United States Department of Agriculture

Forest Service

Pacific Northwest Region

April 1, 2009

White Chuck Road Repair Environmental Assessment

Darrington Ranger District
Mt. Baker-Snoqualmie National Forest

For Information Contact:

District Ranger
Darrington Ranger District
1405 Emens Street
Darrington, WA 98241
(360) 436-1155, ext. 216

USDA Non-Discrimination Statement Revised 6/8/2005

"The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202)720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, DC 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer."

TABLE OF CONTENTS

Chapter 1 Introduction 1

White Chuck Road 23 History 2

Need for Proposed Action 2

Proposed Action 4

Project Scope 13

Process of Determining Project Scope 14

Decision Framework 14

Relationship to the Forest Plan 15

The Forest Plan 15

Other Relevant Laws and Regulations 19

Endangered Species Act 19

Magnuson-Stevens Fishery Conservation and Management Act 19

National Historic Preservation Act 19

Clean Air Act 20

Clean Water Act 20

Executive Orders 11988 (Floodplains) and 11990 (Wetlands) 20

Public Involvement 21

2004 Scoping Comments 22

2008 Scoping Comments 22

Significant Issues 23

Chapter 2 Alternatives 25

Alternatives Considered but Eliminated from Further Study 25

Alternatives Considered in Detail 33

Alternative A – No Action 33

Alternative B – Restore Road 23 to MP 5.8 and Decommission the Remaining Part of the Road (Proposed Action) 34

Alternative C – Restore Road 23 to MP 5.8 and Put the Remaining Part of the Road in Storage 39

Alternative D – Repair all of Road 23 42

Standard Management Practices and Mitigation Measures 45

Comparison of Alternatives 54

Chapter 3 Environmental Consequences 61

Access and Road Management Affected Environment 61

Roads Analysis Findings, Maintenance Level 61

Past Flood Damage 62

Access and Road Management Environmental Consequences 63

Alternative A 63

Alternative B 65
Alternative C 67
Alternative D 68
Access and Road Management Cumulative Effects 69
Consistency with the Forest Plan 70
Timber and Vegetation Management Affected Environment 70
Environmental Consequences 70
Alternative A 70
Alternatives B and C 71
Alternative D 72
Timber and Vegetation Management Cumulative Effects 72
Consistency with the Forest Plan 72
Recreation Affected Environment 73
Trails 73
Outfitter/Guide Use 77
Wilderness 78
Dispersed Recreation 78
Recreation Environmental Consequences 79
Trails 79
Outfitter/Guide Use 81
Wilderness 82
Dispersed Recreation 83
Recreation Cumulative Effects 85
Trails 85
Outfitter/Guide Use 87
Wilderness 87
Dispersed Recreation 88
Consistency with the Forest Plan 88
Recommended Wild and Scenic River Affected Environment 89
Scenic 89
Recreation 89
Fisheries 89
Wildlife 90
Recommended Wild and Scenic River Environmental Consequences 90
Alternative A 90
Alternative B 91
Alternative C 91
Alternative D 91
Recommended Wild and Scenic River Cumulative Effects 91

Consistency with the Forest Plan 91
Geology, Soils, Hydrology Affected Environment 92
White Chuck River 92
Geology, Soils, Hydrology Environmental Consequences 103
Alternative A 103
Alternative B 104
Alternative C 111
Alternative D 112
Geology, Soils, and Hydrology Cumulative Effects 118
Consistency with the Forest Plan 124
Fisheries Affected Environment 124
Fish Species of Interest 124
Fish Habitat Watershed-Scale Assessment 127
Fish Habitat Project Area 128
Watershed and Fish Habitat Restoration 131
Recreation and Fisheries 132
Fisheries Environmental Consequences 132
ESA Consultation 132
Alternative A 133
Alternative B 135
Alternative C 140
Alternative D 144
Fisheries Cumulative Effects 147
Consistency with the Forest Plan 150
Riparian Reserves Affected Environment 150
Riparian Reserves Environmental Consequences 152
Alternative A 152
Alternative B 152
Alternative C 153
Alternative D 153
Riparian Reserves Cumulative Effects 153
Consistency with the Forest Plan 154
Aquatic Conservation Strategy 155
Effects of Implementation 156
Alternative A 157
Alternative B 157
Alternative C 158
Alternative D 159
Consistency with the Forest Plan 159

Wildlife 159
Federal Threatened and Endangered Species and Designated Critical Habitats 159
Regional Forester's Sensitive Listed Species 163
Management Indicator Species 167
Other Rare and Uncommon Species (Formerly Survey and Manage Species) 169
Executive Order 13186 Migratory Landbirds 169
Protection Buffer Species and Bat Roost Sites 169
Wildlife Environmental Consequences 170
ESA Consultation 170
Effects Common to all Alternatives 170
Alternative A 171
Alternative B 172
Alternative C 177
Alternative D 177
Wildlife Cumulative Effects 178
Consistency with the Forest Plan 182
Botany Affected Environment 182
Botany Environmental Consequences 183
Botany Cumulative Effects 184
Consistency with the Forest Plan 185
Visual Resources Affected Environment 185
Visual Resources Environmental Consequences 185
Alternative A 185
Alternative B 186
Alternative C 186
Alternative D 186
Visual Resources Cumulative Effects 187
Consistency with the Forest Plan 187
Heritage Affected Environment 187
Treaty Resources and Reserved Indian Rights 189
Heritage Environmental Consequences 190
Alternative A 190
Alternatives B, C, and D 190
Heritage Cumulative Effects 191
Consistency with the Forest Plan 191
Local Economy/Tourism Affected Environment 191
Local Economy/Tourism Environmental Consequences 192
Alternative A 193
Alternative B 193

Alternative C 193
Alternative D 194
Local Economy/Tourism Cumulative Effects 194
Consistency with the Forest Plan 194
Environmental Justice 195
Other Resources 196
Air Quality Effects 196
Prime Forestland, Prime Farmland, Rangeland, etc. 197
Wetlands and Floodplains Effects 197
Irreversible and Irretrievable Commitment of Resources 197
Potential Conflicts with Plans and Policies of Other Jurisdictions 198
Chapter 4 Agencies and Persons Consulted 199
Federal, State, and Local Agencies 199
ID Team Members, Consultants, and Preparers: 199
Chapter 5 References 201

APPENDICES

Appendix A Flood History
Appendix B White Chuck Road Repair Scoping Report July 2008
Appendix C Cumulative Effects Analysis Process

LIST OF TABLES

Table 1. Forest Road Analysis Results: Roads within the White Chuck Watershed that are Related to this Analysis 19
Table 2. Management Requirements and Mitigation Measures 47
Table 3. Comparison of Alternatives 55
Table 4. Road 23 Flood Damages 63
Table 5. Alternative A No Action Route 64
Table 6. Alternative B Route 66
Table 7. Trailheads and Trails Accessed from Road 23 74
Table 7. