collected at Tahoma Woods since 1988 and at Paradise since 1999. Although these stations are on the south side of the park, they give an indication of the general air quality associated with the park. Light scattering (due to airborne particulates) information is collected by nephelometers at Tahoma Woods. The Tahoma Woods IMPROVE site also measures particulates in various sizes, as well as hydrogen, sodium, lead, nitrate, organic and elemental carbon, and sulfate concentrations. Ozone has been monitored for the past several years at Tahoma Woods and Paradise.

In contrast to the surrounding Seattle-Tacoma metropolitan area, air quality within the park is usually good to excellent. However, high ozone levels and atmospheric deposition of sulfur, nitrogen, and air toxics have been documented within the park. The Puget Sound region has experienced rapid growth over the last 20 years and this trend is expected to continue. Pollutants of most concern to park air quality related values (AQRVs) include fine particles, sulfate, nitrate, ozone, mercury, and pesticides. AQRVs include visibility, aquatic and terrestrial ecosystems, and their components, functions, and processes. Air quality in the park plays a vital role in visitor enjoyment and in ecosystem health. Activities such as campfires and the operation of vehicles and equipment cause air quality degradation, although stationary and mobile (automobile) emissions from the Puget Sound region and areas north and south of the park are the major sources of air pollution near Mount Rainier.

Geology/Geologic Hazards

Mount Rainier has an extensive geologic and historic record of activity, including lava flows, ash eruptions, avalanches, and debris flows. The threat of debris flows is particularly acute due to the weakened array of rocks altered by hot acidic waters within the volcano and the presence of an extensive glacial cap. Earthquakes, although they may also be associated with periodic volcanic activity, are also a threat in and of themselves. Many of the park's developed sites are located on debris flow deposits in valley bottoms, and 7 of 23 developed sites in the park are in a debris flow hazard zone with an estimated recurrence interval of less than 100 years (Scott et al. 1992; Hoblitt et al. 1995). Other potential hazards include pyroclastic flows, ash fall, and lava flows, avalanches, rock falls, debris flows, and landslides.

Approximately 25.1 billion cubic feet of ice and snow are contained within the Carbon River watershed (Driedger and Kennard 1984). Although the potential for a volcanic eruption-related event exists, the greater likelihood in this area is from non-eruptive events, including additional rockfalls, avalanches, glacial outburst floods and debris flows (Driedger and Kennard 1984). Debris flows, in terms of the potential effects and probability of occurrence, constitute the greatest volcanic hazard in the Cascade Range (Hoblitt et al. 1995). Debris flows consist of slurries of water and sediment (60 percent or more by volume) that look and behave much like flowing concrete. Debris flows are sometimes called mudflows or, when they originate on volcanoes, lahars (Hoblitt et al. 1995). On Mount Rainier, debris flows have been broken down into 4 categories depending on their predicted frequency (Hoblitt et al. 1998):

1. Case I debris flows are defined as areas that could be affected by cohesive debris flows that originate as enormous avalanches of weak, chemically altered rock from the volcano. The average time interval between Case I debris flows is about 500 to 1000 years.
2. Case II debris flows are defined as areas that could be affected by relatively large non-cohesive debris flows. The average time interval between Case II debris flows is about 100 to 500 years.
3. Case III debris flows are defined as areas that could be affected by moderately large debris avalanches or small non-cohesive debris flows of non-eruptive origin. The average time interval between Case III debris flows is about 1 to 100 years.
4. Case M is the maximum lahar hazard zone equivalent to the Osceola Mudflow event 5000 years ago.

The current location of the damaged section of the WT in the Carbon River Valley is in a Case III Debris Flow Zone. The spur trail connecting the WT to the NLT at the lower Carbon River crossing (foot log crossing) is also in a Case III Debris Flow Zone and would be part of the designated route under Alternatives 1 and 2. The proposed trail reroute under Alternative 3 would be in a Case I Debris Flow Zone.

Soils

The park contains areas of high elevation solid rock and talus slopes with virtually no soil to low elevation glacial valleys with well-developed organic soils. Hobson (1976) classified park soils into four types as follows: tephra soils (pyroclastic deposits identified by individual ash layers); colluvial soils (coarse, unconsolidated soils of mixed parent materials); alluvial soils (river or glacially deposited soils); and mudflow soils (surface or subsurface parent materials resulting from volcanic mudflows).

The soils within the proposed WT Alternative 3 reroute are silty loams on top of a sandy debris flow. The soils have low clay content and do not erode easily. There are stretches of the proposed reroute that are covered with scree. Approximately 500 feet of the reroute is exposed bedrock with little or no soil. Under Hobson's classification system above, soil types for both Alternatives 1 and 2 include alluvial soils (river or glacially deposited soils) since both alternatives propose using a spur trail with foot logs across the Carbon River floodplain to connect with the NLT.

Vegetation

Three broad vegetation types are represented in MORA: coniferous forest (1,500-5,000 feet elevation); subalpine parkland (5,000-7,000 feet); and alpine (generally above 7,000 feet, where the ground is not covered by ice and snow). Ice, permanent snowfields, rock, and bare ground make up park areas not covered by vegetation.

The WT in the Carbon Glacier area is within the coniferous forest zone. It is characterized by mixed forests of western red-cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), Pacific silver fir (*Abies amabilis*), Douglas-fir (*Pseudotsuga menziesii*), Alaska yellow-cedar (*Chamaecyparis nootkatensis*), and noble fir (*Abies procera*). This vegetation association is the most extensive type in MORA. Mature forests of this type occupy areas lacking extremes of temperature and moisture.

Common understory shrubs include vine maple (*Acer circinatum*), Sitka alder (*Alnus sinuata*), Sitka mountain ash (*Sorbus sitchensis*), devil's club (*Oplopanax horridus*), and Cascade bilberry (*Vaccinium deliciosum*).

Common forbs include vanilla leaf (*Achlys triphylla*), twin flower (*Linnaea borealis*), trillium (*Trillium ovatum*), bead lily (*Clintonia uniflora*), pipsissewa (*Chimaphila umbellata*), little prince's pine (*Chimaphila menziesii*), Cascade penstemon (*Penstemon serrulatus*), bear grass (*Xerophyllum tenax*), piggyback plant (*Tolmiea menziesii*), heartleaf arnica (*Arnica cordifolia*), starflower (*Trientalis borealis*), and western columbine (*Aquilegia formosa*).

Common ferns include sword fern (*Polystichum munitum*), deer fern (*Blechnum spicant*), bracken fern (*Pteridium aquilinum*), and lady fern (*Athyrium filix-femina*). A wide variety of mosses and liverworts are found in this zone, particularly in wet areas.

Water Resources

Mount Rainier National Park contains nine major rivers, 132,630 acres of forested hills and valleys, 75,845 acres of subalpine and alpine meadows, 25 named glaciers, and the highest volcanic peak in the Cascade Range. At 14,410 feet, Mount Rainier rises 7,000 feet above the lower Cascades. From Mount Rainier's summit, the Carbon Glacier descends over 8,000 feet to the headwaters of the Carbon River at 3,600 feet. The Carbon River emanates from the Carbon Glacier and flows west out of the park to the Puget Sound. The 26,320-acre Carbon River watershed is bound by Chenius Mountain on the north, Curtis Ridge on the east, and Ptarmigan Ridge on the south.

The existing section of the WT parallels the Carbon River. The WT in the damaged area does not cross any permanent side streams but does cross an intermittent stream about 0.3 miles up from the damaged section.

Water Quality

Because the natural landscape of Mount Rainier creates the headwaters for nine major rivers originating from rain, snow, and glacial meltwater, there are few existing impacts to park water quality. Some park rivers are being considered for Outstanding Natural Resources Waters classification under state implementation of the Clean Water Act. A changeover from pit toilets to composting toilets placed in backcountry areas has improved the quality of locally affected water resources within the park. The Dick Creek and Cataract Creek backcountry campsites have composting toilets. The Carbon River backcountry campsite still has a pit toilet. Like other park rivers, water quality within the Carbon River is very good, supports a diverse array of aquatic life, and exceeds the standards established for Washington State.

Wetlands and Floodplains

The park contains three major types of wetlands: Riverine (or Riparian), Lacustrine, and Palustrine. Riverine (Riparian) is the wetland type found within the project area and consists of the Carbon River corridor and adjacent floodplain. This wetland type is strongly influenced by flooding and seasonal runoff patterns. When inundated, wetlands in the Carbon River floodplain may provide habitat for

riparian water-tolerant plants such as devil's club, salmonberry, black cottonwood, western red-cedar, red alder, western hemlock, silver fir (climax species), and aquatic animals such as cascades and tailed frogs, and Van Dyke's and Larch mountain salamanders. The damaged trail section and spur trail described in Alternatives 1 and 2 are located within the Carbon River floodplain. The reroute proposed in Alternative 3 is above the floodplain and avoids wetland communities.

Wildlife

A variety of wildlife has been observed throughout the forest adjacent to the Carbon River area. Sixty species of mammals are known to inhabit MORA. Along the WT near the Carbon Glacier, small mammals include the deer mouse (*Peromyscus maniculatus*), Douglas squirrel (*Tamiasciurus douglasii*), and pika (*Ochotona princeps*). In addition, a number of bats are expected to occur in the project area, including long-eared myotis (*Myotis evotis*) and the state and federally sensitive Townsend's big-eared bat (*Plecotus townsendii townsendii*). Small and medium-sized carnivores that may occur in the area are long-tailed weasel (*Mustela frenata*), pine marten (*Martes americana*), raccoons (*Procyon lotor*), bobcat (*Lynx rufus*), and coyote (*Canis latrans*). Large mammals include the black bear (*Ursus americanus*), black-tailed deer (*Odocoileus hemionus columbianus*), and mountain lion (*Felis concolor*).

There are over 229 species of birds listed for the park, with approximately 80 of these known to nest in the park (Checklist of the Birds of MORA 1995). In the project area, raptors include the northern goshawk (*Accipiter gentilis*), northern saw-whet owl (*Aegolius acadicus*), and barred owl (*Strix varia*). Other bird species observed in the project area include raven (*Corvus corax*), gray jay (*Perisoreus canadensis*), Clark's nutcracker (*Nucifraga columbiana*), winter wren (*Troglodytes troglodytes*), chestnut-backed chickadees (*Parus rufescens*), varied thrush (*Ixoreus naevius*), Oregon junco (*Junco hyemalis*), and hermit thrush (*Catharus guttatus*).

Fourteen native species/subspecies of fish occur in park streams. These include rainbow trout/steelhead (*Oncorhynchus mykiss*), coastal cutthroat trout (*Oncorhynchus clarki*), Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*Oncorhynchus kisutch*), bull trout (*Salvelinus confluentus*), and sculpin (*Cottus* sp.). Likely habitat for Chinook salmon includes the Carbon, White, Mowich, and Puyallup Rivers, the West Fork of the White River, and Huckleberry Creek. In the past, Chinook salmon have been documented in the Carbon River just outside the park boundary (D. Nauer, Washington Dept. of Fish and Wildlife, pers. comm.) and in the White River tributaries within the park, near the boundary. Bull trout are present in the White, West Fork, Carbon, and Puyallup Rivers and their tributaries. Coho were historically found in the White, Carbon, North and South Puyallup, and Mowich rivers. Recent surveys have documented their presence in two tributaries (June Creek in the Carbon River and Sunrise creek in the White River).

Approximately 13 species of amphibians occur in the park. Amphibians that may be found in the project area include the northwestern salamander (*Ambystoma gracile*), long-toed salamander (*Ambystoma macrodactylum*), Larch mountain salamander (*Plethodon larselli*), Van Dyke's salamander (*Plethodon vandykei*), Pacific giant salamander (*Dicamptodon tenabrosus*), Ensatina salamander (*Ensatina eschscholtzii*), western redback salamander (*Plethodon vehiculum*), tailed frog (*Ascaphus truei*), Cascades frog (*Rana cascadae*), red-legged frog (*Rana aurora*), Pacific treefrog (*Hyla regilla*), and western toad (*Bufo boreas*).

Special Status Wildlife Species and Critical Habitat

Consultation with the U.S. Fish and Wildlife Service on the presence of rare, threatened, and endangered species that could occur in the project area is ongoing. The following wildlife species may

occur in the project area and are federal and/or state listed or proposed as threatened, endangered, sensitive, or species of concern. See also the summary of state and federal wildlife species listed as endangered, threatened, proposed, candidate, or species of concern in Table 6 following this section.

Northern Spotted Owl

The northern spotted owl is an uncommon year-round resident of the park (breeding between March and September). No critical habitat has been formally designated within MORA, although approximately 82,000 acres of the park contain suitable-to-high-quality northern spotted owl habitat. The draft recovery plan for northern spotted owls listed a number of threats to the population including low and declining populations, limited and declining habitat, poor habitat distribution, and predation.

Prior to 1997, the extent of northern spotted owl surveys at MORA was limited, with less than 25 percent of potentially suitable owl habitat examined. Only those surveys conducted after 1994 were done according to accepted protocols most recently outlined by Franklin et al. (1996) and Forsman (1995). The most comprehensive inventory, when much of the park's suitable habitat was surveyed, was performed in 1997 and 1998. This inventory substantially improved the understanding of the distribution and reproductive status of the northern spotted owl in the park. The majority of the park, including the area of the project, has been surveyed for spotted owls as part of a long-term demography study. Northern spotted owls are found up to 4,500 feet in elevation in the park (note: the 82,000 acres of suitable habitat includes areas up to 4,800 feet that are potential northern spotted owl habitat if there is pressure to escape barred owl invasions). Thirty-two known activity centers have been documented within the park since monitoring began in 1983. These activity centers are distributed throughout the suitable habitat in the park. In 2006, 12 of the 32 sites were known to be occupied by spotted owl pairs and 5 by single spotted owls. Of the 12 pairs, 8 attempted to nest and 6 successfully fledged 11 young (Myers and Schaberl 2007). In 2007 no nesting activity was observed in any of the park activity centers.

Mount Rainier National Park northern spotted owl habitat constitutes approximately 40 percent of the *Rainier Demographic Study Area*, one of the 14 areas monitored throughout the range of the northern spotted owl. The latest meta-analysis (modeling) by Anthony et al. (2004) indicates that the Rainier Demographic Study Area population is undergoing nearly an 11 percent annual decline.

A northern spotted owl territory center occurs approximately 0.5 mile from the damaged WT segment and is about 0.2 mile from the NLT. Annual demographic surveys at the activity site have detected spotted owls in the territory for several years, and nesting occurred in 2004, producing two chicks. No evidence of nesting was detected in 2007. The entire project falls within the one mile disturbance buffer established for spotted owl territories.

Marbled Murrelet

The threatened status of the marbled murrelet is thought to be principally due to a loss of nesting habitat from commercial timber harvesting. Forest fragmentation also may be making nests near forest edges vulnerable to predation by other birds, such as jays, crows, ravens, and great horned owls. In addition, increased human activities in forests, such as picnic grounds, can attract corvids and thus increase the chances of predation (Nelson 1997).

At MORA, marbled murrelet presence is documented within four river corridors: the Carbon, Mowich, Puyallup, and Nisqually rivers. Occupied behavior detections have been documented at all of these locations except the Nisqually River. Because of the occupied behavior detections, it is assumed that murrelets are nesting within the Carbon, Mowich, and Puyallup River corridors below 3,800 feet.

However, because of the difficulty of detecting marbled murrelet nests, no active nests have been located within the park.

Approximately 25,300 acres of forested area is defined as suitable murrelet nesting habitat, which constitutes 11 percent of the park. Marbled murrelets nest in forested areas up to more than 55 miles from their saltwater foraging areas. Nest trees need to be in a stand that is open enough for marbled murrelets to fly through, yet the canopy must have enough cover to hide the nests from predators. Typically such conditions have only been found in old growth or later seral stands; however, some younger stands with a high degree of structural diversity and limb-mistletoe infestations may also be suitable (Nelson 1997). High quality habitat is distributed along the western boundary of the park in valleys running east and west separated by high elevation ridges. Of the 25,300 acres, 8,780 acres of relatively contiguous occupied habitat are in the watersheds of the Carbon, Mowich, and Puyallup Rivers within the park boundary. Critical habitat for the species has been designated within Lewis and Pierce Counties, but the designation does not include MORA because lands within the park are presumed to be protected.

While the forest within 45 yards of the damaged area of the WT is not considered suitable marbled murrelet nesting habitat (the area is close to the forest edge and the trees are of relatively small diameter and do not have suitable platforms for nests), there are approximately 600 acres of suitable nesting habitat within one mile of the damaged section of the WT. Approximately 33 acres of nesting habitat is within 45 yards of the NLT trail maintenance/construction actions proposed under Alternatives 1 and 2. There is no nesting habitat within 45 yards of the actions proposed under Alternative 3.

Gray Wolf

There have been no detections of gray wolves in the Carbon River area within the last few decades. No systematic studies of wolf habitat in the park have recently been conducted, however. Gray wolves are wide ranging carnivores that inhabit forests and tundra. They were eliminated from Washington by the early 20th century but now appear to be naturally recolonizing some areas from Canada. Gray wolves were historically found in the park. Numerous observations were recorded from the late 1800s through 1920s (Taylor and Shaw 1927). Although numerous observations have occurred in the park in the last 20 years, none have been confirmed by biologists. Semi-domesticated hybrid wolf-dogs were documented in the eastern portions of the park during the 1990s. These animals were subsequently apparently removed (on adjacent lands) by Washington Department of Fish and Wildlife.

Canada Lynx

Although the area around the damaged section of the WT is suitable habitat for Canada lynx, lynx were last documented in the park in 1934. The distribution and abundance of lynx tends to be tied to that of its primary prey, the snowshoe hare. Canada lynx probably never have been consistently abundant in most of the contiguous 48 states because of a lack of lynx and snowshoe hare habitat. Their numbers have declined due to over-trapping and from a loss of forest habitat caused by development and urbanization, forest fire suppression, and unsuitable types of forest management. Bobcats and coyotes also have spread into lynx habitat. Biologists suspect that packed snow trails created by recreational activities may allow bobcats and coyotes to compete with lynx for food and space.

Grizzly Bear

The area around the damaged section of the WT is suitable habitat for grizzly bear. The park contains suitable grizzly bear habitat, but there have never been confirmed sightings of grizzlies in the park.

However, grizzly bear tracks were identified near the west boundary of the park in 1993, approximately 20 miles from the project site.

Fisher

The area around the damaged section of the WT is suitable habitat for fisher. Fishers have declined throughout their range and may be on the verge of extinction in Washington State. Fishers were last documented in the park in 1947, with more recent unconfirmed observations in the 1990s. A state reintroduction program is in progress, including Olympic National Park, with potential release sites likely to include MORA in future years.

Puget Sound Chinook

The Carbon River is now the only river in the park without a dam blocking anadromous fish passage. Park biologists have documented the presence of this species in the White River inside the park boundary (MORA 2001 unpublished data). However, due to the difficulties in surveying large glacial rivers, surveys for Chinook salmon have been limited. The Carbon River Chinook runs, if present, would occur during the summer and fall.

Chinook use a variety of freshwater habitats, but it is more common to see them spawn in larger main stem rivers or tributaries. In Mount Rainier, habitat for Chinook salmon includes the Carbon, White, Mowich, and Puyallup Rivers, the West Fork of the White River, and Huckleberry Creek.

The Puget Sound Chinook salmon Ecological Significant Unit (ESU) was listed as threatened on May 24, 1999 (NMFS 1999). The ESU includes all naturally spawned populations of Chinook salmon from rivers and streams flowing into Puget Sound. Based on available information, NMFS concluded that Chinook salmon in the Puget Sound ESU are not presently in danger of extinction, but they are “likely to become endangered in the foreseeable future.” Therefore, NMFS determined that Puget Sound Chinook salmon warrant listing as a threatened species under the ESA. There is no reliable historical source of information on salmonid species abundance in the Puyallup River basin. Historically, runs of Chinook (fall and spring stocks), were present in the Puyallup River system September through October, mostly in South Prairie Creek. Some Chinook ascend the diversion dam when passage conditions in the canyon are favorable, but most are blocked at the diversion. Spring Chinook have been reported below the diversion (USDA 1995).

Bull Trout

Anadromous and fluvial/resident trout have been documented within the park in the Carbon River drainage. Bull trout were detected in the Carbon River below Ipsut Creek in 2007. Surveys have not been conducted in the area of the Carbon River adjacent to the project site, but bull trout have been documented in Cataract Creek, which is located about a half mile up river of the project site. Historically, bull trout were found in most major river systems in the Pacific Northwest. In Mount Rainier, bull trout are present in the White, West Fork, Carbon, Mowich, and Puyallup rivers and their tributaries.

Bull trout in the park are within the Puget Sound Management Unit, one of two management units comprising the Coastal–Puget Sound distinct population segment (DPS) of bull trout. The Puget Sound Management Unit consists of eight core areas. Core areas consist of habitat that could supply all the necessary elements for every life-stage of bull trout (e.g., spawning, rearing, migration, overwintering, foraging) and have one or more local populations of bull trout. The park is within the Puyallup core area.

The Puyallup core area contains the southernmost population of bull trout in the Puget Sound Management Unit. This core area is critical to maintaining the overall distribution of migratory bull trout within the Puget Sound DPS, since it is the only anadromous bull trout population in south Puget Sound. The Puyallup core area consists of several major watersheds draining the north and west sides of the park. Glacial sources significantly influence both water and substrate conditions in the mainstem reaches of this drainage.

At least five local populations have currently been identified for this core area. These are the Upper Puyallup and Mowich Rivers, Carbon River, upper White River, West Fork White River, and Greenwater River. Recent DNA analysis suggests the White River and West Fork populations are similar while the Carbon River population is unique (Samora, pers. comm.). The individual status of each of these local populations within the White River system is currently unknown; however, based on trap counts at the Puget Sound Energy dam, the number of adult migratory bull trout transferred upstream into the White River system is known. These records show that numbers of bull trout trapped ranged from a low of 5 fish in 1992 to a high of 48 fish in 2000. The average for the years from 1990 to 2002 is 26 fish.

Spawning occurs in the Carbon River in the upper reaches of this basin, including areas inside the park boundaries, where higher elevations produce the cool temperatures required by bull trout. Based on current survey data, bull trout spawning in the Puyallup core area appears to occur earlier (September) than what has typically been observed within other Puget Sound core areas (Marks et al. 2002).

Rearing is believed to occur throughout the upper Puyallup, Mowich, Carbon, upper White, West Fork White, and Greenwater rivers; however, sampling indicates that a majority of the rearing is confined to the upper reaches of the basin including the park. Primary foraging, migration, and overwintering habitat for migratory bull trout within the core area is in the mainstem reaches of the White, Carbon, and Puyallup Rivers.

Many of the headwater reaches of the basin are either within the park or in other designated wilderness, providing pristine habitat conditions. However, a majority of the basin outside of the park has been significantly altered by a variety of factors including extensive timber harvest and associated road construction; conversion of landscape to residential, commercial, and agricultural use; substantial channelization of lower mainstem reaches; and total commercial development of the estuarine habitat. These factors have undoubtedly reduced the overall productivity of bull trout populations in the basin.

Bull Trout Critical Habitat

The damaged area of the WT is approximately one-half-mile upstream of bull trout critical habitat; however, the river provides spawning habitat upstream to its headwaters at the Carbon Glacier. The following tributaries provide spawning and rearing habitat for the Carbon River local population from their mouths upstream to a natural barrier or headwaters: Ranger Creek, Falls Creek, Chenuis Creek, Ipsut Creek, Spukwash Creek, and Cataract Creek.

The specific biological and physical features (primary constituent elements) that comprise bull trout habitat are based on the essential biological requirements of the species. These primary constituent elements are: (1) permanent water having low levels of contaminants such that normal reproduction, growth, and survival are not inhibited; (2) water temperatures ranging from 36 to 59 °F, with adequate thermal refugia available for temperatures at the upper end of this range (specific temperatures within this range will vary depending on bull trout life history stage and for geography, elevation, diurnal and seasonal variation, shade—such as that provided by riparian habitat—and local groundwater influence);

(3) complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and in-stream structures; (4) substrates of sufficient amount, size, and decomposition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival (a minimal amount of fine substrate less than 0.25 inch in diameter and minimal substrate embeddedness are characteristic of these conditions); (5) a natural hydrograph, including peak, high, low, and base flows within historic ranges or, if regulated, a hydrograph that demonstrates the ability to support bull trout populations; (6) springs, seeps, groundwater sources, and subsurface connectivity to contribute to water quality and quantity; (7) migratory corridors with minimal physical, biological, or chemical barriers between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows; (8) an abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish; and (9) few or no predatory, interbreeding, or competitive non-native species present.

Critical habitat within the park is located within the Puget Sound Critical Habitat Unit and the Puyallup core area. The Puyallup core area is located on the western slopes of the Cascade Mountains. The Puyallup River System is fed primarily by the glaciers of Mount Rainier and flows west discharging into Puget Sound at Commencement Bay adjacent to the city of Tacoma. The Puyallup River and its two major tributary systems, the White River and Carbon River, are the associated tributaries within the park accessible to bull trout. There are approximately 47 miles of bull trout critical habitat within the park.

Puget Sound Steelhead

Puget Sound Steelhead was listed as threatened on May 14, 2007. The Carbon River is now the only river in the park without a dam blocking anadromous fish passage. Spawning surveys conducted by park staff have not detected steelhead. However, few surveys have been conducted in the park specifically to detect steelhead. The Carbon River steelhead runs, if present, would occur during the summer and winter.

There is no reliable historical source of information on salmonid species abundance in the Puyallup River basin of record. Historically, runs of steelhead (summer and winter stocks) were present in the Puyallup River system. The major run of steelhead in the Puyallup/White River system is a winter run. The winter runs of steelhead begin their upstream migration in the Puyallup/White River in November, with a peak of the run in mid-December. Most fish start migrating towards the upper reaches in March and continue through June, with the peak in April. There are a few summer-run strays caught in the lower Puyallup in August and September. A small population of native spawners still returns to the White River (USDA 1995). Steelheads out-migrate one year later in April/May coinciding with the natural spring run-off pattern of Mount Rainier. Steelhead redds are found in the lower White River outside of the park. It is unknown whether steelheads spawn in the park.

Table 6: Special Status Wildlife Species

<p>FT = Federally Threatened FE = Federally Endangered FPROP = Federally Proposed FC = Federal Candidate FSC = Federal Species of Concern NS = No Status</p> <p>ST = Washington State Threatened SE = Washington State Endangered SS = Washington State Sensitive SC = Washington State Species of Concern SM=Washington State Monitor</p>			
Wildlife Species	Federal Status	State Status	Occurrence and Habitat Needs
Northern Spotted Owl <i>Strix occidentalis caurina</i>	FT	SE	See detailed information above.
Marbled Murrelet <i>Brachyramphus marmoratus marmoratus</i>	FT	ST	See detailed information above.
Bald Eagle <i>Haliaeetus leucocephalus</i>	FSC	ST	Bald eagles migrate through and sometimes forage in the park. There is no known habitat within the project area.
Golden Eagle <i>Aquila chrysaetos</i>	NS	SC	Golden eagles have been seen in the park in suitable habitat. They may nest in the park.
Merlin <i>Falco columbarius</i>	NS	SC	Merlins are rare park visitors to subalpine areas. No known nesting occurs.
Northern Goshawk <i>Accipiter gentilis</i>	FSC	SC	Goshawks nest in trees in mature or old growth coniferous forests. They occur in the park.
Peregrine Falcon <i>Falco peregrinus</i>	FSC	SS	Peregrines nest primarily on cliffs. Peregrines nest near the southwest corner of the park. There is nesting habitat surrounding/above the project area, and no known nesting habitat immediately adjacent to the project area. Surveys have not been conducted in the vicinity of the project area.
Pileated Woodpecker <i>Dryocopus pileatus</i>	NS	SC	Pileated woodpeckers are relatively common in low elevation forest.
Olive-sided Flycatcher <i>Contopus cooperi</i>	FSC	NS	This flycatcher breeds in the park and prefers forest edges adjacent to open areas.
Lewis's Woodpecker <i>Melanerpes lewis</i>	NS	SC	This woodpecker has been observed in the park.

Wildlife Species	Federal Status	State Status	Occurrence and Habitat Needs
Black-backed Woodpecker <i>Picoides arcticus</i>	NS	SC	This woodpecker has been observed in the park.
Vaux's Swift <i>Chaetura vauxi</i>	NS	SC	They are common in forested areas and may nest in the park.
Gray Wolf <i>Canis lupus</i>	FE	SE	See detailed information above.
Canada Lynx <i>Lynx canadensis</i>	FT	ST	See detailed information above.
Grizzly Bear <i>Ursus arctos</i>	FT	SE	See detailed information above.
California Wolverine <i>Gulo gulo luteus</i>	FSC	SC	They inhabit high elevation coniferous forests and subalpine areas. They were last documented in the park in 1933.
Fisher <i>Martes pennanti</i>	FC	SE	See detailed information above.
Long-eared Myotis <i>Myotis evotis</i>	FSC	SM	They inhabit forests and chaparral. A nursing colony occurs near Longmire.
Long-legged Myotis <i>Myotis volans</i>	FSC	SM	They forage over ponds, streams, open meadows and forest edges and roost in caves or mines. They occur in the park.
Pacific Townsend's Big-eared Bat <i>Plecotus townsendii townsendii</i>	FSC	SC	Big-eared bats hibernate in caves and use caves and abandoned buildings for breeding and roosting. Nursery colonies are extremely sensitive to human activity.
Chinook Salmon <i>Oncorhynchus tshawytscha</i> (Puget Sound ESU)	FT	SC	See detailed information above.
Bull Trout <i>Salvelinus confluentus</i>	FT	SC	See detailed information above.
Dolly Varden <i>Salvelinus malma</i>	FPROP	SC	Dolly Varden is proposed under the similarity of appearance provision of the Endangered Species Act. Recent DNA analysis conducted on native char collected in the park suggest that only Bull Trout are present in park streams today.
Coho Salmon <i>Oncorhynchus kisutch</i>	FSC	NS	Coho were historically found in the White, Carbon, Mowich and North and South Puyallup rivers. It is likely that they are present in small numbers in these rivers; however

Wildlife Species	Federal Status	State Status	Occurrence and Habitat Needs
			no surveys have confirmed this.
Coastal Cutthroat Trout <i>Oncorhynchus clarki clarki</i>	FSC	NS	Native Coastal cutthroat occur in the park throughout several drainages.
Steelhead <i>Oncorhynchus mykiss</i>	FT	SC	See detailed information above.
Cascades Frog <i>Rana cascadae</i>	FSC	SM	Cascades frogs occur in mountainous areas, marshes, ponds and small streams. They are found throughout the park.
Western Toad <i>Bufo boreas</i>	FSC	SC	Formerly more abundant in the park; recently found only in and around a few lakes and wetlands.
Tailed Frog <i>Ascaphus Truei</i>	FSC	SM	Tailed frogs are found in fast flowing streams throughout the park.
Cascade Torrent Salamander <i>Rhyacotriton cascadae</i>	NS	SC	This species occurs adjacent to the park and has been documented in the park.
Larch Mountain Salamander <i>Plethodon larselli</i>	FSC	SS	This species is found in forested and talus environments in cool, moist conditions under wood or rock. They have been found in several locations in the park.
Van Dyke's Salamander <i>Plethodon vandykei</i>	FSC	SC	This species is found in streambanks, upland forests, talus areas and seeps. They have been documented in the park.
California Floater Mussel <i>Anodonta californiensis</i>	FSC	SC	This freshwater mollusk inhabits permanent waters of all sizes. This species has been documented in the park.
Fender's Soliperlan Stonefly <i>Soliperlan fenderi</i>	FSC	NS	This species has been documented in the Carbon River valley.

Special Status Plants

The U.S. Fish and Wildlife Service designates rare plant species as endangered, threatened, or species of concern based on their degree of scarcity, the geographic extent to which they occur, and the threats to their survival. Washington State has its own designations—endangered, threatened and sensitive—established by the Washington Natural Heritage Program (WNHP), a division of the State Department of Natural Resources. The WNHP also compiles three lists—review 1, review 2, and watch—for species that appear to be in decline but have not reached a critical scarcity level to merit a higher protective designation (Biek 2000). No federal or state listed species are expected in the project area, but a plant survey will be conducted prior to project implementation. If any listed or NPS plant species

of management concern are detected, appropriate mitigation measures would be taken to avoid any impacts to the species.

Cultural Resources

Archaeology

Only a small percentage of the park has been surveyed for archeological resources. As of the 2006 field season, the park had documented 74 prehistoric sites and prehistoric isolated finds, 12 multi-component (prehistoric and historic) sites, and 108 historic sites and isolated finds. In addition, four ethnographic sites have been found. Ethnographic sites are modern places that, for varying reasons, are of particular importance to tribal people. Most documented archaeological sites (74 percent) are found within subalpine communities, with approximately 16 percent in alpine habitats. The rest (10 percent) have been found in forested habitats, where more continuous vegetative cover and deposition makes it difficult to detect archeological remains. Of these, 75 percent of sites are found on slopes of 5 degrees or less and 75 percent are within 300 feet of water. Archaeological modeling predicts the greatest intensity of prehistoric use in subalpine communities and in the upper forest margins that would have supported similar communities as recently as the last “Little Ice Age” approximately 150-500 years ago.

The most intensive survey efforts have been associated with rehabilitation and construction related projects in the developed areas of the park (including trails and backcountry camps) during the last 10 years. Less intensive reconnaissance efforts have focused on subalpine and alpine landscapes and several forest settings. Other survey efforts have concentrated on areas where known archaeological resources have been reported. Understanding of the park’s prehistoric use patterns is based on the results of these surveys, on the archaeological record in the vicinity of the park, and on environmentally-based models of human subsistence and settlement patterns in mountainous environments (Burtchard 1998). A comprehensive knowledge of the historical archeological record also relies on written records, oral accounts, and historic documents. Collectively, available archaeological data suggests that, like the lowlands, the Carbon River drainage has also provided important resources for thousands of years for the ancestors of today’s affiliated tribes.

Cultural Landscapes

The WT is a contributing element of the Mount Rainier NHL, which was designated in 1997. The designation of a NHL recognizes that the park does not simply contain individual historic resources, but is an historical park. The historic roads, trails, buildings and designed landscapes of the park together comprise a cultural landscape of national significance in American history. The significance of the NHL is divided into the following six categories, which recognize contributing resources:

- Spatial organization—the composition and sequence of outdoor spaces within the district;
- Circulation—the means and patterns of movement through the district;
- Topography—the ways in which the landscape planning responds to the topographic features of the site and the modifications of that topography;
- Vegetation—the response of existing vegetation as well as the management of vegetation through pruning, removal, or addition of trees and shrubs;
- Structures—all contributing structures, including roads, trails, and other small scale features such as rock walls and culverts; and
- Buildings—structures intended to shelter a human activity.

Ethnography

Ethnographic resources are defined as landscapes, sites, structures, objects, or natural resource features that have significance based on importance attached to them by members of socio-cultural groups. At Mount Rainier National Park, these resources are most closely associated with the following six contemporary American Indian tribes: the Nisqually Indian Tribe, Muckleshoot Indian Tribe, Puyallup Tribe of Indians, Confederated Tribes and Bands of the Yakama Nation, Cowlitz Indian Tribe, and the Squaxin Island Tribe.

Mount Rainier has long been an important place and a symbolic landmark for American Indians. In addition to hunting, archaeological evidence suggests that prehistoric peoples used high elevation and forested landscapes on Mount Rainier to gather a variety of economic, medicinal, and ceremonially important resources for thousands of years. Investigations into the archaeology, history, and ethnography of Mount Rainier National Park indicate these practices continue into the twentieth century as well. Gathering bear grass and cedar splits for basketry and collecting plants for medicinal, ceremonial, and religious uses has been documented through 1950. Similar uses continue to the present. While few specific ethnographic resources, other than archeological sites, have been documented to date, it is important to recognize that Mount Rainier remains important as a place for spiritual and traditional use to American Indian people today.

The greater Carbon River drainage falls within the traditional use territory of the Puyallup Tribe. At lower elevations, the combined Carbon and Puyallup River fishery has been and remains a substantial economic resource for the tribe. Nearer to Mount Rainier, it is believed that the river corridor functioned largely to provide access to cedar and to other temperate rainforest plant and animal species, and as a seasonal access route to subalpine hunting and gathering grounds on the northwestern side of the mountain. The existing archaeological record provides substantial evidence of use of subalpine and lower alpine landscapes accessed via the river corridor and adjacent ridges.

Wilderness

About 97 percent of Mount Rainier National Park is designated wilderness. The wilderness boundary extends 200 feet from the centerline of paved roads and developed areas and 100 feet from the centerline of unpaved roads. Non-wilderness developed areas, not adjacent to roadways, are also present at Paradise, Sunrise, Ohanapecosh, White River, Carbon River, Camp Schurman, and Camp Muir. The proposed construction and/or maintenance activities under each of the three alternatives would be located in wilderness.

The purpose of wilderness includes the preservation of wilderness character and resources in an unimpaired condition and, pursuant to the Wilderness Act, wilderness areas are to be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use (NPS *Management Policies* 2006). In addition to managing areas for preservation of the physical wilderness resources, park planning activities must ensure that the wilderness character is preserved.

Trails are permitted in wilderness when they are determined to be necessary for resource protection and/or for providing for visitor use for the purposes of wilderness (NPS *Management Policies* 2006). NPS policy requires trails located in wilderness to be maintained at levels and conditions identified within approved wilderness management plans or other park planning documents. Trail maintenance structures (such as water bars, gabions) may be provided, under minimum requirement protocols, where they are essential for resource preservation or where significant safety hazards exist during normal use periods. Only signs necessary for visitor safety or to protect wilderness resources, such as those identifying routes and distances, are permissible.

When necessary, wilderness may be zoned to achieve certain types of visitor experiences and resource conditions consistent with their wilderness values within the established management zoning for each park. The WT is located within the Transition Trail Zone, which is characterized by a high degree of social interactions with few opportunities for solitude (MORA General Management Plan, NPS 2002).

In addition to the GMP zoning, the park's Wilderness Management Plan (WMP) (NPS 1989) uses management areas to enable operational efficiency in management. WMP areas include trail, cross-country, and alpine areas. The park contains 37 designated trailside camps, 41 cross-country areas, and 19 alpine areas (including 4 alpine camps), each with varying limits for overnight use (described in the 1973 Backcountry Management Plan and Environmental Assessment and 1989 WMP as amended). The 37 trailside camps contain 25 group sites and 127 individual sites. The cross-country areas have limits that specify the number of parties or the allowable number of people.

The WT project area currently exhibits the following characteristics of wilderness:

- opportunities for solitude (although brief encounters with other hikers is common during peak use);
- opportunities for experiencing independence;
- opportunities for closeness to nature;
- opportunities for tranquility;
- an ecosystem that is primarily influenced by natural events;
- natural quiet; and
- wildlife that behaves with a natural fear of human activity.

In general, the majority of wilderness use occurs from June through September, especially on weekends and sunny days. During other months and many summer weekdays (except during the peak season), few people are encountered in the majority of the wilderness area (NPS 2002). Despite heavy seasonal visitation, outstanding opportunities for solitude are available.

Wilderness Visitor Experience: According to visitor use studies, most wilderness visitors take walks or hikes (98.9 percent); of these, 8 percent camped or backpacked overnight in wilderness. The other 92 percent engaged in day use only or camped in the frontcountry. Of the total number of wilderness visitors, 25.4 percent reported staying in a developed campground (Vande Kamp et al. 1999).

Vande Kamp et al. (1999) also found that about 40 percent of park users were aware of the area's wilderness designation and that most visitors sampled (75.9 percent) expected a scenic rather than a wilderness experience (15.8 percent). When compared to the actual experience, most visitors (71 percent) had the type of trip they expected. Approximately 41 percent expected a wilderness trip but had a scenic trip, and 21.8 percent expected a scenic trip but had a wilderness trip (Vande Kamp et al. 1999).

In a 2000 visitor use survey, 79 percent of visitors reported taking a hike. Of those, 89 percent reported hiking near developed areas and 32 percent in wilderness (Simmons et al. 2001). When this data is combined with information on the length of hike (shorter than two hours, between two and four hours or more than four hours), 41 percent reported taking a hike shorter than two hours, 44 percent took a hike between two and four hours and 30 percent took a hike longer than four hours.

Current Use of Mechanized Equipment in Wilderness: Administrative use of mechanized transport and/or equipment is limited to essential resupply and repair of high camps, removal of human waste, search and rescue operations, maintenance and repair of trails, and survey and rehabilitation of natural and cultural resources. Under all circumstances, administrative use of mechanized transport and/or equipment may only occur when it has been determined that these methods are the minimum requirement/tool for wilderness. Additionally, efforts to minimize impacts are implemented where practicable/feasible (i.e. the use of mechanized equipment during off-season or other time periods of low visitation).

Noise: Noise is defined as unwanted sound. Decibels (dB) are used to measure sounds and noise. Because the human ear responds to sound pressures over an extremely large range of values, scientists have developed a logarithmic decibel scale to measure and compare the levels of a wide range of sounds and noise. The levels are noted as dBA. Table 7 below compares sounds and their A-weighted levels. On a logarithmic scale, a 10 dBA increase means it is 10 times greater than the previous level. In comparison, 140 dBA has 10 billion times more sound energy than 40 dBA.

Table 7: Decibel (dBA) Levels of Ambient and Human-induced Sounds

Sound	dBA	Loudness Logarithmic Scale
Soft Whisper	40	
Rainfall	50	50 dBA = 40 dBA x 10
Normal Conversation	60	60 dBA = 40 dBA x 100
Airplane overhead	70	70 dBA = 40 dBA x 1,000
Chain saw	80	80 dBA = 40 dBA x 10,000
Shouting	90	90 dBA = 40 dBA x 100,000
Rock Drill (50 feet)	100	100 dBA = 40 dBA x 1,000,000
Rock Blasting (75 feet)	110+	110 dBA = 40 dBA x 10,000,000
Chinook Helicopter	120	120 dBA = 40 dBA x 100,000,000
Jet Taking Off (200 feet)	140	140 dBA = 40 dBA x 10,000,000,000

(NPS 2007; U.S. Department of Labor Mine Safety).

Natural Soundscape

An important component of the NPS mission is the preservation of natural soundscapes associated with national park units. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural sounds (e.g., animal vocalizations, rushing water, and wind) that occur in park units, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive and can be transmitted through air, water, or solid materials. The frequencies, magnitudes, and durations of human-caused sound considered acceptable varies among NPS units as well as potentially throughout each park unit, being generally greater in developed areas and less in undeveloped areas and wilderness. The goal of soundscape management in MORA is to protect, maintain, and restore soundscapes to natural conditions and prohibit significant degradation as a result of human-caused sounds.

Natural sounds dominate the WT soundscape. Trail use and maintenance along the WT may generate occasional human-caused sounds, including the sound of human voices and footfalls and noise from hand and power tools. Helicopters and fixed winged aircraft are also heard occasionally in this area. The project area is located within the park's West Forest Acoustic zone (MORA draft Soundscape Plan, NPS 2005). Specific soundscape management objectives for wilderness are as follows:

- Natural sounds predominate and are unimpaired by human-caused sounds.
- Seek to eliminate unacceptable human-caused sounds.
- Seek to minimize noise resulting from administration of the wilderness.
- Perpetuate natural sounds conditions and processes.
- Exceptions are made for emergency actions.

Visitor Use and Experience

Located an hour and a half from metropolitan Puget Sound, Mount Rainier is within easy access of more than 2 million people. Since 1970, the region has doubled its population. Census data from 2000 predicts an increase of another 500,000 persons by 2010. Over the last 20 years, Mount Rainier National Park has seen an overall increase in visitation. In 2000, there were 1,970,406 visits to Mount Rainier National Park. The highest visitation in the past two decades was 1992, with 2,358,296 visitors.

The section of the WT in the Carbon River Valley is used by both overnight backpackers and day hikers. From the Ipsut Creek trailhead, it is a relatively easy day hike to the toe of the Carbon Glacier with a round trip distance of approximately 6 miles and an elevation gain of 1,300 feet. Currently, because of the flood-related Carbon River Road closure, it is about 16 miles round trip from the Carbon River Entrance. In 2007 there was a marked decrease in the number of day hikers in the area, probably due to the greater distance from the trailhead.

Nearby facilities are as follows:

Ipsut Creek Campground: This campground has 31 sites available first come, first served. It is open to the public year round. Currently the campground is not accessible by vehicle because of damage to the Carbon River Road. It is currently accessible by foot and bicycle.

Trails and Trailhead Parking: The nearest parking is currently at Carbon River Entrance Area, approximately 6.5 miles west of the damaged trail segment. Until 2006 when the Carbon River Road was damaged, the closest trailhead was at the Ipsut Creek Campground, approximately two miles west of the damaged trail segment.

Backcountry Campsites: The Carbon River backcountry camp is about 0.5 miles to the east of the damaged trail segment and has four individual sites and one group site. Dick Creek backcountry camp is about two miles east of the damaged trail segment and has two individual sites. Cataract Creek backcountry camp is approximately two miles southeast of the damaged trail segment and has six individual sites and one group site.

Park Operations and Safety

This section of the WT serves as the primary route to the Carbon Glacier area and backcountry, which connects to Sunrise and the east side of Mount Rainier. Backcountry rangers use the trail to access their duty station at Mystic Lake.

The trail is also used for search and rescue operations in the Carbon Glacier area. The WT is a wide and well graded trail that makes it possible to safely carry out injured or sick visitors using wheeled litters. An important part of the WT in this area is the Carbon River suspension bridge, which provides a safe crossing of the Carbon River under all flow levels. Currently there is no direct access to the Carbon River suspension bridge from Ipsut Creek Campground because of the damaged section of the WT. During high flows the foot log that crosses the Carbon River on the Northern Loop spur trail can be washed away. Without access to the suspension bridge, when the foot log is out it is almost impossible to carry out injured or sick visitors. In addition, when the foot log washes out, numerous day hikers who are normally not prepared for overnight camping may be stranded. Although helicopters can be used to rescue injured, sick, or stranded visitors, there are a number of limitations to using helicopters, including poor weather conditions and lack of safe landing sites.

Chapter 4: Environmental Consequences of the Alternatives

This section analyzes both the beneficial and adverse impacts that would result from implementing each of the alternatives considered in this environmental assessment. It includes definitions of impact thresholds and the methodology for evaluating impacts and cumulative effects. Impacts are evaluated based on context, duration, intensity, and whether they are direct, indirect, or cumulative. NPS policy also requires that impairment of resources be evaluated in all environmental documents.

Methodology of Evaluating Impacts

The National Environmental Policy Act (NEPA) requires that environmental documents disclose the environmental impacts of the proposed federal action, reasonable alternatives to that action, and any adverse environmental effects that cannot be avoided if the proposed action is implemented. This section analyzes the environmental impacts of the WT project alternatives on affected park resources. These analyses provide the basis for comparing the alternatives. NEPA requires consideration of context, intensity and duration of impacts, indirect impacts, cumulative impacts, and measures to avoid or minimize impacts. Impacts can be beneficial or adverse. Beneficial impacts would improve resource conditions while adverse impacts would deplete or negatively alter resources.

The environmental consequences for each impact topic were defined based on the following information regarding context, type of impact, duration of impact, area of impact, and the cumulative context. Unless otherwise stated in the resource section in Environmental Consequences, analysis is based on a qualitative assessment of impacts. Additionally, the analysis is based on the assumption that any conservation measures identified to avoid and/or minimize negative impacts would be fully implemented under the applicable alternative.

There are several terms used within the environmental consequences section to assess the impacts of each alternative on each impact topic. Unless otherwise stated, the standard definitions for these terms are as follows:

Context: Setting within which impacts are analyzed, such as the project area or region, or for the area of potential effects, if referring to cultural resources.

Type of impact: A measure of whether the impact will improve or harm the resource and whether that harm occurs immediately or at some later point in time.

- **Beneficial:** Reduces or improves impact being discussed.
- **Adverse:** Increases or results in impact being discussed.
- **Direct:** Caused by and occurring at the same time and place as the action, including such impacts as animal and plant mortality, damage to cultural resources, etc.
- **Indirect:** An effect that is caused by an action that is later in time or farther removed in distance, or to another resource, but is still reasonably foreseeable. Indirect effects could include changes in species composition, vegetation structure, range of wildlife, offsite erosion or changes in general economic conditions tied to park activities.

Duration of impact: Duration is a measure of the time period over which the effects of an impact persist. The duration of impacts evaluated in this Environmental Assessment may be one of the following:

- **Short-term:** The impact occurs only during or immediately after the actual management or project activity; although the effect could last one to five years, it is often quickly reversible and associated with a specific event.
- **Long-term:** The impact could occur for an extended period of time after the management or project activity has been completed. The impact may be reversible over a much longer period, may occur continuously based on normal activity, or may last for more than five years.

Area of impact

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

Conservation Measures

- **Avoid** conducting management activities in an area of the affected resource
- **Minimize** the type, duration, or intensity of the impact to an affected resource
- **Mitigate the impact by:**
 - a) Repairing localized damage to the affected resource immediately after an adverse impact
 - b) Rehabilitating an affected resource with a combination of additional management activities
 - c) Compensating a major long-term adverse direct impact through additional strategies designed to improve an affected resource to the degree practicable.

Criteria and Thresholds for Impact Analysis

Definitions of duration and intensity 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, region, and Washington office specialists. In all cases the impact thresholds are defined for adverse impacts. Beneficial impacts are also addressed in a similar manner when an alternative has a positive effect on a resource or impact topic.

Air Quality and Greenhouse Gases

Impact Intensity	Intensity Description
Negligible	An action would have no measurable or detectable effect.
Minor	An action would have a slight effect, causing a change in air emissions or visibility.
Moderate	An impact would be clearly detectable and would cause an appreciable change in air emissions or visibility.
Major	An action would cause a substantial, highly noticeable change in air emissions or visibility.

Geology and Geologic Hazards

Impact Intensity	Intensity Description
Negligible	Visitor and employee exposure to debris flow hazards, avalanches, rockfalls, or landslides would not occur or would not be measurable. An action would have no measurable or detectable effect on geologic resources.
Minor	Visitors would be exposed to (an adverse impact) or removed from (a beneficial effect) the safety hazards associated with Case I or Case M debris flows and areas where the risk of avalanches, rockfalls, or landslides would be slight but could occur. An action would have a slight effect on geologic resources.

Moderate	Visitors would be exposed to or removed from the safety hazards associated with Case II debris flows and areas where the risk of avalanches, rockfalls, or landslides would be readily apparent and well documented through research or historic events. An action would have an appreciable localized effect on geologic resources.
Major	Visitors would be exposed to or removed from the safety hazards associated with Case III debris flows and areas where the risk of avalanches, rockfalls, or landslides would be substantial and potentially severe. An action would have a substantial and highly noticeable widespread effect on geologic resources.

Soils

Impact Intensity	Intensity Description
Negligible	The effects to soils would not be measurable. Ecological processes would not be affected.
Minor	An action would change a soil's profile in a relatively small area, but it would not necessarily decrease or increase the area's overall biological productivity and would not increase the potential for erosion of additional soil.
Moderate	An action would result in a change in quantity or alteration of the topsoil, overall biological productivity in a small area, or the potential for erosion to remove small quantities of additional soil. Changes to localized ecological processes would be of limited extent.
Major	An action would result in a change in the potential for erosion to remove large quantities of additional soil or in alterations to topsoil and overall biological productivity in a relatively large area. Key ecological processes would be altered, and landscape-level changes would be expected.

Vegetation

Included in the evaluation of the vegetative communities was the introduction or promotion of non-native species.

Impact Intensity	Intensity Description
Negligible	The effects to vegetation would not be measurable. Ecological processes would not be affected.
Minor	The action would affect individual native plants in a localized area but would not affect the viability of local or regional populations or of rare, endemic, or other plant species of concern.
Moderate	The action would affect the local population sufficiently to cause a change in abundance or distribution on a local scale but would not affect the viability of the regional population or of rare, endemic, or other plant species of concern. Changes to localized ecological processes would be of limited extent.
Major	The action would affect a regional or local population of a species sufficiently to cause a change in abundance or in distribution to the extent that the population would not be likely to return to its former level (adverse) or would return it to a sustainable level (beneficial). Significant ecological processes would be altered, and landscape-level changes would be expected.

Water Resources

Impact Intensity	Intensity Description
Negligible	An action would have no measurable or detectable effect on water quality or the timing or intensity of flows.
Minor	An action would have measurable effects on water quality or the timing or intensity of flows. 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.
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.

Floodplains

The impact assessment for floodplains is focused on natural river processes, aquatic habitat, and risks to facilities and visitors.

Impact Intensity	Intensity Description
Negligible	Impacts would occur outside the regulatory floodplain, or there would be no measurable or perceptible effect on floodplain functions or values and no measurable or perceptible risk to facilities or visitors.
Minor	Actions within the regulatory floodplain would potentially interfere with or improve floodplain functions/values or facility/visitor risks in a limited way or in a localized area.
Moderate	Actions within the regulatory floodplain would interfere with or improve floodplain functions/values or facility/visitor risks in a substantial way or in a large area.
Major	Actions within the regulatory floodplain would permanently and significantly alter or improve floodplain functions/values or facility/visitor risks.

Wetlands

Impact Intensity	Intensity Description
Negligible	No measurable or perceptible changes in wetland size, integrity, or continuity would occur.
Minor	The 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. The overall viability of the wetland would not be affected.
Moderate	The 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 size, integrity, and continuity (all three) or a permanent loss of large wetland areas. The impact would be substantial and highly noticeable.

Wildlife

Information on Mount Rainier National Park wildlife and habitat derives from park documents and records. Impacts associated with wildlife might include any change in roosting or foraging areas, food supply, protective cover, or distribution or abundance of species.

Impact Intensity	Intensity Description
Negligible	There would be no observable or measurable impacts to native species, their habitats, or the natural processes sustaining them.
Minor	An action would affect the abundance or distribution of individuals in a localized area but would not affect the viability of local or regional populations.
Moderate	An action would affect a local population sufficiently to cause a minor change in abundance or distribution but would not affect the viability of the regional population.
Major	An action would affect a regional or local population of a species sufficiently to cause a change in abundance or in distribution to the extent that the population would not be likely to return to its former level (adverse) or would return to a sustainable level (beneficial).

Impacts would be considered short-term if the wildlife recovered in less than one year. Impacts would be considered long-term if wildlife recovery takes more than one year.

Wilderness

Working from definitions included in the Wilderness Act and the tradition of wilderness preservation at Mount Rainier National Park, the following wilderness resource values have been identified for Mount Rainier National Park and are a component of the wilderness character.

Naturalness

- absence of evidence of people and their activities
- perpetuation of natural ecological relationships and processes and the continued existence of native wildlife populations in largely natural conditions

Wilderness Experiences and Opportunities for Solitude

- the likelihood of not encountering other people while in wilderness; including privacy and isolation
- absence of distractions (such as large groups, mechanization, unnatural noise, signs and other modern artifacts)
- freedom from the reminders of modern society

Opportunities for Primitive, Unconfined Recreation

- the freedom of visitors to explore, with limited or no restrictions; the ability to be spontaneous
- self-sufficiency and absence of support facilities or motorized transportation; direct experience of weather, terrain and wildlife with minimal shelter or assistance from devices of modern civilization

Impact Intensity	Intensity Description
Negligible	The action would produce a change in wilderness resources/values that would not be perceptible or would be barely perceptible by most visitors.
Minor	The action would produce a slight change in wilderness resources/values that would be noticeable and would affect a few visitors' experiences, but would result in little detracting or improvement in the quality of the experience.
Moderate	The action would produce a change in wilderness resources/values that would

	result in a noticeable decrease or improvement in the quality of a large number of visitors' experiences.
Major	The action would produce a substantial improvement in many visitors' wilderness experiences or a severe drop in the quality of many people's experience, such as the addition or elimination of a recreational opportunity or a permanent change in access to a popular area.

Soundscapes

Noise can adversely affect park resources by modifying or intruding upon the natural soundscape, and can also interfere with sounds important for animal communication, navigation, mating, nurturing, predation and foraging functions. Noise can also adversely affect park visitor experiences by intruding upon or disrupting experiences of solitude, serenity, tranquility, contemplation, or a completely natural or historical environment.

The methodology used to assess noise impacts in this document is consistent with NPS *Management Policies 2006* and *Director's Order #47: Soundscape Preservation and Noise Management*.

Context, time and intensity together determine the level of impact for an activity. It is usually necessary to evaluate all three factors together to determine the level of noise impact. In some cases an analysis of one or more factors may indicate one impact level, while an analysis of another factor may indicate a different impact level, according to the criteria below. In such cases, best professional judgment based on a documented rationale must be used to determine which impact level best applies to the situation being evaluated.

Impact Intensity	Intensity Description
Negligible	Natural sounds would prevail. Effects to natural sound environment would be at or below the level of detection and such changes would be so slight that they would not be of any measurable or perceptible consequence to the visitor experience or to biological resources.
Minor	Natural sounds would prevail. Effects to natural sound would be localized, short-term and would be small and of little consequence to the visitor experience or to biological resources. Mitigation measures, if needed to offset adverse effects, would be simple and successful.
Moderate	Natural sounds would prevail, but activity noise could occasionally be present at low to moderate levels. Effects to the natural sound environment would be readily detectable, localized, short- or long-term, with consequences at the local level. Natural sounds would be occasionally heard during the day. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful.
Major	Natural sounds would be impacted by activity noise frequently for extended periods of time. Effects to the natural sound environment would be obvious, long-term, and have substantial consequences to the visitor experience or to biological resources in the region. Extensive mitigation measures would be needed to offset any adverse effects and success would not be guaranteed.

Visitor Use and Experience

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

Mount Rainier National 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. Observations of visitation patterns combined with assessment of what is available to visitors under current management were used to estimate the effects of the actions in the alternatives in this document. The impact on the ability of the visitor 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 use and 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 and to what degree and for how long.

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

Park Operations and Safety

NPS *Management Policies 2006* state that although there are limitations on the NPS ability to totally eliminate all hazards, the NPS will strive to provide a safe and healthful environment for visitors and employees, to protect human life and to provide for injury-free visits.

Impact intensity	Impact Description
Negligible	The impacts to visitor safety would not be measurable or perceptible. Park operations would not be affected.
Minor	The effect would be detectable, short-term, but would be limited to a relatively small number of visitors at a localized area and would not have an appreciable effect on public health and safety. For park operations, the effect would be detectable, but short-term, and there would not be an appreciable effect on park operations.
Moderate	The effects would be sufficient to cause a permanent change or would be readily apparent and result in substantial, noticeable effects to safety on a local scale on a short- or long-term basis. For park operations, the effects would be readily apparent, short-or long-term, and would result in a substantial change in park operations in a manner noticeable to park staff and the public.
Major	The impact to visitor safety would be substantial. Effects would be readily apparent and result in substantial, noticeable effects to safety on a regional scale and long-term basis. For park operations, the effects would be readily apparent, would result in a substantial change in park operations in a manner noticeable to park staff and the public, and be markedly different from existing operations.

Cultural Resources

Cultural Resources include archeology, historic structures, cultural landscapes, and ethnography. Information used in this assessment was obtained from relevant literature and documentation, maps, consultation with landscape architects, park archeologists and site visits. The National Historic Preservation Act requires agencies to take into account the effects of their actions on properties listed or eligible for listing in the National Register of Historic Places (NRHP). The process begins with identification and evaluation of cultural resources for NRHP eligibility, followed by an assessment of effects on eligible resources. In Washington, this process includes consultation with the state historic preservation officer (SHPO). If an action could change in any way the characteristics that qualify the resource for inclusion in the national register, it is considered to have an effect. No adverse effect means there could be an effect, but the effect would not be harmful to the characteristics that qualify the resource for inclusion in the national register. Adverse effect means the action could diminish the integrity of the characteristics that qualify the resource for the national register. For the purposes of this analysis under the National Environmental Policy Act and Section 106 of the National Historic Preservation Act, the intensity of impacts on cultural resources was defined as follows:

- No effect: There are no historic properties in the Area of Potential Effect (APE); or, there are historic properties in the APE, but the undertaking will have no impact on them.
- No adverse effect: There will be an effect on the historic property by the undertaking, but the effect does not meet the criteria in 36 CFR Part 800.5(a)(1) and will not alter characteristics that make it eligible for listing on the National Register. The undertaking is modified or conditions are imposed to avoid or minimize adverse effects. This category of effects is encumbered with effects that may be considered beneficial under NEPA, such as restoration, stabilization, rehabilitation, and preservation projects.
- Adverse effect: The undertaking will alter, directly or indirectly, the characteristics of the property making it eligible for listing on the National Register. An adverse effect may be resolved by developing a memorandum or program agreement in consultation with the SHPO, ACHP, American Indian tribes, other consulting parties, and the public to avoid, minimize, or mitigate the adverse effects (36 CFR Part 800.6(a)).
- Significant Impact: An impact to a National Register historic property would be considered significant when an adverse effect cannot be resolved by agreement among SHPO, ACHP, American Indian tribes, other consulting and interested parties, and the public. The impact will diminish the integrity of location, design, setting, materials, workmanship, feeling or association characteristics that make the historic property eligible for inclusion in the National Register Historic Places. The resolution must be documented in a memorandum or programmatic agreement or the FONSI.

Special Status Species and Critical Habitat

Information on Mount Rainier National Park sensitive species and critical habitat was taken from park documents and records. Management goals for sensitive species and critical habitat include maintaining components and processes of naturally evolving park ecosystems, to perpetuate the natural distribution and abundance of all special status species (MORA GMP, 2002). For special status species, including federally listed species (endangered, threatened, or proposed) and/or federally designated critical habitat, the following impact intensities were used. These terms are defined as follows under Section 7 of the Endangered Species Act:

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

Cumulative Effects

Cumulative impacts are the effects on the environment that would result from the incremental impacts of the action when combined with other past, present, and reasonably foreseeable future actions. Impacts are considered cumulative regardless of what agency or group (federal or non-federal) undertakes the action.

To determine potential cumulative impacts, affected resources are evaluated to determine whether the resource is particularly vulnerable to incremental effects, whether the action is one of several similar actions in the same geographic area, whether other activities in the area have similar effects on the resource, whether these effects have been historically significant for this resource, and whether other analyses in the area have identified a cumulative effect concern.

Projects near the proposed project area were identified. Potential projects identified as cumulative actions included any planning or development activities that occurred in the past, those currently being implemented, or those being planned that would be implemented in the reasonably foreseeable future. These projects were then assessed to determine whether they would have similar effects to identified resources as the proposed project would.

Four types of actions related to the proposal could result in additional cumulative impacts to the drainage.

1. Trail maintenance and installation of additional trails in the Carbon River drainage.
2. Use of helicopters for park management and its potential effect on wilderness users.
3. Repair and maintenance of roads in the Carbon River drainage.
4. Park operations at Ipsut Creek Campground and Carbon River Entrance.

Summary of Past, Current, and Potential Projects in the Carbon River Watershed

Trail Maintenance: There are approximately 22 miles of maintained trails in the Carbon River drainage. Trail opening, brushing, and trail closing take place each year and may include chain saw use when determined to be the wilderness “minimum tool.” Foot logs are replaced when they are washed out. In the Carbon River drainage, two foot logs wash out per year on average.

Helicopter Flights: Helicopters are sometimes used in the Carbon River drainage for a variety of park management tasks including trail and bridge construction, maintenance activities, search and rescue, wildland fire response, and wildlife surveys (e.g., elk, mountain goat). The number of flights varies each year but averages about five per year from June through September.

Road Repair and Maintenance: The 4.5 mile gravel-surfaced Carbon River Road begins at the Carbon River Entrance and ends at Ipsut Creek Campground. The road has been repeatedly damaged by flooding. During the unprecedented storm events of November 2006, the Carbon River Road was severely damaged, and the entire road is currently closed to private vehicular access. In accordance with the 2002 General Management Plan (GMP), private vehicular access to the Ipsut Creek trailhead and campground will not be restored (although opening part of the road may be considered). Public scoping has been initiated for the conservation planning and environmental impact analysis process necessary to respond to the damage throughout the upper Carbon River road corridor. At this time, it is expected that preliminary options for addressing which former corridor area services may be restored and what new opportunities may be appropriate to consider will be presented for public consideration in late 2008 or early 2009.

Park Operations: Ipsut Creek Campground and the Carbon River Entrance are open year-round, although access to Ipsut Creek Campground may be seasonally limited by snow. There is electricity at Carbon River Entrance from commercial sources outside the park. There is no potable water at either area. There are vault toilets at both sites that are pumped out yearly, and the contents are treated outside the park.

Impairment of Park Resources or Values

In addition to determining the environmental consequences of the action and no-action alternatives, NPS *Management Policies 2006* and Director's Order #12 require an analysis of potential effects to determine if actions would impair park resources. The fundamental purpose of the national park system established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must seek ways to avoid, or minimize to the greatest degree practicable, adversely impacting park resources and values. Congress has given NPS managers direction, however, to allow impacts to park resources and values when necessary and appropriate to fulfill the purpose of the park, so long as the impact does not constitute impairment of the affected resources and values.

The prohibited impairment is an impact that would, in the professional judgment of the responsible NPS manager, harm the integrity of park resources or values, including opportunities that would otherwise be present for the enjoyment of those resources or values. An impact would be more likely to constitute impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

- necessary to fulfill specific park purposes identified in the establishment legislation or proclamation of the park;
- key to the natural and cultural integrity of the park or to opportunities for enjoyment of the park; or, is
- identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park. Determinations of

impairment are provided in the conclusion section under each applicable resource topic for each alternative. Impairment determinations, however, are not made for health and safety, visitor use, maintenance, operations, socio-economic resources, and other non-natural or cultural resources topics not subject to the impairment prohibition.

ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVE 1: No Action

This alternative would entail abandonment of the 0.8-mile section of the WT from the intersection with the spur trail (the lower crossing of the Carbon River) to Cataract Creek (suspension bridge crossing). Hikers traveling from Ipsut Creek would continue to bypass the damaged section of the WT by crossing over to the NLT via the existing spur trail and foot log(s) across the Carbon River. Hikers would use the NLT to access the Carbon Glacier and sites along the WT to the east. This bypass route would increase the length of the WT by approximately 0.4 mile. The NLT, from the spur to the Carbon River suspension bridge, would not be upgraded to WT standards.

The spur access to the NLT under this alternative would continue to be vulnerable to outburst flooding and other geological hazards and would pose potential substantial risks to public and employee safety. This alternative would also result in the loss of approximately 0.8 miles of the WT, which is a contributing element of the Mount Rainier NHL.

Air Quality and Greenhouse Gases

Under the No Action Alternative, hikers would be rerouted to the NLT and would not use the washed-out section of the WT. Annual maintenance of the NLT, including occasional power tool use, would create negligible to minor direct short-term adverse impacts on air quality and greenhouse gases. Alternative 1 would not impair air quality or other air resources or values.

Cumulative Effects: Prior to the 2006 flood, routine sources of annual air quality impacts in the watershed included road maintenance using heavy equipment, visitor and park vehicle traffic, campfires at the Ipsut Creek Campground, trail maintenance using power tools on 22 miles of trails, periodic wildland fires, and occasional helicopter use. Normally, road maintenance using heavy equipment begins in April with grading of the Carbon River Road. However, the road is currently closed due to flood damage, and preliminary options for addressing which former corridor area services to restore and what new opportunities may be appropriate are being considered. Historically, passenger vehicles were operated in the Carbon River drainage year round, with peak use from May through October. The Ipsut Creek Campground is open year round and includes 31 campsites, each with an individual fire grate. Trail maintenance is conducted from late March through mid-October, with most power tool use in April and May during trail opening. Over the past ten years there have been small wildland fires in the Carbon River drainage, and these fires were suppressed. Future wildland fires may be allowed to burn under an approved strategy of Wildland Fire Use for Resource Benefits. Helicopters are occasionally used in the Carbon River drainage for a variety of park management tasks including trail and bridge construction, human waste removal from backcountry camps, search and rescue, wildland fire response, and wildlife surveys. Use of heavy equipment and power tools, campfires, wildland fires, park and visitor vehicle operation, and periodic flights result in minor adverse cumulative effects to the air quality in the Carbon River drainage. The impacts on air quality of Alternative 1, including the annual maintenance of the trail, would be localized, short-term, and negligible to minor and would not contribute measurably to the overall cumulative effects on air quality.

Conclusion: The abandonment of the damaged section of WT and use of the NLT would have negligible to minor impacts on air quality and greenhouse gases. Existing and reasonably foreseeable

future cumulative impacts would be direct and indirect, short-term and minor, and this alternative would not contribute measurably to the overall cumulative effects. Under this alternative, because impacts would be negligible to minor, there would be no impairment to air quality.

Geology and Exposure to Geologic Hazards

Under the No Action Alternative, the spur trail connecting the WT and NLT would remain in a Case III Debris Flow Zone, and the trail would continue to be vulnerable to outburst flooding and other geological hazards and could pose potential major safety risks to hikers while they traversed the floodplain. There would be negligible effects on geology.

Cumulative Effects: The Carbon River watershed is a popular destination, and infrastructure built to accommodate visitor and operational needs is located in geologic hazard areas within the watershed. Current and reasonably foreseeable impacts on geology and geologic hazards include road maintenance and repair using heavy equipment and visitor and park administrative use of the Ipsut Creek Campground. Work occurs in both Case II and III zones along the Carbon River. The Ipsut Creek Campground is in a Case III Debris Flow Zone. The campground has 31 campsites and is open year round with most use from May through October. Road maintenance and repairs and campground use result in long-term minor adverse cumulative effects to geologic resources and exposure to major geologic hazards in the Carbon River drainage. The adverse impact of Alternative 1, including potential visitor, employee, and trail infrastructure exposure to Case III debris flows, would be localized and short-term and intermittent/episodic, and Alternative 1 would contribute slightly to the overall cumulative effects on geologic resources.

Conclusion: Under Alternative 1, visitors, employees, and trail infrastructure would be exposed to direct and indirect major adverse effects from geologic hazards since the trail would remain in a geologic hazard zone. However, exposure would be episodic and limited to a relatively short stretch of trail. Existing and reasonably foreseeable future cumulative impacts would be direct and indirect, short- and long-term, and minor to major, and this alternative would contribute slightly to the overall cumulative effects. Under this alternative, because impacts from major geologic hazards would be localized and intermittent, and impacts to geology would be negligible, there would be no impairment of geologic resources.

Soils

There would be negligible adverse impacts on soils because no new trail tread would be constructed in previously undisturbed areas. There would be no impairment of park soil resources or values as a result of Alternative 1.

Cumulative Effects: Alternative 1 would not create new disturbance to soils. In the greater project area in the Carbon River drainage, 16 wilderness campsites, 31 Ipsut Creek Campground sites, 22 miles of maintained trails, and 4.5 miles of road have affected soils. In the Carbon River watershed within the park, the total human-caused disturbance to soil is approximately 35.2 acres, or 0.13% of the watershed inside the park. Alternative 1 would not add any additional acreage to this total and would not contribute measurably to the overall minor to moderate cumulative effects on soils in the Carbon River drainage.

Conclusion: There would be negligible long-term direct and indirect impacts on soil in the immediate project area. Alternative 1 would not contribute measurably to the long-term minor to moderate cumulative impacts on soils. Because the impacts from this alternative would be negligible, there would be no impairment of soils or their associated values.

Vegetation

There would be negligible to minor impacts on vegetation under this alternative. No new trail tread would be constructed in previously undisturbed areas. As in the other alternatives, periodic brushing, removal of trees that fall across the NLT, and trail clearing would continue under this alternative as needed to maintain the trail. Alternative 1 would not impair park vegetation or associated values.

Cumulative Effects: In the greater project area in the Carbon River drainage, 16 wilderness campsites, the Ipsut Creek Campground, 22 miles of maintained trails, and 4.5 miles of road have affected vegetation. In the Carbon River watershed within the park (26,320 acres), the total human-caused disturbance to vegetation is approximately 36.5 acres, or 0.14% of the watershed inside the park. Alternative 1 would not add any additional acreage to this total and would not contribute measurably to the overall minor to moderate cumulative effects on vegetation in the Carbon River drainage.

Conclusion: Routine trail maintenance would cause negligible to minor impacts to vegetation in the immediate project area. Alternative 1 would not contribute measurably to the long-term minor to moderate cumulative impacts on vegetation. Because the impacts from this alternative would be localized and negligible to minor, there would be no impairment of vegetation.

Water Resources

Under the No Action Alternative, hikers would cross the Carbon River via foot logs and would travel through river bar to reach the NLT. Trail maintenance and use would be expected to result in negligible to minor short-term impacts on water resources under this alternative.

Cumulative Effects: In the greater project area in the Carbon River drainage, there are numerous stream crossings on 22 miles of trails. There are minor short-term impacts from the maintenance of culverts, bridges and foot logs along the trails. There are also minor short-term impacts to water resources from park roads in the Carbon River drainage. Other sources of impacts in the Carbon River area include the vault toilets in the Ipsut Creek Campground and at the Carbon River Entrance. These systems are currently functioning properly and have negligible effects on the water resources of the area. The negligible to minor impacts from the use and maintenance of the NLT would contribute slightly to the overall cumulative effects on water resources in the Carbon River drainage.

Conclusion: Negligible to minor impacts on water resources would occur in the immediate project area. Alternative 1 would contribute slightly to the long-term minor cumulative impacts on water resources. Because the impacts from this alternative would be negligible to minor, there would be no impairment of water resources.

Floodplains

Under this alternative, hikers would bypass the damaged section of trail via the NLT, crossing the Carbon River floodplain using the existing spur trail and foot log crossings. Actions under this alternative, including re-delineation of the trail through the river bar and replacement of foot logs after high-water events, would have minor impacts on jurisdictional floodplain functions. The location of the trail would expose hikers to potential major safety risks while they traversed the floodplain. Trails are an excepted action (i.e., not regulated) under Director's Order 77-2, Section B, Procedural Manual, Floodplain Management Guideline because a trail is minor structure that does not involve overnight occupation (i.e., use is transitory). There would be no impairment of floodplains or their values as a result of Alternative 1.

Cumulative Effects: In the greater project area within the park's Carbon River drainage, there are numerous areas where park infrastructure, including roads and trails, is in the floodplain. There are negligible to minor impacts on floodplain functions from the use and maintenance of these facilities. Under Alternative 1, visitors, employees, and trail infrastructure would be exposed to direct and indirect major adverse effects from flooding since the trail would remain in the floodplain. However, exposure would be episodic and limited to a relatively short stretch of trail. The minor impacts of having the trail in the floodplain would contribute slightly to the overall cumulative effects on floodplains and risks to facilities and visitors within the Carbon River drainage.

Conclusion: There would be minor impacts on floodplains in the immediate project area. Risks to trail infrastructure and hiker safety would remain. However, exposure to flooding would be episodic and limited to a relatively short stretch of trail. Alternative 1 would contribute slightly to the long-term minor cumulative impacts on floodplain functions and to the potential major flood risks to facilities and visitors in the Carbon River area. Because the impacts from this alternative would be minor, there would be no impairment of floodplains.

Wetlands

Alternative 1 would have negligible impacts on wetlands since no new trail would be constructed and the NLT does not cross any wetlands within the project area. Trail construction and repair in/adjacent to wetlands is an allowable activity pursuant to NPS Procedural Manual #77-1: Wetland Protection (PM-77) provided the activity would not result in adverse impacts, and/or measures are in place to avoid, minimize and/or mitigate impacts. As such, this alternative is in compliance with PM-77. Alternative 1 would not impair wetlands or their values.

Cumulative Effects: Actions under Alternative 1 would have negligible impacts on wetlands associated with the Carbon River or its tributaries. In the greater project area in the Carbon River drainage, there are numerous areas where trails and roads pass through wetlands. Some of these existing trails and roads influence water flow through wet areas, resulting in minor impacts on wetlands. The negligible impacts on wetlands resulting from Alternative 1, including trail maintenance and use, would not contribute measurably to the overall cumulative effects on wetlands in the Carbon River drainage.

Conclusion: Negligible impacts on wetlands would occur in the immediate project area. Alternative 1 would not contribute measurably to the long-term minor cumulative impacts on wetlands in the Carbon River area. Because the impacts from this alternative would be negligible, there would be no impairment of wetlands.

Wildlife

Species likely to occur in the project area are listed in chapter 3. Under Alternative 1, the damaged segment of the WT would be closed, and hikers would be rerouted to the spur trail and NLT. Trail use and maintenance would disturb some small mammals, amphibians, reptiles, birds, and invertebrates. Large mammals might alter their travel or feeding patterns to avoid areas with high human use. The abandonment of the damaged section and the potentially higher use of the NLT would likely create localized, direct and indirect, short- and long-term, beneficial (because of decreased human use of the abandoned segment) and adverse (because of increased use of the NLT) negligible to minor impacts on wildlife and wildlife habitat. There would be no impairment of wildlife or wildlife values.

Cumulative Effects: Existing and reasonably foreseeable use and maintenance of trails, roads, visitor facilities, and campgrounds create localized minor to moderate adverse impacts on wildlife in the Carbon River area through human presence, noise and other disturbance from maintenance projects,

and through habitat loss, fragmentation, or alteration. Under Alternative 1, the abandonment of a segment of the WT and potential increased use and maintenance of the spur trail and NLT would contribute slightly to the overall cumulative impacts on wildlife.

Conclusion: Impacts from the use and maintenance of the NLT and spur trail by visitors and park staff would have negligible to minor short- and long-term impacts on wildlife and wildlife values. Cumulative impacts would be direct and indirect, short- and long-term, and minor, and this alternative would contribute slightly to the cumulative effects on wildlife. Because the impacts of Alternative 1 would be negligible to minor, they would not constitute impairment of park wildlife or the values for which they have been protected.

Special Status Species and Critical Habitat

Effects determinations were made for federally listed species, and for federal and state species of concern. The three levels of effect are (1) No Effect (NE); (2) May Affect, Not Likely to Adversely Affect (NLAA); and (3) May Affect, Likely to Adversely Affect (LAA). See summary of determinations for each alternative in Table 3 in Chapter 2.

Northern Spotted Owl and Marbled Murrelet: The trail corridor contains marbled murrelet and northern spotted owl nesting habitat within 45 yards of the route. The trail is 0.2 miles from a known northern spotted owl core activity site center. Downed trees would typically be cleared during routine opening and maintenance of the NLT in April or May using either chain saws or hand saws. The number of downed trees that need to be removed from this section of the NLT varies from year to year but generally ranges from two to ten, and on average about an hour of chain saw use would be expected each year if chain saws were determined to be the wilderness minimum tool. Chain saw and other power tool use during the early nesting season would have an effect determination of “may affect, likely to adversely affect” for marbled murrelet and spotted owl but would otherwise be “not likely to adversely affect.” In order to minimize the impacts to sensitive species, power tools would be used only between 2 hours after sunrise and 2 hours before sunset.

Bull Trout, Chinook Salmon, and Steelhead: Under Alternative 1, maintenance of the spur trail across the floodplain and probable frequent replacement of foot logs across the Carbon River has an effect determination of “may affect, not likely to adversely affect” Chinook salmon and steelhead because of the unlikelihood of Chinook salmon or steelhead presence. Trail maintenance/reconstruction and foot log replacement activities have the potential to impact bull trout by increasing sediment, by harassment of juvenile and adult fish due to in-water work, and by direct mortality due to stepping on redds or juveniles seeking refuge in the substrate. In order to minimize effects on bull trout redds, the placement of the foot log would need to be conducted between August 6 and August 31. However, in the likely case that foot log replacement would occur outside this time period in order to restore trail access as soon as possible, the effect determination for trail maintenance/repair activities would be “may affect, likely to adversely affect” bull trout and bull trout critical habitat.

Gray Wolf, Canada Lynx, Grizzly Bear, and Fisher: These are considered extirpated species and likely absent from the park. Recent (within the last 10 years or so) detections of all four species have been reported, but park-wide hair-slug and scent-station surveys targeting these species did not detect them. There would be no effect on gray wolf, Canada lynx, grizzly bear, or fisher.

Bald Eagle, Peregrine Falcon, Coastal Cutthroat Trout, and Coho Salmon (federal special concern species): There is no known nesting habitat for bald eagles or peregrine falcons immediately adjacent to the project area. There would be no effect on these species. Maintenance of the spur trail across the

floodplain and probable frequent replacement of foot logs across the Carbon River would likely adversely affect coastal cutthroat trout but would be unlikely to adversely affect Coho salmon.

Special Status Plant Species: No federal threatened or endangered species are currently known to occur at MORA. A vegetation survey has not been conducted along the route proposed in Alternative 1, but habitat conditions exist within the trail zone that could potentially support species of concern. Because Alternative 1 would be implemented within an area previously influenced by both human and natural disturbance, additional impacts on rare, sensitive, threatened, or endangered plants resulting from this work would be negligible. Under Alternative 1, there would be no impairment of rare or listed plants or the values for which they have been protected.

Cumulative Effects: In the Carbon River watershed, trails, roads, visitor facilities, and campgrounds are associated with habitat loss and fragmentation, maintenance activities, power tool use, helicopter operations, and human presence on about 35 acres, or about 0.13 percent of the watershed. Existing infrastructure and ongoing park maintenance activities, including power tool use and helicopter flights, cause short- and long-term, direct and indirect, minor to moderate impacts on sensitive, threatened, and endangered species. Because the impacts associated with Alternative 1 would be negligible to moderate, Alternative 1 would contribute slightly to the overall cumulative effects on sensitive, threatened, and endangered species and on critical habitat for bull trout.

Conclusion: Actions under this alternative are likely to adversely affect bull trout, bull trout critical habitat, and coastal cutthroat trout. Alternative 1 is not likely to adversely affect spotted owl or marbled murrelet (assuming no chain saw or power tool use during the early nesting season), Chinook salmon, steelhead, or Coho salmon. Impacts to special status species would be localized and negligible to moderate. Cumulative impacts would be direct and indirect, short- and long-term, and minor to moderate, and this alternative would contribute slightly to the cumulative effects. Because impacts would be localized and no more than moderate, there would be no impairment of sensitive, threatened, and endangered species and critical habitat.

Cultural Resources

There would be minor long-term impacts on cultural resources. The damaged WT section would be abandoned. The NLT from the spur to the Carbon River suspension bridge would not be upgraded to WT standards and width. The effect determination under Section 106 of the National Historic Preservation Act would be *no adverse effect*.

Archaeology

There would be no effect on known archeological resources as a result of actions under Alternative 1. Because the WT may continue to erode, there would be a potential for erosion to unearthing previously unidentified archeological resources.

Historic Structures

The damaged section of the historic WT would be abandoned and exposed to further damage from erosion. The WT is part of the Mount Rainier NHL and contains a variety of character-defining features. The NLT from the spur to the Carbon River suspension bridge would not be upgraded to WT standards. The NLT, which is also part of the Mount Rainier NHL, would be used by hikers to reach the Carbon Glacier area and the WT to the east. Although about 0.8 mile of the designated WT would be abandoned under this alternative, there would be *no adverse effect* to the NHL, since this would be a small percentage of the WT (0.8 mile of the 93-mile trail).

Ethnographic Resources

There would be negligible impacts on ethnographic resources from Alternative 1.

Cumulative Effects: The Carbon River area has experienced both pre-historic and historic use. Numerous historic artifacts associated with past mining activities continue to be affected by off-trail hiking and other human impacts. In addition, undocumented archeological sites may be impacted by visitors. Flooding has affected the Carbon River Road and the Ipsut Creek Cabin, which like the WT, are contributing elements of the National Historic Landmark District. Existing and reasonably foreseeable cumulative impacts are direct and indirect, long-term, and minor to moderate. The abandonment of the damaged section of the WT and increased use of the NLT would contribute slightly to the overall cumulative effects on cultural resources.

Conclusion: The abandonment of the damaged section of the WT would have local, direct, long-term minor impacts on cultural resource values. The effect determination under Section 106 of the National Historic Preservation Act would be *no adverse effect*. Existing and reasonably foreseeable cumulative impacts would be direct and indirect, short- and long-term, and minor to moderate, and this alternative would contribute slightly to the overall cumulative effects. Under this alternative, because long-term impacts would be negligible to minor, there would be no impairment of archaeology, historic structures, the NHL, or ethnographic resources or values.

Wilderness

This alternative would have negligible to minor effects on wilderness character and values, including wilderness recreation and experience, opportunities for solitude, and other public purposes of scenic, scientific, educational, conservation, and historical use. Some increase in visitor and administrative use of the spur trail and NLT in this area of wilderness would be expected as a result of abandoning the damaged section of WT. Access to some areas of wilderness would occasionally be limited when the foot log is washed out. However, these impacts on wilderness would be localized, mostly short-term, and minor.

Cumulative effects: The Carbon River watershed is a popular destination. Current wilderness infrastructure includes hiking trails, trail structures, backcountry campsites with toilets and bear poles, ranger cabins, fire lookouts, and scientific instrument installations. The majority of this infrastructure is concentrated along 22 miles of maintained trails, creating localized impacts on the wilderness landscape. When determined to be the wilderness “minimum tool” or during emergency situations, helicopters are occasionally used in the Carbon River drainage for a variety of park management tasks including trail and bridge maintenance and construction, human waste removal from backcountry camps, installation and service of seismic stations, search and rescue, wildland fire response, and animal surveys. The number of flights varies each year, depending on administrative and emergency needs. In addition, power tools, such as chain saws, may be used for removal of downed trees during annual trail maintenance. Existing facilities, trails, park operations, and periodic flights result in adverse, moderate cumulative effects to wilderness resources in the project area. The incremental impacts of Alternative 1, including the use of the NLT instead of the damaged section of the WT, the annual maintenance of the trail, and temporary lack of access during foot log outages, would be localized, short- and long-term, and minor, and would contribute slightly to the overall cumulative effects.

Conclusion: The use of the NLT instead of the damaged WT would have negligible to minor adverse impacts on wilderness values. Existing and reasonably foreseeable cumulative impacts would be direct and indirect, short- and long-term, and moderate, and this alternative would contribute slightly to the

overall cumulative effects. Under this alternative, because impacts would be localized and negligible to minor, there would be no impairment of wilderness values.

Natural Soundscape

Impacts to the Carbon River soundscape under Alternative 1 would be negligible to minor since there would be no new construction. The expected slight increase in routine trail use and maintenance of the NLT would result in localized short-term negligible to minor adverse impacts on the natural soundscape in the vicinity of the NLT and localized beneficial impacts on the natural soundscape in the vicinity of the abandoned segment of trail. There would be no impairment of soundscapes as a result of this alternative.

Cumulative Effects: Visitor use and park operations in the Carbon River area result in minor to moderate short-term adverse impacts on the natural soundscape. Prior to the flood-related closure of the Carbon River Road in 2006, the natural soundscape included vehicle traffic along the road to Ipsut Creek Campground. Trail maintenance, including use of hand tools and chain saws, creates localized, short-term, above-ambient noise. Helicopters and fixed-wing aircraft are occasionally used in the Carbon River drainage for a variety of park management tasks including trail and bridge maintenance and construction, human waste removal from backcountry camps, installation and service of seismic stations, search and rescue, wildland fire response, and animal surveys. The number of flights varies each year, depending on administrative and emergency needs. While wildlife surveys have been routinely conducted in the Carbon River drainage in the past, there has been increased aircraft use in the last few years associated with short-term research studies. In addition, military or civilian aircraft overflights (> 500 feet above ground level) may occasionally occur in the area. Park operations, visitor use, and overflights cumulatively affect soundscapes in the greater project area and occasionally affect sound in the direct vicinity of the project site. Above-ambient human-related sounds in the Carbon River drainage result in short-term, minor to moderate, adverse impacts on natural soundscapes. The negligible to minor incremental impacts of Alternative 1, including continuing the annual maintenance of the NLT and abandoning the damaged section of the WT, would contribute slightly to the overall cumulative effects on the natural soundscape.

Conclusion: Under this alternative, the slight increase in use and maintenance of the NLT and decreased use and maintenance of the damaged WT segment would result in negligible to minor short-term adverse and beneficial impacts on soundscapes. Alternative 1 would contribute slightly to the overall cumulative effects. Because impacts would be short-term, localized, and no more than minor under this alternative, there would be no impairment of natural soundscapes.

Visitor Use and Experience

Under this alternative, the damaged section of the WT would be closed, and hikers would be rerouted to the NLT. The spur trail and foot log crossings that provide access to the NLT would be subject to flooding. During high-water events, hikers could be stranded without a safe route to return to the Ipsut Creek trailhead, and Wonderland Trail backpackers would likely opt to use the Spray Park route, rather than the official WT route, potentially increasing use of and impacts on the fragile Spray Park area. Wonderland Trail backpackers camping at the Carbon River Wilderness Camp would need to travel slightly out of their way to stay at the camp, which is west of the suspension bridge, unless they opted to use the Spray Park Trail instead of the official WT route. There would be no new trail construction under this alternative. Alternative 1 would result in short- and long-term minor adverse impacts on visitor use and experience. Because there would be no new construction, Alternative 1 avoids the additional short-term construction-related impacts on visitor use and experience that would occur under Alternatives 2 and 3.

Cumulative Effects: Maintenance occurs along 22 miles of trails in the Carbon River drainage. Occasionally these activities have minor short-term impacts on visitor use and experience. Damage to and closure of the Carbon River Road has affected vehicle access to the Ipsut Creek Campground and trailhead and has created substantial changes in visitor use and experience of the road and its related trailheads. Future flooding may have impacts on other sections of trail in the Carbon River drainage and could create additional impacts to visitor use and enjoyment because of temporary trail closures or repair activities. In general the trail maintenance program provides safe trails for visitor use and has long-term moderate beneficial impacts to visitor use and experience. Under Alternative 1, the incremental short-term minor adverse impacts on visitor use would slightly contribute to the cumulative effects of Carbon River area infrastructure, trail maintenance, and park operations.

Conclusion: Alternative 1 would result in short- and long-term minor adverse impacts on visitor use and experience. This alternative would contribute slightly to the short- and long-term minor to major cumulative effects on visitor use and experience in the Carbon River drainage.

Park Operations and Safety

Under this alternative, the damaged WT segment would be abandoned, and the NLT would be used to access the Carbon Glacier area by park rangers for backcountry patrols and search and rescue efforts. The spur trail and foot log crossings that provide access to the NLT would be subject to flooding. During foot log outages, the trail crew would need to mobilize quickly to replace the foot logs to enable continued use of the route, and other trail work would be put on hold. Delays in foot log replacement might occur if the washout occurred during the crew's days off or if other trail work were a higher priority. Alternative 1 would result in short- and long-term minor impacts on park operations and visitor safety.

Cumulative Effects: Trail infrastructure in the Carbon River area facilitates park operations and visitor safety by providing access to visitor destinations along safe and reliable routes. In general, Carbon River area trails are constructed to a high standard to minimize recurring maintenance and repair. The trail system creates moderate long-term beneficial impacts on park operations and safety in the Carbon River area. Trail maintenance activities may create localized short-term negligible to minor adverse impacts on park operations and safety. Closure of the flood-damaged Carbon River Road has resulted in substantial changes in park operations in the Carbon River area. Under this alternative, abandonment of the damaged section of the WT and use of the NLT would result in long-term minor impacts that would add slightly to the cumulative effects on park operations and safety.

Conclusion: Abandonment of the damaged segment of WT and use of the flood-prone spur trail and foot log crossings would result in minor short- and long-term adverse impacts on park operations and visitor safety. Alternative 1 would contribute slightly to the overall cumulative effects on park operations and visitor safety in the Carbon River area.

ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVE 2: Abandon Damaged Trail Segment and Reroute the WT to the NLT

Like Alternative 1, this alternative would entail abandonment of the 0.8-mile section of the WT from the intersection with the spur trail (near the lower crossing of the Carbon River) to Cataract Creek (near the suspension bridge crossing). Hikers would bypass the damaged section of the WT by crossing over to the NLT via the existing spur trail and foot log(s) across the Carbon River. The NLT segment would provide access to the Carbon Glacier and sites along the WT to the east. This bypass route would increase the length of the WT by approximately 0.4 mile. Under Alternative 2, about 0.7 mile of the

NLT would be upgraded to WT standards, including improvement of the trail surface, widening of the trail tread, and removal of downed trees. Trail widening would result in new disturbance to about 0.5 acre of soil and vegetation.

The spur trail access to the NLT under this alternative would remain vulnerable to outburst flooding and other geological hazards and would pose potential substantial risks to public and employee safety. This alternative would also result in the loss of approximately 0.8 miles of the WT, which is a contributing element of the Mount Rainier NHL. However, by upgrading the NLT segment to WT standards, some of the defining characteristics of the WT would be retained.

Tools and equipment needed to improve the trail would include axes, rockbars, shovels, chain saws, pulaskis and McCleods. No blasting or helicopter operations would be required to accomplish the work.

Air Quality and Greenhouse Gases

Under this alternative, the NLT would be widened and some standing and down trees would be removed using chain saws. Chain saw use during trail widening activities and recurring annual maintenance of the trail would result in short-term, minor adverse impacts to local air quality. A small amount of greenhouse gases would be generated from vehicle use to get to and from the trailhead and power tool and chain saw use. Alternative 2 would not impair air quality or other air resources or values.

Cumulative Effects: Prior to the 2006 flood, routine sources of air quality impacts in the watershed included road maintenance using heavy equipment, visitor and park vehicle traffic, campfires at the Ipsut Creek Campground, trail maintenance using power tools on 22 miles of trails, periodic wildland fires, and occasional helicopter use. Normally, road maintenance using heavy equipment begins in April with grading of the Carbon River Road. However, the road is currently closed due to flood damage, and preliminary options for addressing which former corridor area services to restore and what new opportunities may be appropriate are being considered. Historically, passenger vehicles were operated in the Carbon River drainage year round, with peak use from May through October. The Ipsut Creek Campground is open year round and includes 31 campsites, each with an individual fire grate. Trail maintenance is conducted from late March through mid-October, with most power tool use in April and May during trail opening. Over the past ten years there have been small wildland fires in the Carbon River drainage, and these fires were suppressed. Future wildland fires may be allowed to burn under an approved strategy of Wildland Fire Use for Resource Benefits. Helicopters are occasionally used in the Carbon River drainage for a variety of park management tasks including trail and bridge construction, human waste removal from backcountry camps, search and rescue, wildland fire response, and wildlife surveys. Use of heavy equipment and power tools, campfires, wildland fires, park and visitor vehicle operation, and periodic flights result in minor adverse cumulative effects to the air quality in the Carbon River drainage. The impacts on air quality of Alternative 2, including widening of the NLT and annual maintenance of the trail, would be localized, short-term, and minor and would contribute slightly to the overall cumulative effects on air quality.

Conclusion: Abandoning the damaged section of WT and upgrading the NLT to WT standards would have minor impacts on air quality. Administrative vehicle use to and from the trailhead and power tools would generate a small amount of greenhouse gases. Existing and reasonably foreseeable cumulative impacts would be direct and indirect, short-term and minor, and this alternative would contribute slightly to the overall cumulative effects. Under this alternative, because impacts would be minor, there would be no impairment of air quality.

Geology and Exposure to Geologic Hazards

Under the No Action Alternative, the spur trail connecting the WT and NLT would remain in a Case III Debris Flow Zone, and the trail would continue to be vulnerable to outburst flooding and other geological hazards and could pose potential major safety risks to hikers while they traversed the floodplain. There would be negligible effects on geology.

Cumulative Effects: The Carbon River watershed is a popular destination, and infrastructure built to accommodate visitor and operational needs is located in geologic hazard areas within the watershed. Current and reasonably foreseeable impacts on geology and geologic hazards include road maintenance and repair using heavy equipment and visitor and park administrative use of the Ipsut Creek Campground. Work occurs in both Case II and III zones along the Carbon River. The Ipsut Creek Campground is in a Case III Debris Flow Zone. The campground has 31 campsites and is open year round with most use from May through October. Road maintenance and repairs and campground use result in long-term minor adverse cumulative effects on geologic resources and exposure to major geologic hazards in the Carbon River drainage. The adverse impact of Alternative 2, including potential visitor, employee, and trail infrastructure exposure to Case III debris flows, would be localized and short-term and intermittent/episodic, and Alternative 2 would contribute slightly to the overall cumulative effects on geologic resources.

Conclusion: Under Alternative 2, visitors, employees, and trail infrastructure would be exposed to direct and indirect major adverse effects from geologic hazards since the trail would remain in a geologic hazard zone. However, exposure would be episodic and limited to a relatively short stretch of trail. Existing and reasonably foreseeable future cumulative impacts would be direct and indirect, short- and long-term, and minor to major, and this alternative would contribute slightly to the overall cumulative effects. Under this alternative, because impacts from major geologic hazards would be localized and intermittent, and impacts on geology would be negligible, there would be no impairment of geologic resources.

Soils

Upgrading and widening approximately 0.7 mile of the NLT would result in about 0.5 acre of new disturbance and would create moderate short-term and minor long-term localized adverse impacts on soils. Using hand tools, trail workers would remove topsoil and duff to reach mineral soil, and the topsoil and duff would then be side cast as part of cut and fill operations. This would result in mixing of soil layers and an area initially subject to erosion prior to plant re-establishment. There would be no impairment of park soil resources or values as a result of Alternative 2.

Cumulative Effects: In the greater project area in the Carbon River drainage, 16 wilderness campsites, 31 Ipsut Creek Campground sites, 22 miles of maintained trails, and 4.5 miles of road have affected soils. The total human-caused disturbance to soil is approximately 35.2 acres, or 0.13 percent of the Carbon River watershed inside the park. Alternative 2 would add about 0.5 acre to this total. Because Alternative 2 would create minor to moderate impacts on soils, it would contribute slightly to the overall minor to moderate cumulative effects on soils in the Carbon River drainage.

Conclusion: There would be moderate short-term and minor long-term direct and indirect adverse impacts to soil in the immediate project area. Alternative 2 would contribute slightly to the long-term minor to moderate cumulative impacts on soils. Because the impacts from this alternative would be moderate over the short term, minor over the long term, and limited to the local area, there would be no impairment of soils or their associated values.

Vegetation

There would be long-term minor to moderate adverse impacts on vegetation in the immediate project area. Approximately 20 trees next to the NLT would be removed under this alternative in order to upgrade the trail to WT standards. These trees would all be less than 20 inches in diameter. The following species would be affected: western hemlock, Pacific silver fir, western red-cedar, and Douglas-fir. Although over time natural thinning of these trees would eventually occur, the removal of these trees to create a trail corridor would not mimic natural thinning.

Trail construction to widen the NLT would disturb some vegetation on either side of the trail for approximately 0.7 mile of the NLT. Approximately 0.5 acre of vegetation would be disturbed during trail construction. Where possible, vegetation would be salvaged and replanted in appropriate disturbed areas adjacent to the trail reroute.

At least one exotic species, foxglove (*Digitalis purpurea*), is found in the area of the proposed construction. Before and during construction, any foxglove found would be manually removed and disposed of to prevent spread. Before construction would begin, the area would be surveyed for other exotic plants, and if present, these plants would also be pulled.

Cumulative Effects: In the Carbon River watershed, 16 wilderness campsites, 31 Ipsut Creek Campground sites, 22 miles of maintained trails, and 4.5 miles of road have affected vegetation. Approximately 36.5 acres of vegetation, or 0.14% of the vegetation within the watershed, are disturbed due to park infrastructure, visitor use, and administrative activities. The localized impacts of the reroute would add an additional 0.5 acre to this total. Because it would result in minor to moderate adverse impacts, this alternative would contribute slightly to the overall minor to moderate cumulative effects on vegetation in the Carbon River drainage in the park.

Conclusion: There would be long-term minor to moderate adverse impacts on vegetation in the immediate project area. Alternative 2 would impact an additional 0.5 acre of vegetation and would contribute slightly to the long-term minor to moderate cumulative impacts on vegetation. Because the impacts from this alternative would be localized and minor to moderate, there would be no impairment of vegetation.

Water Resources

Under this alternative, hikers would cross the Carbon River via foot logs and would travel through river bar to reach the NLT, and a section of the NLT would be upgraded and widened to WT standards. Soil disturbance from these activities and from routine trail maintenance and foot log replacement would create direct and indirect short-term minor impacts on water resources from increased turbidity and sedimentation.

Cumulative Effects: Annual maintenance of culverts, bridges, and foot logs along 22 miles of trail in the Carbon River area create minor short-term impacts on water resources. There are also minor short-term impacts to water resources from park roads in the Carbon River drainage. Other sources of impacts in the Carbon River area include the vault toilets in the Ipsut Creek Campground and at the Carbon River Entrance. These systems are currently functioning properly and have negligible effects on the water resources of the area. Minor impacts from the widening and maintenance of the NLT would contribute slightly to the overall cumulative effects on water resources in the Carbon River drainage.

Conclusion: Minor short-term impacts on water resources would occur in the immediate project area. Alternative 2 would contribute slightly to the long-term minor cumulative impacts on water resources.

Because the impacts from this alternative would be short-term and minor, there would be no impairment of water resources.

Floodplains

This alternative would connect the WT to the Northern Loop via the spur trail, which crosses the Carbon River floodplain. Actions under this alternative, including re-delineation of the spur trail through the river bar and replacement of foot logs after high-water events, would have minor impacts on jurisdictional floodplain functions. The location of the trail would expose hikers to potential major safety risks while they traversed the floodplain. Trails are an excepted action (i.e., not regulated) under Director's Order 77-2, Section B, Procedural Manual, Floodplain Management Guideline because a trail is minor structure that does not involve overnight occupation (i.e., use is transitory). There would be no impairment of floodplains or their values as a result of Alternative 2.

Cumulative Effects: The WT reroute under Alternative 2 would be in the floodplain of the Carbon River. In the greater project area within the park's Carbon River drainage, there are numerous areas where park infrastructure, including roads and trails, is in the floodplain. There are negligible to minor impacts on floodplain functions from the use and maintenance of these facilities. Under Alternative 2, visitors, employees, and trail infrastructure would be exposed to direct and indirect major adverse effects from flooding since the trail would remain in the floodplain. However, exposure would be episodic and limited to a relatively short stretch of trail. The minor impacts of having the trail in the floodplain would contribute slightly to the overall cumulative effects on floodplains and potential major flood risks to facilities and visitors in the Carbon River area.

Conclusion: Minor impacts on floodplains would occur in the immediate project area. Risks to trail infrastructure and hiker safety would remain. However, exposure to flooding would be episodic and limited to a relatively short stretch of trail. Alternative 2 would contribute slightly to the long-term minor cumulative impacts on floodplains and exposure to flood risks. Because the impacts from this alternative would be minor, there would be no impairment of floodplains.

Wetlands

Upgrading and widening the NLT would result in negligible impacts on wetlands since no wetlands are located in the vicinity of this section of the NLT. There would be no impairment of wetlands or their values as a result of Alternative 2.

Cumulative Effects: In the greater project area in the Carbon River drainage, there are numerous areas where trails and roads pass through wetlands. Some of these existing trails and roads influence water flow through wet areas, creating minor impacts on wetlands. The negligible impacts on wetlands resulting from Alternative 2, including trail widening, would not contribute measurably to the overall cumulative effects on wetlands in the Carbon River drainage.

Conclusion: There would be negligible impacts on wetlands in the immediate project area. Alternative 2 would not contribute measurably to the long-term minor cumulative impacts to wetlands. Because the impacts from this alternative would be negligible, there would be no impairment of wetlands.

Wildlife

Wildlife abundance and/or distribution surveys have not been conducted in the project area. This analysis is based upon available habitat information and wildlife observations recorded by trail users and staff in the area. While it is unknown how important this area is to wildlife and what specific species would be disturbed or displaced, it is likely that aspects of trail work, particularly noise and

human activity, would create a short-term disturbance to nearby wildlife, including birds, amphibians, reptiles, invertebrates, and large and small mammals (including bats). Mobile wildlife would probably avoid the area during the construction period and be displaced to other locations in the Carbon River area. Once trail work was completed, some wildlife would likely return to the area. Some mortality to less mobile species would be expected during construction. Amphibians in large downed logs in the project area and small mammals that burrow nearby would likely be adversely affected by trail construction activities, particularly during removal of large logs and woody debris. These affects would be minimized by crews carefully moving logs and woody debris located within the construction zone.

The noise and activity associated with trail construction would be greater than that associated with visitor use of the WT and NLT. These activities would probably limit wildlife presence near the construction area, especially during daylight hours. Periodically, noise from chain saws would be higher than ambient sound levels. Chain saws would be run for no more than 3 hours each day for a total of 20 days. Some species, such as birds, deer, and squirrels, would be minimally affected by the construction and would continue to be seen throughout the day. During late evening and night hours, when construction would not occur, wildlife would likely continue to frequent the site.

Construction activities under this alternative are expected to have short-term moderate adverse impacts and long-term minor adverse impacts on wildlife. In addition, the loss of approximately 0.5 acre of potential habitat in the project area and disturbance associated with construction of the trail and annual maintenance would have short-term moderate impacts and long-term minor impacts on wildlife.

Cumulative Effects: Existing and reasonably foreseeable use and maintenance of trails, roads, visitor facilities, and campgrounds create localized minor to moderate adverse impacts on wildlife in the Carbon River area through human presence, noise and other disturbance from maintenance projects, and through habitat loss, fragmentation, or alteration. Under Alternative 2, the abandonment of a segment of the WT, potential increased use and maintenance of the spur trail and NLT, and disturbance of 0.5 acre of habitat would contribute slightly to the overall cumulative impacts on wildlife.

Conclusion: Under Alternative 2, there would be moderate short-term impacts on wildlife during construction, and minor long-term impacts associated with habitat loss and use of the trail. Because long-term impacts are expected to be minor and short-term impacts moderate, these impacts would not constitute impairment of park wildlife.

Special Status Species and Critical Habitat

Effect determinations for Alternative 2 on federally listed species are summarized below. The three levels of effect, based upon Section 7 of the Endangered Species Act are (a) No Effect (NE); (b) May Affect, Not Likely to Adversely Affect (NLAA); and (c) May Affect, Likely to Adversely Affect (LAA). State and federal special status are discussed as applicable.

Northern Spotted Owl and Marbled Murrelet: The project area is within 45 yards of marbled murrelet and northern spotted owl nesting habitat. The project is 0.2 miles from a known northern spotted owl core activity site center. Noise disturbance from chain saws may occur from July through November. In order to minimize the impacts to sensitive species, power tools would only be used between 2 hours after sunrise and 2 hours before sunset. Chain saw and other power tool use during the early nesting season would have an effect determination of “may affect, likely to adversely affect” for northern spotted owls and marbled murrelets but would otherwise be “not likely to adversely affect.”

Bull Trout, Chinook Salmon, and Steelhead: Under Alternative 2, maintenance of the spur trail across the floodplain and probable frequent replacement of foot logs across the Carbon River has an effect determination of “may affect, not likely to adversely affect” Chinook salmon and steelhead because of the unlikelihood of their presence in the area. Trail maintenance/reconstruction and foot log replacement activities have the potential to impact bull trout by increasing sediment, by harassment of juvenile and adult fish due to in-water work, and by direct mortality due to stepping on redds or juveniles seeking refuge in the substrate. In order to minimize effects on bull trout redds, the placement of the foot log would need to be conducted between August 6 and August 31. However, in the likely case that foot log replacement would occur outside this time period in order to restore trail access as soon as possible, the effect determination for trail maintenance/repair activities would be “may affect, likely to adversely affect” bull trout and bull trout critical habitat.

Gray Wolf, Canada Lynx, Grizzly Bear, and Fisher: These are considered extirpated species and likely absent from the park. Recent (within the last 10 years or so) detections of all four species have been reported, but park-wide hair-snap and scent-station surveys targeting these species did not detect them. There would be no effect on gray wolf, Canada lynx, grizzly bear, or fisher.

Bald Eagle and Peregrine Falcon (federal special concern species): There is no known nesting habitat for bald eagles or peregrine falcons immediately adjacent to the project area. There would be no effect on these species.

Special Status Plant Species: No federal threatened or endangered species are currently known to occur at MORA. A vegetation survey has not been conducted along the route proposed in Alternative 2, but habitat conditions exist within the trail zone that could potentially support species of concern. A survey for sensitive, threatened, or endangered plants would be conducted before any work on the project begins. If special status plants were found, to the extent possible they would be avoided during construction or, if necessary and feasible, salvaged and replanted in appropriate habitat elsewhere (transplanting survival rates for these species may be low). Impacts on special status plant species would be negligible to minor, and there would be no impairment of rare or listed plants or the values for which they have been protected.

Cumulative Effects: In the Carbon River watershed, trails, roads, visitor facilities, and campgrounds are associated with habitat loss and fragmentation, maintenance activities, power tool use, helicopter operations, and human presence on about 35 acres, or about 0.13 percent of the watershed. Existing infrastructure and ongoing and reasonably foreseeable park maintenance activities, including power tool use and helicopter flights, cause short- and long-term, direct and indirect, minor to moderate impacts on sensitive, threatened, and endangered species. Because the impacts associated with Alternative 2 would be negligible to moderate, Alternative 2 would contribute slightly to the overall cumulative effects on sensitive, threatened, and endangered species and on critical habitat for bull trout.

Conclusion: Actions under this alternative are likely to adversely affect bull trout, bull trout critical habitat, and coastal cutthroat trout. Alternative 2 is not likely to adversely affect spotted owl or marbled murrelet (assuming no chain saw or other power tool use during the early nesting season), Chinook salmon, steelhead, or the following sensitive species: Coho salmon, northern goshawk, pileated woodpecker, olive-sided flycatcher, Lewis’s woodpecker, long-eared myotis, long-legged myotis, Pacific Townsend’s big-eared bat, Cascades frog, western toad, Larch mountain salamander, and Van Dyke’s salamander. Impacts to special status species would be localized and negligible to moderate. Cumulative impacts would be direct and indirect, short- and long-term, and minor to moderate, and this alternative would contribute slightly to the cumulative effects. Because impacts would be localized and

no more than moderate, there would be no impairment of sensitive, threatened, and endangered species and critical habitat.

Cultural Resources

There would be minor long-term impacts to cultural resources from the abandonment of the damaged section of the WT and the rerouting to the NLT. The effect determination under Section 106 of the National Historic Preservation Act would be *no adverse effect*.

Archaeology

Archeological surveys have found no evidence of prehistoric archaeological resources along the proposed reroute of the WT to the NLT. There would be no effect on known archeological resources as a result of park actions. Because the damaged section of the WT may continue to erode, there is the potential for erosion to unearthen previously unidentified archeological resources. Under this alternative, trail construction activities would proceed with the caveat that if any potential archeological resources were uncovered during work (inadvertent discovery), all activity would cease until the find could be evaluated by a park archaeologist. As appropriate, additional consultation with the State Historic Preservation Office or affected Native American Tribes would also occur.

Historic Structures

The damaged section of the historic WT would be abandoned and exposed to further damage from erosion. The WT is part of the Mount Rainier NHL and contains a variety of character-defining features. The NLT, which is also part of the Mount Rainier NHL, would be upgraded to WT standards and would be used by hikers to reach the Carbon Glacier area and the WT to the east. Although about 0.8 mile of the designated WT would be abandoned under this alternative, there would be *no adverse effect* to the NHL, since this would be a small percentage of the WT (0.8 mile of the 93-mile trail).

Ethnographic Resources

Alternative 2 would have negligible impacts on ethnographic resources of the WT. There would be no impairment of ethnographic resources or values as a result of Alternative 2.

Cumulative Effects: The Carbon River area has experienced both pre-historic and historic use. Numerous historic artifacts associated with past mining activities continue to be affected by off-trail hiking and other human impacts. In addition, undocumented archeological sites may be impacted by visitors. Flooding has affected the Carbon River Road and the Ipsut Creek Cabin, which like the WT, are contributing elements of the National Historic Landmark District. Existing and reasonably foreseeable cumulative impacts are direct and indirect, short- and long-term, and minor to moderate. The abandonment of the damaged WT and increased use of the NLT would contribute slightly to the overall cumulative effects on cultural resources in the Carbon River Valley.

Conclusion: Although the abandonment of the damaged WT would have long-term minor impacts on cultural resource values, the determination of effect for this alternative would be *no adverse effect*. Existing and reasonably foreseeable cumulative impacts would be direct and indirect, short- and long-term, and minor to moderate, and this alternative would contribute slightly to the overall cumulative effects. Under this alternative, because long-term impacts would be minor, there would be no impairment of archaeology, historic structures, the National Historic Landmark District, or ethnographic resources or values.

Wilderness

Alternative 2 would have long-term minor adverse impacts on wilderness character and values, and short-term moderate adverse impacts related to power tools and chain saw use. Some increase in visitor and administrative use of the spur trail and NLT in this area of wilderness would be expected as a result of abandoning the damaged section of WT. Access to some areas of wilderness would occasionally be limited when the foot log is washed out. However, these impacts on wilderness would be localized, mostly short-term, and minor. Trail construction to widen and improve the NLT would temporarily disrupt wilderness character and visitor experience.

Under this alternative, construction work would disrupt wilderness use and experience for approximately four months. Construction would initially include the use of chain saws to remove approximately 20 standing trees and many downed logs. (See draft Wilderness Minimum Requirement/Minimum Tool Analysis in Appendix A.) Chain saws would be run for no more than three hours a day for approximately 20 days. Hand tools would also be used over the four-month construction period. State conservation crews and an NPS trail crew would be working together on this project to minimize construction time and the duration of adverse effects on wilderness values. There would be no impairment of wilderness resources or values as a result of Alternative 2.

Cumulative Effects: The Carbon River watershed is a popular destination. Current wilderness infrastructure includes hiking trails, trail structures, backcountry campsites with toilets and bear poles, ranger cabins, fire lookouts, and scientific instrument installations. The majority of this infrastructure is concentrated along 22 miles of maintained trails, creating localized impacts on the wilderness landscape. When determined to be the wilderness “minimum tool” or during emergency situations, helicopters are occasionally used in the Carbon River drainage for a variety of park management tasks including trail and bridge maintenance and construction, human waste removal from backcountry camps, installation and service of seismic stations, search and rescue, wildland fire response, and animal surveys. The number of flights varies each year, depending on administrative and emergency needs. In addition, power tools, such as chain saws, may be used for removal of downed trees during annual trail maintenance. Existing facilities, trails, park operations, and periodic flights result in adverse, moderate cumulative effects to wilderness resources in the project area. The incremental impacts of Alternative 2, including the use of the NLT instead of the damaged section of the WT, widening of the NLT, the annual maintenance of the trail, and temporary lack of access during foot log outages, would be localized, short- and long-term, and minor to moderate, and would contribute slightly to the overall cumulative effects on wilderness in the Carbon River watershed.

Conclusion: Rerouting the WT to the NLT would have long-term minor adverse impacts on wilderness values, and short-term moderate adverse impacts related to power tool and chain saw use. Existing and foreseeable cumulative impacts would be direct and indirect, minor to moderate, and short- and long-term, and Alternative 2 would contribute slightly to the overall cumulative effects. Under this alternative, because long-term impacts would be minor, and short-term impacts would be moderate, there would be no impairment to wilderness values.

Natural Soundscape

This alternative would cause short-term disturbance to the soundscape during the four-month construction period. The increases in noise levels above ambient would be from use of hand tools and chain saws. Chain saws would be run for no more than 3 hours a day for up to 20 days. Chain saw and hand tool use would result in short-term minor to moderate adverse impacts on the natural soundscape. There would be no impairment of soundscapes as a result of Alternative 2. (See also Table 7: Decibel (dBA) Levels of Ambient and Human-induced Sounds.)

Cumulative Effects: Visitor use and park operations in the Carbon River area result in minor to moderate short-term adverse impacts on the natural soundscape. Prior to the flood-related closure of the Carbon River Road in 2006, the natural soundscape included vehicle traffic along the road to Ipsut Creek Campground. Trail maintenance, including use of hand tools and chain saws, creates localized, short-term, above-ambient noise. Helicopters and fixed-wing aircraft are occasionally used in the Carbon River drainage for a variety of park management tasks including trail and bridge maintenance and construction, human waste removal from backcountry camps, installation and service of seismic stations, search and rescue, wildland fire response, and animal surveys. The number of flights varies each year, depending on administrative and emergency needs. While wildlife surveys have been routinely conducted in the Carbon River drainage in the past, there has been increased aircraft use in the last few years associated with short-term research studies. In addition, military or civilian aircraft overflights (> 500 feet above ground level) may occasionally occur in the area. Park operations, visitor use, and overflights cumulatively affect soundscapes in the greater project area and occasionally affect sound in the direct vicinity of the project site. Above-ambient human-related sounds in the Carbon River drainage result in short-term, minor to moderate, adverse impacts on natural soundscapes. The minor to moderate incremental impacts of Alternative 2, including the short-term impacts of chain saw use, would contribute slightly to the overall cumulative effects on the natural soundscape.

Conclusion: Under this alternative, construction activities would result in short-term minor to moderate impacts on the natural soundscape. Routine use and maintenance of the trail would create short-term negligible to minor impacts on the natural soundscape. This alternative would contribute slightly to the cumulative effects on soundscapes in the Carbon River watershed. Because impacts would be short-term and no more than moderate, there would be no impairment of the natural soundscape.

Visitor Use and Experience

This alternative would result in a well-constructed trail that would retain the character-defining features and standards associated with the historic WT. Upgrading the NLT to WT standards would result in long-term minor beneficial impacts on visitor use and experience in Carbon River area. Trail construction activities and periodic flooding of the spur trail/loss of foot logs would create short-term minor adverse impacts. During construction, the trail would be closed to visitors for short periods of time. The use of chain saws and power tools would create noise louder than the ambient noise that visitors would normally experience when traveling through the area.

Cumulative Effects: Maintenance occurs along 22 miles of trails in the Carbon River drainage. Occasionally these activities have minor short-term impacts on visitor use and experience. Damage to and closure of the Carbon River Road has affected vehicle access to the Ipsut Creek Campground and trailhead and has created substantial changes in visitor use and experience of the road and its related trailheads. Future flooding may have impacts on other sections of trail in the Carbon River drainage and could create additional impacts to visitor use and enjoyment because of temporary trail closures or repair activities. In general the trail maintenance program provides safe trails for visitor use and has long-term moderate beneficial impacts to visitor use and experience. Under Alternative 2, the short-term minor adverse and long-term minor beneficial impacts on visitor use would slightly contribute to the cumulative effects of Carbon River area infrastructure, trail maintenance, and park operations on visitor use and experience.

Conclusion: Alternative 2 would result in long-term minor beneficial and short-term minor adverse impacts on visitor use and experience. This alternative would contribute slightly to the short- and long-term minor to major cumulative effects on visitor use and experience in the Carbon River drainage.

Park Operations and Safety

Under this alternative, the damaged WT segment would be abandoned, and an improved NLT would be used to access the Carbon Glacier area by park rangers for backcountry patrols and search and rescue efforts. The spur trail and foot log crossings that provide access to the NLT would be subject to flooding. During foot log outages, the trail crew would need to mobilize quickly to replace the foot logs to enable continued use of the route, and other trail work would be put on hold. Delays in foot log replacement might occur if the washout occurred during the crew's days off or if other trail repairs were a higher priority. Alternative 2 would result in short-term minor adverse and long-term minor beneficial impacts on park operations and visitor safety.

Cumulative Effects: Trail infrastructure in the Carbon River area facilitates park operations and visitor safety by providing access to visitor destinations along safe and reliable routes. In general, Carbon River area trails are constructed to a high standard to minimize recurring maintenance and repair. The trail system creates moderate long-term beneficial impacts on park operations and safety in the Carbon River area. Trail maintenance activities may create localized short-term negligible to minor adverse impacts on park operations and safety. Closure of the flood-damaged Carbon River Road has resulted in substantial changes in park operations in the Carbon River area. Under this alternative, abandonment of the damaged section of the WT and use of an improved NLT would result in long-term minor beneficial and short-term minor adverse impacts that would add slightly to the cumulative effects on park operations and safety.

Conclusion: The trail improvement under Alternative 2 would cause minor long-term beneficial impacts on park operations and safety and minor short-term adverse impacts during trail construction and during spur trail/foot log outages from periodic flooding. Alternative 2 would contribute slightly to the overall cumulative effects on park operations and visitor safety in the Carbon River area.

ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVE 3: Reroute Trail to Higher Ground (Management Preferred and Environmentally Preferred Alternative)

Under this alternative, 1,500 feet (0.28 mile) of new trail would be constructed in designated wilderness to bypass the flood-damaged area and relocate the route to higher ground. Trail construction activities would result in removal of soil duff and organic layers as well as approximately ten trees and 0.2 acre of understory vegetation to reach mineral soil.

The trail would connect with the undamaged sections of the WT and would be located just upslope of the damaged trail section. The new alignment would generally run through forest and across open rock slopes and bedrock cliffs, beginning at an elevation of approximately 2,840 feet and ending at approximately 3,200 feet. New trail would be constructed to the same historic standards as the original trail, including a 24- to 36-inch-wide tread at a 5 to 15 percent grade. Backsloping would also be incorporated into the new trail with drain logs or drain dips as needed. Two switchbacks across a slope covered in vine maple would also be required. The trail would then follow the contours up the valley with a trail grade comparable to the former trail. Where the trail crosses the 500 feet of bedrock cliff, explosives would be used to remove rock in order to create a bench wide enough to hike along.

Tools and equipment necessary to construct the trail would likely include axes, rockbars, shovels, pulaskis, McCleods, chain saws, air compressor, pneumatic rock drill, and explosives. A type-III helicopter (Bell Jet Ranger or similar) would be used to fly the air compressor, hoses, and pneumatic rock drill to and from the site.

Air Quality and Greenhouse Gases

There would be numerous short-term, minor adverse impacts to local air quality from the use of chain saws, an air compressor and other power tools, helicopter flights, and blasting. These activities are required for tree felling, stump removal, log relocation, transporting equipment, and blasting bedrock to create a bench for the trail. A small amount of greenhouse gases would be generated from vehicle use to get to and from the trailhead, helicopter use, and power tool and chain saw use. Alternative 3 would not impair air quality or other air resources or values.

Cumulative Effects: Prior to the road closure caused by the 2006 flood, typical sources of impacts to air quality included road maintenance using heavy equipment, visitor and park administrative use of passenger vehicles, campfires at the Ipsut Creek Campground, trail maintenance using power tools on 22 miles of trails, periodic wildland fires, and occasional helicopter use. Normally, road maintenance using heavy equipment begins in April with grading of the Carbon River Road. However, the road is currently closed due to flood damage, and preliminary options for addressing which former corridor area services to restore and what new opportunities may be appropriate are being considered. Historically, passenger vehicles were operated in the Carbon River drainage year round, with peak use from May through October. The Ipsut Creek Campground is open year round and includes 31 campsites, each with an individual fire grate. Trail maintenance is conducted from late March through mid-October, with most power tool use in April and May during trail opening. Over the past ten years there have been small wildfires in the Carbon River drainage, and these fires were suppressed. However, wildland fires in the future may instead be allowed to burn under the strategy of Wildland Fire Use for Resource Benefits.

Helicopters are occasionally used in the Carbon River drainage for a variety of park management tasks including trail and bridge construction, human waste removal from backcountry camps, search and rescue, wildland fire response, and wildlife surveys. The number of flights varies each year, primarily in response to natural, catastrophic, or emergency events. Use of heavy equipment and power tools, campfires, wildland fires, park and visitor vehicle operation, and periodic flights result in minor adverse cumulative effects on the air quality in the Carbon River drainage. The impacts on air quality of Alternative 3, including trail construction and the annual maintenance of the trail, would be localized, short-term, and minor and would contribute slightly to the overall cumulative effects on air quality.

Conclusion: The reroute of the WT under Alternative 3 would have numerous, short-term minor adverse impacts on air quality related to helicopter use, power tool use, and blasting operations. Helicopter flights, administrative vehicle use to and from the trailhead, and power tools would generate a small amount of greenhouse gases. Existing and reasonably foreseeable cumulative impacts would be direct and indirect, short-term and minor, and this alternative would contribute slightly to the overall cumulative effects. Under this alternative, because impacts would be minor, there would be no impairment of air quality.

Geology and Exposure to Geologic Hazards

Under this alternative, the rerouted trail would be in a Case I Debris Flow Zone rather than a Case III Debris Flow Zone. The rerouted section of trail would likely survive future outburst floods and debris flows that recur at a frequency of less than 500 years. Moving the trail to higher ground would substantially reduce visitor and trail exposure to geologic hazards in the localized area. Blasting of bedrock to create a 4-foot-wide trail bench along 500 feet of trail would cause minor long-term adverse impacts on geologic resources. There would be no impairment of geologic resources.

Cumulative Effects: The Carbon River watershed is a popular destination, and infrastructure built to accommodate visitor and operational needs is located in geologic hazard areas within the watershed. Impacts on geology and geologic hazards include road maintenance and repair using heavy equipment and visitor and park administrative use of the Ipsut Creek Campground. Work occurs in both Case II and III Debris Flow zones along the Carbon River. The Ipsut Creek Campground is in a Case III zone. Road maintenance and repairs and campground use have resulted in long-term minor adverse cumulative effects on geologic resources and substantial exposure to geologic hazards in the Carbon River drainage. The long-term beneficial impact of Alternative 3, including removing visitors, employees, and trail infrastructure from exposure to Case III debris flows in a localized area, would slightly reduce the overall cumulative risk from geologic hazards. The long-term minor adverse effect on bedrock would contribute slightly to the overall cumulative effects on geologic resources.

Conclusion: Rerouting the WT to higher ground would reduce impacts from geologic hazards in a localized area since the trail would be out of the Case II and Case III Debris Flow Zones. Alteration of bedrock would result in minor long-term impacts to local geology. Cumulative impacts would be direct and indirect, short- and long-term, and minor to major, and this alternative would contribute slightly to the overall cumulative effects. Under this alternative, because exposure to geologic hazards would be reduced, and impacts on geology would be minor, there would be no impairment of geologic resources.

Soils

Construction of 0.28 mile of new trail tread in a previously undisturbed area would disturb approximately 0.2 acre of soil and would result in moderate short-term and minor long-term localized adverse impacts on soils. Using hand tools, trail workers would remove topsoil and duff to reach mineral soil, and the topsoil and duff would then be side cast as part of cut and fill operations. This would result in mixing of soil layers and an area initially subject to erosion prior to plant re-establishment.

Cumulative Effects: In the greater project area in the Carbon River drainage, 16 wilderness campsites, 31 Ipsut Creek Campground sites, 22 miles of maintained trails, and 4.5 miles of road have affected soils. The total human-caused disturbance to soil is approximately 35.2 acres, or 0.13 percent of the Carbon River watershed inside the park. Alternative 3 would add about 0.2 acre to this total. Because Alternative 3 would create minor to moderate impacts on soils, it would contribute slightly to the overall minor to moderate cumulative effects on soils in the Carbon River drainage.

Conclusion: There would be moderate short-term and minor long-term direct and indirect adverse impacts to soil in the immediate project area. Alternative 3 would contribute slightly to the long-term minor to moderate cumulative impacts on soils. Because the impacts from this alternative would be moderate over the short term, minor over the long term, and limited to the local area, there would be no impairment of soils or their associated values.

Vegetation

There would be long-term minor to moderate adverse impacts on vegetation in the immediate project area. Approximately 10 trees would be removed along the proposed reroute under this alternative. These trees would all be less than 20 inches in diameter. The following species would be affected: western hemlock, Pacific silver fir, western red-cedar, and Douglas-fir. Although over time natural thinning of these trees would eventually occur, the removal of these trees to create a trail corridor would not mimic this natural thinning. Construction of 0.28 mile of new trail tread in a previously undisturbed area would disturb approximately 0.2 acre of vegetation. Where possible, vegetation would be salvaged and replanted in appropriate disturbed areas adjacent to the trail reroute.

The understory shrubs in the reroute include vine maple (*Acer circinatum*), Sitka alder (*Alnus sinuata*), Barclay's willow (*Salix barclayi*), Sitka mountain ash (*Sorbus sitchensis*), devil's club (*Oplopanax horridus*), and Cascade bilberry (*Vaccinium deliciosum*). The understory vegetation includes vanilla leaf (*Achlys triphylla*), twin flower (*Linnaea borealis*), trillium (*Trillium ovatum*), bead lily (*Clintonia uniflora*), pipsissewa (*Chimaphila umbellata*), and western rattlesnake plantain (*Goodyera oblongifolia*). The following ferns are found in the reroute area: sword fern (*Polystichum munitum*), deer fern (*Blechnum spicant*), bracken fern (*Pteridium aquilinum*), lady fern (*Athyrium felix-femina*), Canadian rockbrake (*Cryptogramma canadensis*), and American rockbrake (*Cryptogramma acrostichoides*). In addition, there are graminoids (grasses, sedges, and rushes) and a wide variety of mosses and liverworts in the reroute area.

At least one exotic species, foxglove (*Digitalis purpurea*), is found near the area of the proposed construction. Before construction would begin, the area would be surveyed for foxglove and other exotics. Before and during construction, any observed exotic plants would be manually removed and disposed of in order to manage non-native species in the project area and to prevent them from spreading elsewhere.

Cumulative Effects: In the Carbon River watershed, 16 wilderness campsites, 31 Ipsut Creek Campground sites, 22 miles of maintained trails, and 4.5 miles of road have affected vegetation. Approximately 36.5 acres of vegetation, or 0.14% of the vegetation within the watershed, are disturbed due to park infrastructure, visitor use, and administrative activities. The localized impacts of the reroute would add an additional 0.2 acre to this total. Because it would result in minor to moderate adverse impacts, this alternative would contribute slightly to the overall minor to moderate cumulative effects on vegetation in the Carbon River drainage in the park.

Conclusion: There would be long-term minor to moderate adverse impacts on vegetation in the immediate project area. Alternative 3 would impact an additional 0.2 acre of vegetation and would contribute slightly to the long-term minor to moderate cumulative impacts on vegetation. Because the impacts from this alternative would be localized and minor to moderate, there would be no impairment of vegetation.

Water Resources

This alternative would reroute the trail above the river and floodplain and would not cross any permanent streams. There may be indirect short-term negligible to minor impacts to water resources during construction as a result of small-charge blasting of bedrock that may deposit some debris or fly rock into the Carbon River below. A total of 100 shots would be expected to occur during the six months of construction. Following each blast, a small amount of debris might reach the Carbon River, which is 50 to 100 feet below the proposed blasting site.

Cumulative Effects: Annual maintenance of culverts, bridges, and foot logs along 22 miles of trail in the Carbon River area create minor short-term impacts on water resources. There are also minor short-term impacts to water resources from park roads in the Carbon River drainage. Other sources of impacts in the Carbon River area include the vault toilets in the Ipsut Creek Campground and at the Carbon River Entrance. These systems are currently functioning properly and have negligible effects on the water resources of the area. Negligible to minor impacts from the construction of new trail tread would contribute slightly to the overall cumulative effects on water resources in the Carbon River drainage.

Conclusion: Negligible to minor short-term impacts on water resources would occur in the immediate project area during construction of the reroute. Alternative 3 would contribute slightly to the long-term minor cumulative impacts on water resources. Because the impacts from this alternative would be short-term and negligible to minor, there would be no impairment of water resources.

Floodplains

There would be long-term minor beneficial impacts on Carbon River floodplain functions and visitor safety, because the new trail segment as proposed under this alternative would be removed from the floodplain. There would be short-term negligible adverse impacts from fly rock as a result of blasting. There would be no impairment of floodplains or their values as a result of Alternative 3.

Cumulative Effects: In the greater project area within the park's Carbon River drainage, there are numerous areas where park infrastructure, including roads and trails, is in the floodplain. There are negligible to minor impacts on floodplain functions from the use and maintenance of these facilities. Under Alternative 3, the trail segment would be rerouted above the floodplain and would thus have a slightly beneficial impact on floodplain functions and would slightly reduce flood risks to infrastructure and hikers in the Carbon River area.

Conclusion: This alternative would result in minor long-term beneficial impacts on Carbon River floodplain functions and would reduce flood risks to trail infrastructure and hikers along the rerouted segment of trail. Short-term negligible impacts would result from blasting during construction. There would be no impairment of floodplains.

Wetlands

U.S. Fish and Wildlife Service National Wetlands Inventory (NWI) maps and field surveys were used to identify potential wetlands in the vicinity of the proposed project area. There would be negligible impacts on wetlands because no wetlands are located in the vicinity of the proposed reroute of the WT.

Cumulative Effects: In the greater project area in the Carbon River drainage, there are numerous areas where trails and roads pass through wetlands. Some of these existing trails and roads influence water flow through wet areas, resulting in minor impacts on wetlands. The negligible impacts on wetlands resulting from Alternative 3 would not contribute measurably to the overall cumulative effects on wetlands in the Carbon River drainage.

Conclusion: There would be negligible impacts on wetlands in the immediate project area. Alternative 3 would not contribute measurably to the long-term minor cumulative impacts on wetlands. Because the impacts from this alternative would be negligible, there would be no impairment of wetlands.

Wildlife

Wildlife abundance and/or distribution surveys have not been conducted in the project area. This analysis is based upon available habitat information and wildlife observations recorded by trail users and staff in the area. While it is unknown how important this area is to wildlife and what specific species would be disturbed or displaced, it is likely that aspects of trail work, particularly noise and human activity, would create a short-term disturbance to nearby wildlife, including birds, amphibians, reptiles, invertebrates, and large and small mammals (including bats). Mobile wildlife would probably avoid the area during the construction period and be displaced to other locations in the Carbon River area. Once trail work was completed, some wildlife would likely return to the area. Some mortality to less mobile species would be expected during construction. Amphibians in large downed logs in the project area and small mammals that burrow nearby would likely be adversely affected by trail

construction activities, particularly during removal of large logs and woody debris. These affects would be minimized by crews carefully moving logs and woody debris located within the construction zone.

Noise generated by trail construction would be greater than that associated with normal visitor and administrative use and maintenance of the WT. Reroute construction would limit wildlife presence near the construction area, especially during daylight hours. Periodically, noise from chain saws, power tools, air compressor, pneumatic drill, rock hammer, helicopter, and blasting would be higher than the surrounding ambient noise. Chain saws would be run for about 2 hours a day for a total of approximately 30 days. In order to minimize the noise and rotor wash impacts from helicopter flights, a type-III helicopter (Bell Jet Ranger or similar) would be used to transport the blasting equipment (which would be too heavy to transport by other means). The helicopter flights and blasting activities would occur after August 5 to minimize effects on special status wildlife species. Work would end in October or November each of the construction years, depending on weather and work progress. In order to drill holes in bedrock, an air compressor and pneumatic rock drill would be used for a maximum of 3 hours a day over a period of 3 months (during the August 6 through October window). Over the course of construction, there may be as many as 100 small charges of two pounds or less of explosives used for blasting. The shots would take place between August 6 and early November during the years of construction. All blasts would occur at least 2 hours after sunrise and 2 hours before sunset. There would be 2 to 6 shots per week. Sound would likely be above ambient for up to a mile away from the blast.

Construction activities under this reroute alternative are expected to have long-term minor and short-term moderate adverse impacts on wildlife as a result of the loss of 0.2 acre of habitat, minor forest/understory fragmentation, and the noise disturbance associated with construction of the trail. There would be no impairment of park wildlife.

Cumulative Effects: Existing and reasonably foreseeable use and maintenance of trails, roads, visitor facilities, and campgrounds create localized minor to moderate adverse impacts on wildlife in the Carbon River area through human presence, noise and other disturbance from maintenance projects, and through habitat loss, fragmentation, or alteration. Under Alternative 3, construction activities, including drilling, blasting, and helicopter and chain saw use; ongoing maintenance and use of the trail; and disturbance of 0.2 acre of habitat would contribute to the overall cumulative impacts on wildlife.

Conclusion: Under Alternative 3, there would be moderate short-term impacts on wildlife during construction, and minor long-term impacts associated with habitat loss and use of the trail. Because long-term impacts are expected to be minor and short-term impacts moderate, these impacts would not constitute impairment of park wildlife.

Special Status Species and Critical Habitat

Determinations of effect are described below for Federally Listed Species expected to be impacted by Alternative 3. The three levels of effect, based upon Section 7 of the Endangered Species Act are (a) No Effect (NE); (b) May Affect, Not Likely to Adversely Affect (NLAA); and (c) May Affect, Likely to Adversely Affect (LAA). State and federal special status are discussed as applicable.

Northern Spotted Owl and Marbled Murrelet: There is no suitable marbled murrelet or northern spotted owl nesting habitat within 65 yards of the project area. As many as 10 trees less than 20 inches in diameter may be removed. None of these trees are suitable nesting habitat for either marbled murrelets or northern spotted owls.

The nearest known northern spotted owl activity site core area is approximately 0.3 mile away (the center of this core area is approximately 0.5 mile away). There are 600 acres of occupied suitable marbled murrelet habitat within one mile of the project site. In order to minimize the noise and rotor wash impacts from helicopter flights, a type-III helicopter (Bell Jet Ranger or similar) would be used to transport the blasting equipment (which would be too heavy to transport by other means). Over the course of construction, there may be as many as 100 small charges of two pounds or less of explosives used for blasting. There would be 2 to 6 shots per week. Sound would likely be above ambient for up to a mile away from the blast.

Noise disturbance from chain saws or other power tools may occur from July through November. The helicopter flights and blasting activities would occur after August 5 to minimize effects on breeding and nesting marbled murrelets and spotted owls. Work would end in October or November each of the construction years, depending on weather and work progress. In order to drill holes in bedrock, an air compressor and pneumatic rock drill would be used for a maximum of 3 hours a day over a period of 3 months (during the August 6 through October window each year of construction). Chain saws, other power tools, and blasting and drilling equipment would only be used between 2 hours after sunrise and 2 hours before sunset to minimize disturbance.

The effect determination for removal of 10 trees, power tool use, compressor use, helicopter use, and blasting activity and would be “may affect, not likely to adversely affect” for both northern spotted owl and marbled murrelet.

Bull Trout, Chinook Salmon, and Steelhead: During the blasting operations, debris would be expected to fall on the hillside immediately below the construction zone. In order to minimize or prevent debris from reaching the Carbon River, each charge would use less than two pounds of explosive. However, there is the possibility small amounts of fly rock might fall into the riverbed, which in 2007 was flowing near the base of the cliff that the trail would be built through. The Carbon River is rearing and foraging habitat for all three of these listed salmonid species and is considered critical habitat for bull trout. The possibility of some small amounts of debris falling into the riverbed “may affect, but is not likely to adversely affect” Chinook salmon, steelhead, bull trout, and bull trout critical habitat.

Bald Eagle and Peregrine Falcon (federal special concern species): There is no known nesting habitat for bald eagle or peregrine falcon in the immediate project area. There is suitable nesting habitat for peregrine falcon within one mile of the project area, and noise disturbance from blasting activities “may affect, but is unlikely to adversely affect” peregrine falcon.

Gray Wolf, Canada Lynx, Grizzly Bear, and Fisher: These species are considered extirpated from the park. Although recent (within the last 10 years or so) unconfirmed reports of all four species have been noted, they have not been detected in park-wide hair-snag and scent-station surveys. There would be no effect on gray wolf, Canada lynx, grizzly bear, or fisher.

Special Status Plant Species: No federal threatened or endangered species are currently known to occur at MORA. No surveys for rare, sensitive, threatened or endangered plants were conducted during site assessments, but habitat conditions within the reroute zone could potentially support several listed species. A survey for sensitive, threatened, or endangered plants would be conducted before any work on the project begins. If special status plants were found, to the extent possible they would be avoided during construction or, if necessary and feasible, salvaged and replanted in appropriate habitat elsewhere (transplanting survival rates for these species may be low). Impacts on special status plant

species would be negligible to minor, and there would be no impairment of rare or listed plants or the values for which they have been protected.

Cumulative Effects: In the Carbon River watershed, trails, roads, visitor facilities, and campgrounds are associated with habitat loss and fragmentation, maintenance activities, power tool use, helicopter operations, and human presence on about 35 acres, or about 0.13 percent of the watershed. Existing infrastructure and ongoing and reasonably foreseeable park maintenance activities, including power tool use and helicopter flights, cause short- and long-term, direct and indirect, minor to moderate impacts on sensitive, threatened, and endangered species. Because the impacts associated with Alternative 3 would be moderate over the short term and minor over the long term, Alternative 3 would contribute to the overall cumulative effects on sensitive, threatened, and endangered species and on critical habitat for bull trout.

Conclusion: Alternative 3 is not likely to adversely affect spotted owl or marbled murrelet, bull trout or bull trout critical habitat, Chinook salmon, steelhead, or the following species of concern: Coho salmon, coastal cutthroat, northern goshawk, golden eagle, peregrine falcon, Lewis's woodpecker, Vaux's swift, Pacific Townsend's big-eared bat, Cascades frog, western toad, Larch mountain salamander, and Van Dyke's salamander. This alternative is likely to adversely affect the following species of concern: pileated woodpecker, olive-sided flycatcher, long-eared myotis, and long-legged myotis. Impacts to special status species would be localized and negligible to moderate. Cumulative impacts would be direct and indirect, short- and long-term, and minor to moderate, and this alternative would contribute to the cumulative effects. Because impacts would be localized and no more than moderate, there would be no impairment of sensitive, threatened, and endangered species and critical habitat.

Cultural Resources

Archaeology

Alternative 3 would have negligible impacts on archaeological resources. Park archaeological surveys found no evidence of prehistoric archeological resources along the proposed reroute of the WT. Under this alternative, trail construction activities would proceed with the caveat that if any potential archeological resources were uncovered during work (inadvertent discovery), all activity would cease until the find could be evaluated by an archeologist. As appropriate, additional consultation with the State Historic Preservation Office or affected Native American Tribes would also occur.

Historic Structures

Alternative 3 would have minor long-term impacts on the Mount Rainier National Historic Landmark District. Both the WT and NLT are contributing elements of the Mount Rainier National Historic Landmark District. WT features, such as structures, signs, and trail design, would be incorporated into the reroute construction. Since this alternative would retain cultural resource values, including the character-defining features of the WT, it would have *no adverse effect* on the historic WT and the National Historic Landmark District. There would be no impairment of the WT and NHLD as a result of Alternative 3.

Ethnographic Resources

Alternative 3 would have negligible impacts on the ethnographic resources of the WT. There would be no impairment of ethnographic resources or values as a result of Alternative 3.

Cumulative Effects: The Carbon River area has experienced both pre-historic and historic use. Numerous historic artifacts associated with past mining activities continue to be affected by off-trail

hiking and other human impacts. In addition, undocumented archeological sites may be impacted by visitors. Flooding has affected the Carbon River Road and the Ipsut Creek Cabin, which like the WT, are contributing elements of the National Historic Landmark District. Existing and reasonably foreseeable cumulative impacts are direct and indirect, short- and long-term, and minor to moderate. The reroute of a section of the WT to higher ground would contribute slightly to the overall cumulative effects on cultural resources.

Conclusion: The reroute of the WT would have local, long-term minor impacts on cultural resource values. For the purposes of Section 106 of the National Historic Preservation Act, the determination of effect would be *no adverse effect*. Existing and reasonably foreseeable cumulative impacts would be direct and indirect, short- and long-term, and minor to moderate, and this alternative would contribute slightly to the overall cumulative effects. Under this alternative, because long-term impacts would be negligible to minor, there would be no impairment of archaeology, historic structures, the NHL, or ethnographic resources or values.

Wilderness

Alternative 3 would have long-term minor adverse and beneficial impacts on wilderness values, and short-term moderate adverse impacts related to power tool use, compressor use, helicopter use, and blasting operations. (See draft Wilderness Minimum Requirement/Minimum Tool Analysis in Appendix A.) In the long term, this alternative would not adversely affect opportunities for wilderness character and values, including wilderness recreation and experience, solitude, and other public wilderness purposes of scenic, scientific, educational, conservation, and historical use. About 0.28 mile of new trail tread would be constructed in designated wilderness to replace a damaged segment of the WT. Although trail construction activities would disrupt wilderness character and visitor experiences in the short term (during the six-month construction period over the course of two years), once the trail is in place, the effect of this segment of trail on overall wilderness values and character at Mount Rainier National Park would be minor. Currently, there are more than 260 miles of maintained trails in wilderness throughout the park.

Trail construction would include the use of chain saws to remove approximately 10 standing trees and many downed logs. Chain saws would be used for about two hours per day for no more than 30 days spread over an estimated six-month construction period during the 2008-2009 work seasons. Blasting and drilling would be required to create trail through a 500-foot section of bedrock. Blasting and drilling would begin after August 5 each year of construction. There would be 2 to 6 small charges per week adding up to a total of approximately 100 blasts during the course of the six-month construction period. All blasts would use 2 pounds or less of explosive. In order to drill holes in the bedrock, an air compressor and pneumatic rock drill would be used up to 3 hours a day during blasting operations. The air compressor and other power tools would be flown to the site using a type III (Bell Jet Ranger or similar) no earlier than August 6. The use of hand tools would also occur over the six-month construction period. Conservation crews and the NPS trail crew would be working together on this project to shorten the construction period and thus shorten the duration of adverse effects on wilderness values.

Cumulative Effects: The Carbon River watershed is a popular destination. Current wilderness infrastructure includes hiking trails, trail structures, backcountry campsites with toilets and bear poles, ranger cabins, fire lookouts, and scientific instrument installations. The majority of this infrastructure is concentrated along 22 miles of maintained trails, creating localized impacts on the wilderness landscape. When determined to be the wilderness “minimum tool” or during emergency situations, helicopters are occasionally used in the Carbon River drainage for a variety of park management tasks

including trail and bridge maintenance and construction, human waste removal from backcountry camps, installation and service of seismic stations, search and rescue, wildland fire response, and animal surveys. The number of flights varies each year, depending on administrative and emergency needs. In addition, power tools, such as chain saws, may be used for removal of downed trees during annual trail maintenance. Existing facilities, trails, park operations, and periodic flights result in adverse, moderate cumulative effects to wilderness resources in the project area. The incremental adverse impacts of Alternative 3, including construction of new trail tread and the annual maintenance of the trail, would be localized, short- and long-term, and minor to moderate, and would contribute to the overall cumulative effects on wilderness in the Carbon River watershed.

Conclusion: Constructing new trail tread to replace the damaged section of the WT would have long-term minor beneficial and adverse impacts on wilderness values, and short-term moderate adverse impacts related to blasting, drilling, helicopter use, and chain saw use. Existing and foreseeable cumulative impacts would be direct and indirect, minor to moderate, short- and long-term, and Alternative 3 would contribute to the overall cumulative effects. Under this alternative, because long-term impacts would be minor, and short-term impacts would be moderate, there would be no impairment to wilderness values.

Natural Soundscape

This alternative would cause short-term disturbance to the soundscape during the six-month construction period. Use of hand tools and chain saws, blasting and drilling, and helicopter flights would increase noise levels above ambient. Chain saws would be run for about 2 hours a day for up to 30 days. Over the course of the construction period, approximately 100 intermittent blasts would occur, and drilling would take up to three hours during each blasting cycle. Sound would likely be above ambient for up to a mile away from the blast. Helicopters would be used to transport the drilling and blasting equipment to and from the project site. Chain saw and hand tool use, blasting, drilling, and helicopter flights would result in short-term moderate adverse impacts on the natural soundscape. Because impacts would be short term and no more than moderate, there would be no impairment of soundscapes as a result of Alternative 3. (See also Table 7: Decibel (dBA) Levels of Ambient and Human-induced Sounds.)

Cumulative Effects: Visitor use and park operations in the Carbon River area result in minor to moderate short-term adverse impacts on the natural soundscape. Prior to the flood-related closure of the Carbon River Road in 2006, the natural soundscape included vehicle traffic along the road to Ipsut Creek Campground. Trail maintenance, including use of hand tools and chain saws, creates localized, short-term, above-ambient noise. Helicopters and fixed-wing aircraft are occasionally used in the Carbon River drainage for a variety of park management tasks including trail and bridge maintenance and construction, human waste removal from backcountry camps, installation and service of seismic stations, search and rescue, wildland fire response, and animal surveys. The number of flights varies each year, depending on administrative and emergency needs. While wildlife surveys have been routinely conducted in the Carbon River drainage in the past, there has been increased aircraft use in the last few years associated with short-term research studies. In addition, military or civilian aircraft overflights (> 500 feet above ground level) may occasionally occur in the area. Park operations, visitor use, and overflights cumulatively affect soundscapes in the greater project area and occasionally affect sound in the direct vicinity of the project site. Above-ambient human-related sounds in the Carbon River drainage result in short-term minor to moderate adverse impacts on natural soundscapes. The short-term minor to moderate impacts of Alternative 3 would contribute to the overall cumulative effects on the natural soundscape.

Conclusion: During construction, use of helicopters, power tools, and blasting would have direct, short-term moderate adverse impacts on the natural soundscape. Following construction, the level of impacts from subsequent visitor and administrative use and maintenance of the trail would return to former negligible to minor levels. Actions under Alternative 3 would contribute to the minor to moderate cumulative effects on soundscapes in the Carbon River Valley. Because no more than moderate short-term impacts would occur under this alternative, there would be no impairment of natural soundscapes.

Visitor Use and Experience

This alternative would result in a well-constructed trail that would incorporate the character-defining features and standards associated with the historic WT and would remove the trail from the floodplain. Rerouting the trail above the floodplain would create long-term moderate beneficial effects on visitor use and experience of this segment of the WT. Visitors would be able to continue to use the NLT reroute during construction, thus minimizing construction-related impacts. The use of chain saws, rock drills, helicopters, and explosives would create short-term minor adverse impacts on visitor use and experience during construction.

Cumulative Effects: Maintenance occurs along 22 miles of trails in the Carbon River drainage. Occasionally these activities have minor short-term impacts on visitor use and experience. Damage to and closure of the Carbon River Road has affected vehicle access to the Ipsut Creek Campground and trailhead and has created substantial changes in visitor use and experience of the road and its related trailheads. Future flooding may have impacts on other sections of trail in the Carbon River drainage and could create additional impacts to visitor use and enjoyment because of temporary trail closures or repair activities. In general the trail maintenance program provides safe trails for visitor use and has long-term moderate beneficial effects on visitor use and experience. Under Alternative 3, the short-term minor adverse and long-term moderate beneficial impacts on visitor use and experience would contribute to the cumulative effects of Carbon River area infrastructure, trail maintenance, and park operations on visitor use and experience.

Conclusion: Alternative 3 would result in long-term moderate beneficial and short-term minor adverse impacts on visitor use and experience of the WT in the Carbon River area. This alternative would contribute to the short- and long-term minor to major cumulative effects on the visitor use and experience in the Carbon River drainage.

Park Operations and Safety

Under this alternative, the damaged segment of the WT would be rerouted to higher ground above the floodplain, resulting in long-term moderate beneficial effects on park operations and safety. This alternative would provide a well-constructed trail that would require little annual maintenance once completed and would facilitate safe transport of injured or sick visitors. The trail would provide safe and reliable access to the Carbon Glacier and points east on the WT via the Carbon River suspension bridge. There would be some short-term minor adverse impacts during construction.

Cumulative Effects: Trail infrastructure in the Carbon River area facilitates park operations and visitor safety by providing access to visitor destinations along safe and reliable routes. In general, Carbon River area trails are constructed to a high standard to minimize recurring maintenance and repair. The trail system creates moderate long-term beneficial impacts on park operations and safety in the Carbon River area. Trail maintenance activities may create localized short-term negligible to minor adverse impacts on park operations and safety. Closure of the flood-damaged Carbon River Road has resulted in substantial changes in park operations in the Carbon River area. Under this alternative, reroute of the

WT to higher ground would result in long-term moderate beneficial and short-term minor adverse effects that would contribute to the cumulative effects on park operations and safety.

Conclusion: The trail reroute under Alternative 3 would cause moderate long-term beneficial impacts on park operations and safety and minor short-term adverse impacts during trail construction. Alternative 3 would contribute to the overall cumulative effects on park operations and visitor safety in the Carbon River area.

Chapter 5: Consultation and Coordination

Internal and External Scoping

Mount Rainier National Park conducted internal scoping with appropriate NPS staff and external scoping with the public and interested and affected groups, agencies, and tribes to determine the range of issues to be discussed in this Environmental Assessment. This interdisciplinary process defined the purpose and need, identified potential actions to address the need, determined the likely issues and impact topics, and identified the relationship of the alternatives to other planning efforts in the park.

Four preliminary alternative concepts were developed internally and were refined and released to the public, including affected tribes, for a 30-day comment period (April 16-May 15, 2008) as part of an early scoping process to identify issues, constraints, and other potential alternatives. Announcements inviting public input were mailed to individuals and organizations on the park's mailing list, area libraries, and area newspapers for publication. The announcement was also posted on the park's web page.

Early Scoping Responses

Preliminary options presented to the public included (1) allowing trail use to continue as is without repairing the damaged section of trail or formalizing the bypass via the NLT, (2) repairing the damaged section of trail in the existing alignment along the Carbon River, (3) formalizing the bypass via the NLT and closing the damaged section of trail, and (4) relocating the damaged Wonderland section to higher ground above the Carbon River flood zone.

Four individuals and one organization provided written comments. One group recommended the park explore an alternative that addresses long-term solutions to future trail damage along the Carbon River while limiting impacts to designated wilderness, the trail, and other park resources. This commenter also suggested an alternative that would re-designate the trail through Spray Park or other areas rather than down to Ipsut creek. (This alternative was not pursued because re-designation of the trail would not meet the purpose and need of the project to "maintain the historic alignment and character of the WT as closely as possible.") All respondents noted relocating the damaged section of the WT to higher ground above Carbon River could provide a long-term solution; however, one of the respondents did express concerns regarding blasting activities associated with this alternative and encouraged the park to apply the minimum requirement/minimum tool concept in order to protect wilderness values.

Issues of concern included impacts to the backcountry experience in undeveloped areas, including preserving opportunities for solitude and other wilderness values; habitat fragmentation; invasive weeds; increased predation; ensuring trail routes were out of the flood zone; and cumulative effects on the Carbon River watershed. One group that commented noted they were interested in the location of the spur trail and NLT, noting that if this alternative route is also in the flood zone of the Carbon River, it would not be a desirable alternative, particularly if constant replacement of the foot log bridge was required to keep the route open. A permanent bridge that could withstand high flow events was suggested as a potential solution to the foot log bridge issue.

All alternatives and associated issues raised during the early scoping process have been considered and/or evaluated in this document.

Consultation and Public Review

Consultation with the State Historic Preservation Officer (SHPO) was initiated on August 6, 2008. On August 19, the SHPO concurred with park findings of no adverse effect on cultural resources. This document will be sent to the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and affiliated tribes for review and comment as part of the consultation process. All required state and federal permits, surveys, and recommendations would take place prior to issuance of a decision document and implementation of trail work. A concurrent 30-day public review of this document will occur from September 17 through October 18.

Comments on this EA should be directed to:

Superintendent

Mount Rainier National Park

55210 238th Ave. East

Ashford, WA 98304

If results of consultation with these agencies indicate a potential for significant impacts despite mitigation measures, the park would prepare an Environmental Impact Statement (EIS). If reviewers do not identify substantial environmental impacts, this Environmental Assessment will be used to prepare a Finding of No Significant Impact (FONSI) which will be sent to the Regional Director, Pacific West Region for signature.

For additional copies of this document, please call Mount Rainier National Park at (360) 569-2211, extension 2301.

The following persons were consulted during the preparation of this Environmental Assessment:

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Randy King, Deputy Superintendent

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Susan Dolan, Historical Landscape Architect

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Larry Miranda, Environmental Protection Specialist

Heather Moran, Biological Technician

Ellen Myers, Biological Technician

Arnie Peterson, Cartographic Technician

Michael Powell, Resource Advisor

Barbara Samora, Biologist

Jim Schaberl, Wildlife Ecologist

Rob Wilcoxon, Resource Advisor

Ben Wright, Biological Technician

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Appendix A: *draft* Minimum Requirement Worksheets Carbon River Wonderland Trail Reroute Alternatives 2 and 3

STEP 1—DETERMINING THE MINIMUM REQUIREMENT (a two part process)

PART A—Minimum Requirement Key to Making a Determination on Wilderness Management Proposals

(This flow chart will help you assess whether the project is the minimum required action for administration of the area as wilderness. Answering these questions will help determine **IF** this action is really the **minimum required** action in wilderness.)

Guiding Questions

Is this an emergency? (i.e. a situation that involves an inescapable urgency and temporary need for speed beyond that available by primitive means, such as fire suppression, health and safety of people, law enforcement efforts involving serious crime or fugitive pursuit, retrieval of the deceased or an immediate aircraft accident investigation.)

If **Yes**, then:

Document rationale for line officer approval using the minimum tool form and proceed with action.

If **No**, then:

↓
go to next question

Does the project or activity conflict with the stated wilderness goals, objectives, and desired future conditions of applicable legislation, policy and management plans?

If **Yes**, then:

Do not proceed with the proposed project or activity.

If **No**, then:

↓
go to next question

Are there other less intrusive actions that should be tried first? (i.e. signing, visitor education, or information.)

If **Yes**, then:

Implement other actions using the appropriate process.

If **No**, then:

↓
go to next question

Can this project or activity be accomplished outside of wilderness and still achieve its objectives? (i.e. some group events.)

Use the available space or additional sheets as necessary.

Answer:	YES: <input type="checkbox"/>	NO: <input checked="" type="checkbox"/>
Explain:		

Answer:	YES: <input type="checkbox"/>	NO: <input checked="" type="checkbox"/>
Explain: The proposed alternatives are consistent with applicable laws, policy, and plans. NPS <i>Management Policies 2006</i> states “Trails will be permitted within wilderness when they are determined to be necessary for resource protection and/or for providing for visitor use for the purposes of wilderness.” Rerouting the Wonderland Trail to bypass damage caused by flooding will provide for recreation of park visitors in the wilderness. It will also protect wilderness resources by providing a safe travel route, thereby preventing off-trail trampling of natural and cultural resources in the area.		

Answer:	YES: <input type="checkbox"/>	NO: <input checked="" type="checkbox"/>
Explain: There are no other less intrusive actions that would meet the wilderness management objective to provide a safe, reliable, well-constructed trail to the Carbon Glacier area from Ipsut Creek and to preserve the continuity of the Wonderland Trail and the Mother Mountain Loop. The identified alternatives minimize or avoid to the extent practicable impacts on wilderness resources and values.		

Answer:	YES: <input type="checkbox"/>	NO: <input checked="" type="checkbox"/>
Explain: The trail provides visitors and park staff		

<p>If Yes, then:</p> <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0;"> Proceed with action outside of wilderness using the appropriate process. </div>	<p>If No, then:</p> <p style="text-align: center;">↓ go to next question</p>	<p>with access to the wilderness, which starts 200 feet from the trailhead. The damaged section of trail is in the wilderness.</p>
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<p>Is this project or activity subject to valid existing rights? (i.e. a mining claim or right-of-way easement.)</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Answer:</td> <td style="width: 35%;">YES: <input type="checkbox"/></td> <td style="width: 50%;">NO: <input checked="" type="checkbox"/></td> </tr> <tr> <td colspan="3" style="padding: 5px;">Explain:</td> </tr> </table>	Answer:	YES: <input type="checkbox"/>	NO: <input checked="" type="checkbox"/>	Explain:		
Answer:	YES: <input type="checkbox"/>	NO: <input checked="" type="checkbox"/>					
Explain:							

<p>If Yes, then:</p> <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0;"> Proceed to minimum tool section of this document, STEP 2. </div>	<p>If No, then:</p> <p style="text-align: center;">↓ go to next question</p>	
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<p>Is there a special provision in legislation (the 1964 Wilderness Act or subsequent wilderness legislation), that <u>allows</u> this project or activity? (i.e. maintenance of dams and water storage facilities with motorized equipment and mechanical transport or control of fire, insects and disease.)</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Answer:</td> <td style="width: 35%;">YES: <input checked="" type="checkbox"/></td> <td style="width: 50%;">NO: <input type="checkbox"/></td> </tr> <tr> <td colspan="3" style="padding: 5px;">Explain: Section 4(b) states that “each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character. Except as otherwise provided in this Act, wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use.” The existing historical trail was present when Mount Rainier Wilderness was designated in 1988. The Wilderness Act does not prohibit trails in wilderness.</td> </tr> </table>	Answer:	YES: <input checked="" type="checkbox"/>	NO: <input type="checkbox"/>	Explain: Section 4(b) states that “each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character. Except as otherwise provided in this Act, wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use.” The existing historical trail was present when Mount Rainier Wilderness was designated in 1988. The Wilderness Act does not prohibit trails in wilderness.		
Answer:	YES: <input checked="" type="checkbox"/>	NO: <input type="checkbox"/>					
Explain: Section 4(b) states that “each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character. Except as otherwise provided in this Act, wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use.” The existing historical trail was present when Mount Rainier Wilderness was designated in 1988. The Wilderness Act does not prohibit trails in wilderness.							

<p>If Yes, then:</p> <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0;"> The proposed project or activity can be considered but is not necessarily <u>required</u> just because it is mentioned in legislation. <i>Go to Part B, as needed.</i> </div>	<p>If No, then:</p> <p style="text-align: center;">↓ <i>Proceed to Part B, Responsive Questions</i></p>	
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PART B—Determining the Minimum Requirement

Responsive Questions for Minimum Requirements Analysis: Explain your answer in the response column. If your responses indicate potential adverse impacts to wilderness character, evaluate whether or not you should proceed with this proposal. If you decide to proceed, begin developing plans to mitigate impacts, and complete the Minimum Tool Analysis in this guide. Some of the following questions may not apply to your proposed project or activity.

RESPONSIVE STATEMENT	
EFFECTS ON WILDERNESS CHARACTER	
How does the project or activity benefit the wilderness resource as a whole as opposed to maximizing one resource?	Under either alternative 2 or 3, installing a safe trail from Ipsut Creek to the Carbon Glacier area and points east on the Wonderland Trail would allow visitors, employees, and researchers access to the Carbon River wilderness of Mount Rainier. Use of the trail is high, and a durable designated trail would foster use of a single trail rather than development of several informal unofficial trails and stream crossings that would adversely impact natural and cultural resources.
If this project or activity were not completed, what would be the beneficial and detrimental effects to the wilderness resource?	If the project by either action alternative were not completed, short-term construction-related impacts would be avoided, including soundscape disturbances from chain saws, helicopter use, or blasting. However, there would be loss of continuity of the historic Wonderland Trail, a wilderness cultural resource. Over the long term, <i>Alternative 2: Abandon the Damaged Segment of Trail and Reroute the Wonderland Trail to the Northern Loop Trail</i> would have some beneficial effect on the wilderness resource because hikers would be able to use a well-constructed trail built to Wonderland Trail standards to reach

	<p>wilderness destinations.</p> <p>Over the long term, <i>Alternative 3: Reroute Trail to Higher Ground</i> would have greater beneficial effects on wilderness values than Alternative 2 because the rerouted trail segment would not be vulnerable to flood damage. As a result, future disturbances to wilderness resources caused by temporary trail closures and trail reconstructions would be avoided.</p>
How would the project or activity help ensure that human presence is kept to a minimum and that the area is affected primarily by the forces of nature rather than being manipulated by humans?	Under each action alternative, once the project was completed, human presence and manipulation would not be expected to be greater than what was typical under pre-flood conditions. That is, implementation of either of the action alternatives will not result in additional miles of trail or incursions in wilderness but will replace what was lost in the flood. The trail would minimize the influence of humans on the wilderness by providing a designated route rather than allowing proliferation of multiple social trails throughout the wilderness. Effects related to construction would be relatively short-term (two seasons of construction) and would be minimized, mitigated, or avoided to the extent practicable.
How would the project or activity ensure that the wilderness provides outstanding opportunities for solitude or a primitive and unconfined type of recreation? (i.e. does the project or activity contribute to people's sense that they are in a remote place with opportunities for self-discovery, adventure, quietness, connection with nature, freedom, etc.)	Providing a safe trail to the Carbon Glacier area will allow visitors to access large areas of the wilderness where there are outstanding opportunities for solitude and a primitive and unconfined recreation.
MANAGEMENT SITUATION	
What does your management plan, policy, and legislation say to support proceeding with this project?	The General Management Plan and Wilderness Plan support having trails in this zone of the park, the semi-primitive trail zone.
How did you consider wilderness values over convenience, comfort, political, economic or commercial values while evaluating this project or activity?	The purpose of the trail is to enable visitors to experience wilderness in the Carbon River area while minimizing impacts on wilderness resources. The trail under either action alternative would provide a safe route into wilderness while minimizing impacts on wilderness resources and values through trail design, siting considerations (minimizing removal of vegetation, avoiding sensitive resources, etc), and identification and implementation of conservation measures.
<u>SHOULD WE PROCEED?</u>	<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <u>YES:</u> Go to Step 2 </div> <div style="text-align: center;"> NO: Stop </div> </div>

Note: Additional sheets deleted in favor of analysis in Environmental Assessment

STEP 2—DETERMINING THE MINIMUM TOOL

Mount Rainier National Park Draft Minimum Tool Analysis

Carbon River Wonderland Trail Reroute—Environmental Assessment Alternative 2 Abandon the Damaged Segment of Trail and Reroute the Wonderland Trail to the Northern Loop Trail

PEPC ID # 14989
YR 2008

Completed By Project Manager

1. One time project? ☒ Yes or ☐ No Recurring? (how often) _____

2. Project/Action Location and Description:

Alternative 2: Abandon the Damaged Segment of Trail and Reroute the Wonderland Trail to the Northern Loop Trail

Under this alternative, 0.8 miles of the Wonderland Trail on the west side of the Carbon River would be abandoned. The Wonderland Trail from Ipsut Creek would be rerouted across the Carbon River via the “lower crossing,” which consists of footlog bridge crossings along an existing spur trail to the Northern Loop Trail. The reroute would follow the Northern Loop Trail on the east side of the river and would then rejoin the Wonderland Trail at the Carbon River suspension bridge below the Carbon Glacier.

The segment of the Northern Loop Trail that the Wonderland Trail would be rerouted onto does not currently meet Wonderland Trail standards (as defined in the National Historic Landmark designation). Under Alternative 2, this 0.7-mile segment of the Northern Loop Trail would be upgraded to meet Wonderland Trail standards and would officially become part of the Wonderland Trail. Upgrades would include increasing trail width by 1 to 2 feet, improvement of tread, and removal of downed trees. Trail widening would result in removal of soil duff and organic layers, approximately 20 trees (all less than 20 inches in diameter), and 0.5 acre of vegetation to reach mineral soil. This method of construction would create a reasonably sustainable trail, and the improved trail section, which is located above the floodplain, would require minimum routine maintenance. Following completion of the reroute, which is expected to take 4 months over the course of the 2008 and 2009 seasons, major trail maintenance for this section in wilderness would likely take place every five years. Removal of downed trees would likely be required more frequently. Foot log replacement, re-delineation of the trail through the river bar, and minor maintenance, such as repair of drains and check dams, would be expected to occur annually.

Tools and equipment needed to improve the trail (digging through roots and duff to mineral soil, clearing downed logs, etc.) would likely include axes, rockbars, shovels, chain saws, pulaskis, and McCleods. Chain saws would be required for removing logs and downed trees and constructing stream crossings. Expected chain saw use would be for a maximum of 3 hours per day for approximately 20 days.

3. Mechanized equipment requested? ☒ Yes ☐ No

Chain Saw <input checked="" type="checkbox"/>	Power Tools <input type="checkbox"/>	Helicopter <input type="checkbox"/>	(A70 # _____)
Rock Drill <input type="checkbox"/>	Generator <input type="checkbox"/>	Fixed Wing <input type="checkbox"/>	(A70 # _____)
Explosives <input type="checkbox"/>	Snowmobile <input type="checkbox"/>	Other _____	

4. Date(s) of Action: 2008, 2009 seasons Duration: Approximately 4 months

5. Describe alternative(s) on how task would be accomplished without use of mechanized equipment and/or less intrusive actions:

Implementing Alternative 2 without mechanized equipment would involve using hand tools such as hand saws, crosscut saws, and axes. The work would include felling 20 trees, cutting logs off the trail that are up to 4 ft. in diameter, shaping and moving logs for footlog and bridge construction, cutting materials for railings, and clearing trailside brush. Tasks that typically take minutes using a chain saw would require hours or even days to complete and would expose workers to additional felling hazards.

6. Describe impacts to wilderness resource/values AND visitor use of above alternatives:

Implementing Alternative 2 using only hand tools would lessen the effects of noise disturbance on wilderness resources and visitor experience. Project time would be increased, however, resulting in the prolonged presence of work crews, a longer period of trail closure, and greater resource damage related to use of informal routes and stream crossings.

The use of chain saws would cause brief, intermittent noise impacts on wilderness resources and values, but would allow crews to complete tasks in a timely manner to create a safe and clear route for hikers. Timely project completion would also reduce effects on resources caused by the prolonged use of informal routes and river crossings.

Signature:

Date:

Project Manager/Trails Supervisor

Completed By Wilderness Coordinator

7. Minimum Requirement Analysis: Is the project or activity consistent with, or necessary, to meet the minimum requirements for the administration of the area as wilderness, without imposing a significant impact to the wilderness resources, and character?

Yes, improving this section of trail is critical for Wonderland Trail continuity.

8. Minimum Tool Analysis: Will the selected tool or method used to complete the project result in the least overall impact to the physical resources and experiential qualities (character) of wilderness?

The use of chain saws during the improvement of this section of trail will enable the work to be completed in a timely manner. This will result in fewer resource impacts as the trail will be able to handle the increased number of visitors that utilize this section of trail as a result of the flood damage. Fewer visitors will need to endure the trail construction activities; however, they will be exposed to short duration noise impacts from chain saw use. The faster timeframe of completion of this project will allow other trail projects to be completed which would have a beneficial effect upon resources and wilderness character.

9. Describe the beneficial and detrimental effects on wilderness values if the selected alternative is accomplished.

The beneficial effect will be that the Wonderland Trail will be restored in a shortened timeframe to maximize visitor experience opportunities. The detrimental effect will be that visitors who enter the trail construction site may experience short term noise impacts from chain saw use.

Recommendation: _____

Signature: _____ Date: _____
Wilderness Coordinator

Recommendation: _____

Signature: _____ Date: _____
Environmental Compliance Specialist

Recommendation: _____

Signature: _____ Date: _____
Superintendent

Comments:

Mount Rainier National Park
Draft Minimum Tool Analysis
Carbon River Wonderland Trail Reroute—Environmental Assessment Alternative 3 Reroute Trail
to Higher Ground
(Management Preferred Alternative)

PEPC ID # 14989
YR 2008

Completed By Project Manager

1. One time project? ☒ Yes or ☐ No **Recurring? (how often)** _____

2. Project/Action Location and Description:

Alternative 3: Reroute Trail to Higher Ground

Under this alternative, 1,500 feet (0.28 mile) of new trail would be constructed in wilderness to bypass the section of trail washed away by the flooding in 2006. This new section of trail would be removed from proximity of the river, therefore eliminating threats from future flood events. The new alignment would generally run through forest, across open rock slopes and bedrock cliffs, beginning at an elevation of approximately 2,840 feet and ending at approximately 3,200 feet. It would be constructed to the same historic standards of the original trail, which included a 24 to 36 inch wide tread at a 5% to 15% grade. Backsloping would also be incorporated into the new trail with drain logs or drain dips as needed. Two switchbacks across a slope covered in vine maple would also be required. The trail would then follow the contours up the valley with a trail grade comparable to the former trail.

Tools and equipment necessary to construct the trail would include axes, rockbars, rock drills, air compressor, small explosive charges (ANFO and ammonium nitrate packaged emulsion), shovels, chain saws, pulaskis and McCleods. A type III helicopter (Bell Jet Ranger or similar) would fly the air compressor, hoses, and pneumatic rock drill to and from the site.

Tools required to remove sections of bedrock to build trail tread would include an air compressor, pneumatic rock drill, and explosives. Holes would be drilled in the bedrock with the pneumatic rock drill and air compressor. Drilling would take place for a maximum of 3 hours a day and there would be up to 2 to 6 shots per week. Overall, there would be an estimated total of 100 intermittent blasts conducted over a period of six months. All blasts would occur at least 2 hours after sunrise and 2 hours before sunset. In order to reduce noise impacts, the shots would be detonated using Non-Electric Detonators (Non-el). Use of Non-el detonators reduces the level of noise significantly compared to standard detonation cord. Drilling/blasting (and other noise producing activities) would be initiated at the earliest in the fall of 2008, run to early November, resume the following season after August 5 (to minimize effects on marbled murrelets), and then continue until early November 2009.

Construction of the new trail tread would also include removal of soil duff and organic layers, approximately 10 trees (all less than 20 inches in diameter), and 0.2 acre of understory vegetation to reach mineral soil. Chain saw use would be required to remove the standing and downed trees along the proposed reroute. Expected duration of chain saw use is a maximum of 2 hours per day for approximately 30 days over an estimated 6-month construction period during the 2008-2009 seasons. The felled trees would be used to build trail structures such as cribbing.

3. Mechanized equipment requested? ☒ Yes ☐ No

Chain Saw ☒ Power Tools ☐ Helicopter ☒ (A70 # _____)
Rock Drill ☒ Generator ☐ Fixed Wing ☐ (A70 # _____)
Explosives ☒ Snowmobile ☐ Other Air Compressor

4. Date(s) of Action: As described above **Duration:** As described above

5. Describe alternatives on how task would be accomplished without use of mechanized equipment and/or less intrusive actions:

Implementing Alternative 3 without chain saws would involve using hand tools such as hand saws, crosscut saws, and axes. The work would include felling 10 trees, cutting logs off the trail, and clearing trailside brush. Tasks that typically take minutes using a chain saw would require hours or even days to complete. Felling trees with hand tools such as crosscut saws in very steep terrain is more hazardous than doing the same job with a chain saw because the hand tools require two people at the cutting site. This exposes two people to the hazards of falling trees rather than one and complicates the use of escape routes as the tree is falling because there are two people in the danger zone rather than one.

There is no feasible alternative route that would avoid bedrock. There are no feasible alternatives to blasting (e.g., a Boulder Blaster would not be effective) for breaking up approximately 500 feet of bedrock in order to create the trail reroute above the washed out Wonderland Trail section and floodplain. Blasting noise and flyrock would be minimized by using non-electric blasting initiation and careful blast planning and design. These practices would minimize noise disturbances and collateral damage caused by flyrock and would reduce hazards to visitors and employees.

Drilling rock for blasting purposes without power tools would require many more months of construction time due to the slow progress made with a hand-operated rock drill. In comparison, one person with a powered rock drill can make a two-foot hole in about ten minutes while the hand drill would take two people several hours. This process would also place more employees in work areas where they are exposed to falling hazards for much longer periods of time.

There are no feasible non-mechanized alternatives to using a helicopter to transport the air compressor needed for the pneumatic rock drill. The compressor weighs approximately 1000 pounds, and use of stock or people to transport the compressor over steep and rugged terrain would not be possible.

6. Describe impacts to wilderness resource/values AND visitor use of above alternative(s):

The use of power tools will cause relatively brief noise disturbances to wilderness resources during the construction periods. Visitors will be largely unaffected by power tool noise because the location of the temporary reroute and the proximity of the Carbon River will mask the noise. Visitors will hear blasts when they are detonated. Blasting procedures will include informing visitors in order to minimize the affects of the blast noises. Visitors may experience brief (10 min.) delays during blasting operations.

Signature: _____

Date: _____

Project Manager/Trails Supervisor

Completed By Wilderness Coordinator

7. Minimum Requirement Analysis: Is the project or activity consistent with, or necessary to meet the minimum requirements for the administration of the area as wilderness, without imposing a significant impact to the wilderness resources, and character?

Yes, replacing this section of trail is critical for Wonderland Trail continuity. The Wonderland Trail is an important contributing factor to the wilderness character and administration of the area as wilderness.

8. Minimum Tool Analysis: Will the selected tool or method used to complete the project result in the least overall impact to the physical resources and experiential qualities (character) of wilderness?

The use of chain saws, power drills, and explosives during the construction of this section of trail will enable the work to be completed in a safe and timely manner. Few visitors will be exposed to the trail construction activities; however, those that do will be exposed to short duration noise impacts from chain saw, helicopter, drill, and explosives. Impacts to physical resources will be similar to those incurred through primitive tool use except for some periodic noise impacts. The faster timeframe of completion for this project will allow other trail projects to be completed which would have a beneficial effect upon resources and wilderness character.

9. Describe the beneficial and detrimental effects on wilderness values if the selected alternative is accomplished.

The beneficial effect will be that the Wonderland Trail will be restored in a shortened timeframe to maximize visitor experience opportunities. The detrimental effect will be that visitors who enter the trail construction site may experience short term noise impacts from chain saw, helicopter, drill, and explosives use.

Recommendation: _____

Signature: _____

Date: _____

Wilderness Coordinator

Recommendation: _____

Signature: _____

Date: _____

Environmental Compliance Specialist

Recommendation: _____

Signature: _____

Date: _____

Superintendent

Comments:

APPENDIX B: Resource Conservation Measures

Resource Conservation Measures: *Impact Avoidance, Minimization or Mitigation Measures Common to Both Action Alternatives*

Park Resource Advisors will provide periodic on-site guidance and oversight during construction activities.

Air Quality and Greenhouse Gases

1. Minimize equipment idling when not in use.
2. Whenever time and resources permit, use non-motorized hand tools, instead of motorized tools.
3. Use only well maintained and properly functioning equipment.
4. Minimize the use of helicopters.

Geology and Exposure to Geologic Hazards

1. Minimize blasting of rocks to the amount needed to create useable trail tread.

Vegetation and Soil

1. Take extra care when building trail around large trees to ensure that roots are not significantly impacted.
2. Remove only vegetation that is directly in the line of the new trail.
3. Where appropriate, salvage and replant vegetation in disturbed areas near the construction site.
4. Manage blasting operations to minimize fly rock that could damage trees and other vegetation.
5. Reclaim all disturbed ground using appropriate best management practices, which may include planting or seeding with native vegetation, or, in the case of small or narrow treatment areas where natural reestablishment is likely to occur within 2 years, allowing native vegetation to reclaim the area naturally. Active revegetation should be emphasized in sites susceptible to erosion or invasive plants.

Water Resources

1. Broadcast materials removed during trail work down slope off-trail and allow it to blend in with the terrain. It will never be placed in low-lying drainages where it may inhibit the natural free flow of water.
2. Manage blasting operations to prevent or minimize fly rock reaching the Carbon River.
3. Follow a hierarchy of drainage structures to support the trail drainage systems; the least obtrusive structure possible is preferred over the heavily constructed. The type of structure to be used will depend upon the trail layout, terrain and the minimum structure required to support the natural drainage pattern and minimize erosive impact. The minimum structure is outslipping of the trail tread, allowing water to flow across the trail. Another alternative would be using a dip drain, or dip in the trail edge that facilitates water-flow off the trail. As required, various configurations of water bars and structures will be constructed to reinforce cross-trail flow. In areas where drainages may cross multiple segments of the same trail, a drainage system will be established which supports the natural drainage pattern and the efficient removal of flowing water from the trail alignment.
4. Do not conduct refueling of power tools within 100 feet of water bodies.

Wildlife and Habitat

1. No night work will be conducted.
2. Remove the fewest trees (or vegetation) possible.
3. Minimize the amount of explosives and blasting.

4. When amphibians or other small wildlife are found in downed logs or woody debris that will be disturbed, the wildlife will be carefully relocated to appropriate habitat. Logs and debris will also be carefully moved out of the way to avoid disturbing nests.

Status Wildlife Species and Critical Habitat

1. Minimize the use of power tools.
2. Conduct blasting and helicopter operations after August 5.
3. Conduct chain saw operations after July 15.
4. Use the minimum amount of explosive needed, if possible 2 pounds or less.
5. Use Non-Electric Detonators (Non-el) instead of standard detonation cord when blasting.
6. Use smallest helicopter possible that will accomplish the work without increasing the number of flights needed.
7. Use the minimum number of flights necessary to accomplish the project.

Cultural Resources

1. Inadvertent discovery: If concealed archeological resources are encountered during activities, stop work and notify archeologist immediately, so that the site can be evaluated and recorded, and any required consultation completed, before work resumes.
2. Brushing should be accomplished with hand tools if possible and is preferred in all areas with high visitor access areas. Work with chain saws and power weed eaters should be kept to a minimum.

Wilderness Values and Soundscapes

1. Minimize the use of power tools.
2. Use the minimum amount of explosive needed, if possible 2 pounds or less, and place shot in drilled holes to minimize noise and fly-rock.
3. Conduct blasting on clear days.
4. Use Non-Electric Detonators (Non-el) instead of standard detonation cord.
5. Use the smallest helicopter possible that will accomplish the work without increasing the number of flights needed.
6. Use the minimum number of flights necessary to accomplish the project.

Visitor Use and Experience

1. Provide a safe alternative trail during trail construction.
2. Minimize construction activities during weekends and holidays.

Park Operations and Safety

1. Post trail guards to insure visitors are not exposed to hazards during construction.
2. Post signs alerting visitors to the project.

APPENDIX C: Relationship to Laws, Policy, and Park Planning Documents

Mount Rainier National Park Act 1899

Mount Rainier National Park was established as the fifth National Park on March 2, 1899. The Act stated the “public park shall be under the exclusive control of the Secretary of the Interior, whose duty it shall be to make and publish, as soon as practicable, such rules and regulations as he may deem necessary or proper for the care and management of the same. Such regulations shall provide for the preservation from injury or spoliation of all timber, mineral deposits, natural curiosities, or wonders within said park, and their retention in their natural condition. The Secretary may, in his discretion, grant parcels of ground at such places in said park as shall require the erection of buildings for the accommodation of visitors; all of the proceeds of said leases, and all other revenues that may be derived from any source connected with said park, to be expended under his direction in the management of the same, and the construction of roads and bridle paths therein.” The act went further to direct the Secretary of the Interior to “provide against the wanton destruction of the fish and game found within said park, and against their capture or destruction for the purposes of merchandise or profit”.

The Mount Rainier National Park Act 1899 established the framework to manage the park within the boundaries defined within the Act. This allowed for the establishment of roads and trails, which the WT would become an integral part.

National Park Service Organic Act (1916) (16 USC 1)

The key provision of the legislation establishing the National Park Service, referred to as the 1916 Organic Act:

The National Park Service shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified . . . by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations (16 USC 1).

1970 National Park Service General Authorities Act (as amended in 1978 – Redwood amendment)

This act prohibits the NPS from allowing any activities that would cause derogation of the values and purposes for which the parks have been established (except as directly and specifically provided by Congress in the enabling legislation for the parks). Therefore, all units are to be managed as national parks, based on their enabling legislation and without regard for their individual titles. Parks also adhere to other applicable federal laws and regulations, such as the Endangered Species Act, the National Historic Preservation Act, the Wilderness Act, and the Wild and Scenic Rivers Act. To articulate its responsibilities under these laws and regulations, the National Park Service has established management policies for all units under its stewardship.

National Parks Omnibus Management Act (1998) (PL 105-392, 112 Statute 3497)

The National Park Service Omnibus Management Act addresses resources inventory and management in Title II. Section 201 defines the purposes of this title to enhance and encourage scientific study in National Park System (NPS) units. Section 202 authorizes and directs the Secretary of the Interior to ensure management is enhanced in NPS units by a broad program of high quality science and information. Section 205 states the Secretary may solicit, receive, and consider requests from Federal and non-Federal public or private entities for the use of NPS units for scientific study. Such proposals

must be: 1) consistent with applicable laws and the NPS Management Policies, and 2) the study would be conducted in a manner as to pose no threat to park resources or public enjoyment of those resources.

National Environmental Policy Act (1969) (NEPA) (42 USC 4341 et seq.)

NEPA requires the identification and documentation of the environmental consequences of federal actions. Regulations implementing NEPA are set for by the President's Council on Environmental Quality (40 CFR Parts 1500-1508). CEQ regulations establish the requirements and process for agencies to fulfill their obligations under the act.

Clean Air Act (1977 as amended) (42 USC 7401 et seq.)

The Clean Air Act states that park managers have an affirmative responsibility to protect park air quality related values (including visibility, plants, animals, soils, water quality, cultural resources and visitor health) from adverse air pollution impacts. Special visibility protection provisions of the Clean Air Act also apply to Class I areas, including new national rules to prevent and remedy regional haze affecting these areas. Under existing visibility protection regulations, the NPS identified "integral vistas" that are important to the visitor's visual experience in NPS Class I areas, and it is NPS policy to protect these scenic views.

Clean Water Act (CWA) (1972, 1977 as amended) (33 USC 1241 et seq.)

Under the Clean Water Act, it is a national policy to restore and maintain the chemical, physical, and biological integrity of the nation's waters, to enhance the quality of water resources, and to prevent, and control, and abate water pollution. Section 401 of the *Clean Water Act* as well as NPS policy requires analysis of impacts on water quality. *Management Policies* (NPS 2006) provide direction for the preservation, use, and quality of water in national parks.

Director's Order #28 and Cultural Resources Guideline #28, NPS 1998

This guideline elaborates on cultural resource management policies and standards and offers guidance in applying them to establish, maintain and refine park cultural resource programs. It is intended to aid managers, planners, staff, and cultural resource specialists, and places greater emphasis on the needs of park managers and staff and non-specialists. It outlines the basic principles and ingredients of a good park program.

Director's Order #41: Wilderness Preservation and Management (1999)

The National Park Service will apply the minimum requirement concept to all administrative activities that affect the wilderness resource and character. The application of the minimum requirement concept is intended to minimize impacts on wilderness character and resources and must guide all management actions in wilderness.

Directors Order #47 – Soundscape Preservation and Noise Management

The purpose of this Director's Order is to articulate National Park Service operational policies that will require, to the fullest extent practicable, the protection, maintenance or restoration of the natural soundscape resource in a condition unimpaired by inappropriate or excessive noise sources. NPS *Management Policies 2006*, states that "the National Park Service will preserve, to the greatest extent possible, the natural soundscapes of parks." The policy requires the restoration of degraded soundscapes to the natural condition whenever possible, and the protection of natural soundscapes from degradation due to unnatural sounds (noise) (*Management Policies 2006*, sec. 4.9). The NPS is specifically directed to "take action to prevent or minimize all noise that, through frequency, magnitude or duration, adversely affects the natural soundscape or other park resources or values, or that exceeds

levels that have been identified as being acceptable to, or appropriate for, visitor uses at the sites being monitored” (*Management Policies 2006*, sec. 4.9).

Endangered Species Act (1972) (16 USC 1531 et seq.)

The Endangered Species Act (ESA) requires federal agencies, in consultation with the Secretary of the Interior, to use their authorities in the furtherance of the purposes of the act and to carry out programs for the conservation of listed endangered and threatened species (16 USC 1535 Section 7(a)(1)). The ESA also directs federal agencies, in consultation with the Secretary of the Interior, to ensure that any action authorized, funded, or carried out by an agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat (16 USC 1535 Section 7(a)(2)). Consultation with the United States Fish and Wildlife Service (USFWS) is required if there is likely to be an effect.

Executive Order 13112: Invasive Species (1999)

This executive order states that any federal agency action that may affect the status of invasive species shall identify such actions and prevent the introduction of invasive species. Furthermore, park managers should provide for restoration of native species and habitat conditions in ecosystems that have been invaded by invasive species.

Federal Noxious Weed Control Act

The Act provides for the control and management of non indigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health. The Act requires that each federal agency develop a management program to control undesirable plants on federal lands under the agency's jurisdiction.

Floodplains

Executive Order 11988 (Floodplain Management) requires an examination of impacts to floodplains and potential risk involved in placing facilities within floodplains. NPS Management Policies, DO-2 (Planning Guidelines), and DO-12 (Conservation Planning, Environmental Impact Analysis, and Decision Making) provide guidelines for proposals in floodplains.

Mount Rainier National Park General Management Plan (2002)

The WT is in the Semi-Primitive Trail Zone which is characterized by having well maintained trails with up to a 4 foot wide tread corridor, with a maximum of a 8 foot wide maintenance corridor. Trail structures such as culverts, bridges, turnpiking, and safety railings may be used. The desired visitor experience in this zone is a wilderness hiking experience with visitors widely dispersed. Opportunities for solitude would be relatively common but would be interspersed with opportunities for social interaction. The desired resource condition in this zone is a natural ecological functions, components and processes only modified by the presence of wilderness appropriate structures in a minor portion of the zone (i.e. designated camps). The facilities and activities that are desired in this zone are designated trails, camps, and other wilderness-appropriate structures, with activities oriented toward hiking. The zone is approximately 1 mile wide to allow for trail reroutes that may be required due to changes in natural conditions, such as floods (NPS 2002).

Table 8: Mount Rainier National Park General Management Plan Zones

Management Wilderness Zones	Resource Condition	Visitor Experience	Facilities and Activities
Pristine	Essentially untouched environment	The feeling of being alone	Very minimal signs of human use, no trails or designated campsites.
Primitive	Largely natural, unmodified landscape	Opportunities to experience solitude and quiet. The feeling of being apart, but not alone	Minimal signs of human use, except for a few primitive routes and designated campsites in alpine areas.
High Use Climbing	Natural landscape modified by presence of wilderness appropriate structures. No visible signs of human use off the routes.	Moderate to high degree of social interaction and few opportunities for solitude.	A few wilderness appropriate structures such as primitive routes and designated campsites. Activities oriented toward mountaineering.
Moderate Use Climbing	Similar to the high use climbing zone.	Moderate to low degree of social interaction and more opportunities for solitude	Similar to the high use climbing zone
Semi-primitive Trail	Natural landscape modified by presence of wilderness appropriate structures.	Wilderness experience with occasional periods of solitude.	Designated trails, camps and other wilderness appropriate structures. Activities oriented toward hiking.
Transition Trail	Same as Semi-primitive Trail.	Wilderness hiking experience with a high degree of social interaction and few opportunities for solitude.	Same as the semi-primitive zone, but with greater evidence of human use.
Non-wilderness zones			
Sensitive Resource Recreation		Experience of park resources generally unimpeded by other visitors and relatively close to developed facilities. A high degree of social interaction.	Facilities and structures in localized areas. Hiking would be the primary activity.

Mount Rainier National Park Wilderness Management Plan (1989)

The Mount Rainier National Park Wilderness Management Plan established a system of cross-country and alpine areas across the park landscape. At the same time, it established designated trailside camps

and overnight limits on either the number of parties or number of people per camp or per zone. The limits of acceptable change established by this plan are still in effect, although over time, some have been modified slightly. This plan is being revised and a new plan will be available in 2008. Public scoping meetings for the Environmental Assessment on the WMP are planned for the fall of 2008.

National Historic Preservation Act (1966 as amended) (16 USC 470)

Section 106 of the National Historic Preservation Act (NHPA) directs federal agencies to take into account the effect of any undertaking [a federally funded or assisted project] on historic properties. "Historic property" is any district, building, structure, site, or object that is eligible for listing in the National Register of Historic Places because the property is significant at the national, state, or local level in American history, architecture, archeology, engineering, or culture. This section also provides the Advisory Council on Historic Preservation and the State Historic Preservation Officer (SHPO) an opportunity to comment on the undertaking. The 1992 amendments to the act have further defined the roles of American Indian Tribes and the affected public in the Section 106 process. Section 10 of the Act requires the ongoing documentation of historic resources by federal agencies.

National Park Service Management Policies (2006)

Management Policies governs the way park managers make decisions on a wide range of issues that come before them. The following sections contained within *Management Policies* pertain specifically to the subject of this Environmental Assessment.

Section 2.3.1.4 Science and Scholarship

Decisions documented in general management plans and other planning products, including environmental analyses and documentation, will be based on current scientific and scholarly understanding of park ecosystems and cultural contexts and the socioeconomic environment both internal and external to the park. The collection and analysis of information about park resources will be a continuous process that will help ensure that decisions are consistent with park purposes.

Section 4.8.1.3 Geologic hazards

Naturally occurring geologic processes, which the Park Service is charged to preserve unimpaired, can be hazardous to humans and park infrastructure. These include earthquakes, volcanic eruptions, mudflows, landslides, floods, shoreline processes, tsunamis, and avalanches.

The Service will work closely with specialists at the U. S. Geological Survey and elsewhere, and with local, state, tribal, and federal disaster management officials, to devise effective geologic hazard identification and management strategies. Although the magnitude and timing of future geologic hazards are difficult to forecast, park managers will strive to understand future hazards and, once the hazards are understood, minimize their potential impact on visitors, staff, and developed areas. Before interfering with natural processes that are potentially hazardous, superintendents will consider other alternatives.

Section 6.3.4.3 Environmental Compliance

. . . Managers contemplating the use of aircraft or other motorized equipment or mechanical transportation within wilderness must consider impacts to the character, esthetics, and traditions of wilderness before considering the costs and efficiency of the equipment.

In evaluating environmental impacts, the National Park Service will take into account (1) wilderness characteristics and values, including the primeval character and influence of the wilderness; (2) the preservation of natural conditions (including the lack of man-made noise); and (3) assurances that

there will be outstanding opportunities for solitude, that the public will be provided with a primitive and unconfined type of recreational experience, and that wilderness will be preserved and used in an unimpaired condition. Managers will be expected to appropriately address cultural resources management considerations in the development and review of environmental compliance documents impacting wilderness resources.

Section 6.3.5 Minimum Requirement

All management decisions affecting wilderness must be consistent with the minimum requirement concept. This concept is a documented process used to determine if administrative actions, projects, or programs undertaken by the Service or its agents and affecting wilderness character, resources, or the visitor experience are necessary, and if so how to minimize impacts.

The minimum requirement concept will be applied as a two-step process that determines

- *whether the proposed management action is appropriate or necessary for administration of the area as wilderness and does not cause a significant impact to wilderness resources and character, in accordance with the Wilderness Act; and*
- *the techniques and types of equipment needed to ensure that impacts on wilderness resources and character are minimized.*

In accordance with this policy, superintendents will apply the minimum requirement concept in the context of wilderness stewardship planning, as well as to all other administrative practices, proposed special uses, scientific activities, and equipment use in wilderness. The only exception to the minimum requirement policy is for eligible areas that the Service has not proposed for wilderness designation. However, those lands will still be managed to preserve their eligibility.

When determining minimum requirements, the potential disruption of wilderness character and resources will be considered before, and given significantly more weight than economic efficiency and convenience. If a compromise of wilderness resources or character is unavoidable, only those actions that preserve wilderness character and/or have localized, short-term adverse impacts will be acceptable.

Although park managers have flexibility in identifying the method used to determine minimum requirement, the method used must clearly weigh the benefits and impacts of the proposal, document the decision-making process, and be supported by an appropriate environmental compliance document. Parks must develop a process to determine minimum requirement until the plan is finally approved. Parks will complete a minimum requirement analysis on those administrative practices and equipment uses that have the potential to impact wilderness resources or values. The minimum requirement concept cannot be used to rationalize permanent roads or inappropriate or unlawful uses in wilderness.

Administrative use of motorized equipment or mechanical transport will be authorized only

- *if determined by the superintendent to be the minimum requirement needed by management to achieve the purposes of the area, including the preservation of wilderness character and values, in accordance with the Wilderness Act; or*
- *in emergency situations (for example, search and rescue, homeland security, law enforcement) involving the health or safety of persons actually within the area.*

Such management activities will also be conducted in accordance with all applicable regulations, policies, and guidelines and, where practicable, will be scheduled to avoid creating adverse resource impacts or conflicts with visitor use.

While actions taken to address search and rescue, homeland security and law enforcement issues are subject to the minimum requirement concept, preplanning or programmatic planning should be undertaken whenever possible to facilitate a fast and effective response and reduce paperwork.

Natural Resources Management Guideline, NPS-77 (1991)

This document provides guidance to park managers for all planned and ongoing natural resource management activities. Managers must follow all federal laws, regulations and policies. This document provides the guidance for park management to design, implement and evaluate a comprehensive natural resource management program.

Wetlands

Executive Order 11990 requires that impacts to wetlands be addressed. The proposed project would not occur in areas that exhibit the characteristics of wetlands as defined by Cowardin et al. (1979).

Wilderness Act (1964) (Public Law 88-577) (16 USC 1131-1136)

The Wilderness Act and legislation establishing individual units of the national park system as wilderness (for example, the Washington Parks Wilderness Act for Mount Rainier) establish consistent direction for the preservation, management, and use of wilderness and prohibit the construction of roads, buildings and other man-made improvements and the use of mechanized transportation in wilderness (with exceptions). The public purpose of wilderness in national parks includes the preservation of wilderness character and wilderness resources in an unimpaired condition, as well as for the purposes of recreational, scenic, scientific, education, conservation, and historical use.

Management Policies (NPS 2006) establish consistent servicewide direction for the preservation, management, and use of wilderness and prohibit new construction of roads, buildings and other man-made improvements and the use of mechanized transportation in wilderness. All park management activities proposed within wilderness are subject to review following the minimum requirement concept and decision guidelines. Pertinent sections of the Wilderness Act follow:

Section 2 (a)

. . . there is hereby established a National Wilderness Preservation System to be composed of federally owned areas designated by the Congress as “wilderness areas,” and these shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness. . .

Section 2 (c)

A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work

substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

Section 4 (a) (3)

Nothing in this Act shall modify the statutory authority under which units of the national park system are created. Further, the designation of any area of any park, monument, or other unit of the national park system as a wilderness area pursuant to this Act shall in no manner lower the standards evolved for the use and preservation of such park, monument or other unit of the national park system in accordance with the Act of August 25, 1916, . . . or any other Act of Congress which might pertain to or affect such area, including, but not limited to. . .

Section 4 (b)

. . . each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character. Except as otherwise provided in this Act, wilderness areas shall be devoted to the public purposes of recreational, scenic, *scientific*, educational, conservation, and historical use. (*Emphasis added.*)

Section 4 (c)

“...there shall be no commercial enterprise and no permanent road within any wilderness area designated by this Act and, except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area.”

APPENDIX D: Definitions and Acronyms

Definitions

Affected Environment: Existing natural, cultural, social, and recreational conditions of an area, subject to change indirectly or directly as a result of human action.

Alternatives: Sets of management elements that represent a range of options for how or whether to proceed with a proposed action. An environmental assessment analyzes the potential environmental impacts of the range of alternatives, as required under the National Environmental Policy Act (NEPA).

Appropriate: Especially suitable or compatible. Source: American Heritage Dictionary (NWTC 2002)

Archaeological Resources: Historic and prehistoric deposits, sites, structures, and anything from a human culture from an archaeological site.

Best Management Practices (BMPs): Effective, feasible (including technological, economic, and institutional considerations) conservation practices and land and water management measures that avoid or minimize impacts to natural and cultural resources. BMPs may be physical, organizational, or management practices or prohibitions.

CEQ Regulations: The Council on Environmental Quality (CEQ) was established by the National Environmental Policy Act (NEPA) and given the responsibility of developing federal environmental policy and overseeing the implementation of NEPA by federal agencies.

Decibel: A unit of measure for sound intensity.

Ecosystem: A geographically identifiable area that encompasses unique physical and biological characteristics. It includes the plant community, animal community, and environment in a particular region or habitat.

Environmental Assessment (EA): A public document required under NEPA that identifies and analyzes actions that might affect the human environment, including natural, cultural and social resources. An Environmental Assessment provides sufficient evidence and analysis to determine whether an Environmental Impact Statement (EIS) is necessary. An EA facilitates compliance with NEPA when no EIS is necessary and facilitates preparation of an EIS if one is necessary.

Environmental Impact Statement (EIS): A public document required under NEPA that identifies alternatives and analyzes their effects on the human environment.

Environmentally Preferred Alternative: The alternative in an EA or EIS that best promotes the goals of NEPA and meets the identified CEQ criteria. In general, this is the alternative that causes the least damage to the environment and best protects natural, cultural, and social resources.

Facilities: Buildings and the associated supported infrastructure, including roads, trails and utilities.

Finding of No Significant Impact (FONSI): The decision document for an environmental assessment.

Floodplain: The area surrounding a stream subject to flooding on some interval.

Historic or Cultural Resources: Under NEPA/CEQ, means culturally valued pieces of real property that are not historic properties and non-tangible values such as cultural use of the biophysical and built environment, and sociocultural attributes such as social cohesion, social institutions, lifeways, religious practice, and other institutions.

Historic Property: Under NHPA and NEPA/CEQ, means a district, site, building, structure, or object that is included in or eligible for listing in the National Register of Historic Places, and includes resources to which American Indians attach cultural and religious significance (traditional cultural properties; see NR Bulletin 38).

Human Environment: The natural and physical (e.g., built) environment and the relationships of people to that environment (i.e., social and cultural aspects and the relationships between natural and cultural). Culturally valued aspects of the environment generally include National Register historic properties and other culturally valued pieces of real property, cultural use of the biophysical environment, and intangible sociocultural attributes such as social cohesion, social institutions, lifeways, religious practices, and other cultural institutions.

Impairment: Impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including opportunities that would otherwise be present for the enjoyment of those resources or values.

Invasive species: A non-native species of plant or wildlife that not only exists away from its natural habitat but also exhibits characteristics that allow it to take over the habitat to displace native species.

Mechanical Transport: Any contrivance for moving people or material in or over land, water, snow or air that has moving parts and is powered by a living or non-living power source. This includes (but is not limited to) wheeled vehicles such as bicycles, game carriers, carts and wagons. “Mechanical transport” does not include wheelchairs when used as necessary medical appliances, nor does it include skis, snowshoes, sleds, travois, non-motorized river craft including driftboats, rafts, or canoes, or similar primitive devices. Source: National Park Service Director’s Order #41 (NWTC 2002)

Minimum: The smallest quantity, number, or degree possible or permissible. Source: American Heritage Dictionary (NWTC 2002)

Minimum Tool: The method, equipment, device, force, regulation, practice, or use that will have the least impact and still meet the management objective in a wilderness context. This represents the “how” question that must be asked to ensure that the process to implement the minimum required action will minimize impact on social and biophysical wilderness values. Minimum tool is not synonymous with primitive tool. In some cases the minimum tool could be a motorized tool or a form of mechanical transport. (NWTC 2002)

Minimum Requirement: An action that is determined to be absolutely necessary but results in the least discernible impact on all the wilderness values and is the least manipulative or restrictive means of achieving a management objective in wilderness. This represents the “why” and “is it necessary” questions that must be answered before deciding that an action that could potentially leave a mark of human influence in wilderness is necessary. (NWTC 2002)

Motorized Equipment: Machines that use a motor, engine, or other nonliving power sources. This includes, but is not limited to, machines such as chain saws, aircraft, snowmobiles, generators, motor boats, and motor vehicles. It does not include small battery or gas powered hand carried devices such as shavers, wristwatches, flashlights, cameras, stoves, or other similar small equipment. Source: FSM 2320.5, 36 CFR 293.6b (NWTC 2002)

National Environmental Policy Act (NEPA): The federal act requiring the development of an Environmental Assessment or Environmental Impact Statement for federal actions having an effect on the human environment.

Necessary: That must be done; undeniable; mandatory; required; indispensable; inherent in the situation. Source: American Heritage Dictionary (NWTC 2002)

Organic Act (NPS): 1916: The National Park Service Organic Act established the National Park Service to “promote and regulate the use of the parks.”

National Register of Historic Places: The National Register of Historic Places is the Nation's official list of cultural resources worthy of preservation. Authorized under the National Historic Preservation Act of 1966, the National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect our historic and archeological resources. Properties listed on or “determined eligible” for listing on the National Register must be given consideration for preservation in the planning for federal or federally assisted projects.

No Action Alternative: The alternative that proposes to continue current management actions and direction. “No Action” means the proposed activity would not take place. The No Action Alternative sets the standards for comparing the action alternatives.

Non-native species: Also exotic species. Plants or wildlife not from a particular area and which may interfere with natural biological systems or ecosystems. Some non-native species are also invasive (see Invasive species).

Permanent Improvement: A structural or non-structural improvement that is to remain at a particular location for more than one field season. Permanent improvements include such items as trails, toilet buildings, cabins, fences, tent frames, fire grills, and instrumentation stations. Permanent improvements may be allowed in wilderness, subject to a minimum requirement analysis. Source: FSM 2320.5 (NWTC 2002)

Planning: An interdisciplinary process for developing short- and long-term goals and alternatives for visitor experience, resource conditions, projects, facility type and placement, and other proposed actions.

Preferred Alternative: The alternative in an EA or EIS that the agency believes would best fulfill the purpose and need for action.

Primitive Traditional Tool: Implements, devices, equipment, and tools that originated in the pre-motorized or pioneering era such as the axe, cross-cut saw, hammer, wrench, hand winch, pulley, packstring, oar-powered or paddle-powered water craft, and skis. Modern versions of these tools and other hand or stock operated tools, which are powered by a living source, are also included. (NWTC 2002)

Public Comment Process: A formal review process required by NEPA in which the action agency publishes a notice in the Federal Register which provides notice that the agency is preparing an EIS. Public meetings are a required part of the EIS process. For Environmental Assessments, the public comments process is less formal, with notification of the public by press release and optional public meetings.

Requirements: Something needed; a necessity; something obligatory or demanded, as a condition; something required. Source: American Heritage Dictionary (NWTC 2002)

Riparian area or zone: The land area and associated vegetation bordering a stream or river.

Scoping: A means of establishing the area of potential effect (APE) and determining the level of effort required to identify National Register historic properties relevant to the undertaking. Scoping should be done during NEPA Internal Scoping.

Section 7 Consultation: Section 7 of the Endangered Species Act requires federal agencies, when proposing a federal action, to obtain a species list for the project area from, and to consult with, the U.S. Fish and Wildlife Service (USFWS) regarding potential impacts to listed species from the proposed action.

Threatened or Endangered Species: Plants or animals that receive special protection under federal or state laws, including the Endangered Species Act. Species may be “listed” in the state but not by the federal government (USFWS) or vice versa. Some USFWS regional offices also maintain a list of those species of special concern either nationally or locally, which may be or may have been previously considered for listing as threatened or endangered.

U.S. Fish and Wildlife Service (USFWS): The federal agency responsible for implementing the provisions of the Endangered Species Act, including listing species, developing recovery plans, etc.

Visitor experience: The perceptions, feelings, reactions, and activities of a park visitor in relationship to the surrounding environment.

Visitor use: The types of recreation activities engaged in by visitors, including the type of activity, visitor behavior, timing and distribution of use.

Wetland: As defined by the Army Corps of Engineers – an area inundated or saturated with surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Wilderness Values: The recognized reasons for wilderness to exist and be preserved. Wilderness has natural values that are vital to the health of our planet as well as the enjoyment of those visiting them. Wilderness values include things such as watersheds for cities, benchmarks for scientific research, critical habitat for wildlife, genetic material for plant and animal diversity, undisturbed geological resources, sanctuary from the pressures and pace of modern society, and a repository for cultural resources. The public values of wilderness include, but are not limited to, opportunities for scientific study, education, solitude, physical and mental challenge and stimulation, inspiration, and primitive recreation experiences.

Acronyms

BA: Biological Assessment (under Section 7 of the Endangered Species Act an assessment of the adverse impacts of a proposed action on a species listed by the USFWS).

BMP: Best Management Practice

BO: Biological Opinion (a determination, under Section 7 of the Endangered Species Act) of the effects of a proposed action on a species listed by the USFWS).

CEQ: Council on Environmental Quality

dB: decibel

dBA: “A” scale weighted decibel (a standard measure of noise)

EA: Environmental Assessment

EIS: Environmental Impact Statement

EPA: (United States) Environmental Protection Agency

FONSI: Finding of No Significant Impact

GMP: General Management Plan

NEPA: National Environmental Policy Act

NHLD: National Historic Landmark District

NHPA: National Historic Preservation Act

NPS: National Park Service

SHPO: State Historic Preservation Office or Officer

USDOJ: United States Department of the Interior

USFWS: United States Fish and Wildlife Service

APPENDIX E: Park Purpose and Significance

***Mount Rainier National Park Purpose and Significance Statements**

Park Purposes

- To protect and preserve its 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 and to provide for wilderness experiences.

Park Significance

- Mount Rainier is the highest volcanic peak and has the largest alpine glacial system in the contiguous U.S.
- The park's comprehensive national historic landmark district — a cultural landscape district including buildings, roads, 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.
- As part of the Pacific Ring of Fire, Mount Rainier is an outstanding example of Cascade volcanism.
- Mount Rainier's eruptions and mudflows continue to shape the park and are a continual threat to park visitors, employees and surrounding lowland communities.
- Mount Rainier, visible throughout the region, is a continuing source of inspiration to people. This quality contributed to the establishment of the national park in 1899. The mountain is a prominent icon that continues to shape the physical environment and human experience in the Pacific Northwest.
- The park offers recreational and educational opportunities in a wide range of scenic settings, including wildflower meadows, glaciers and rainforests, all in a relatively compact area that is easily accessible to a large urban population.

**Source: Mount Rainier National Park General Management Plan and Environmental Impact Statement (NPS, 2002:11)*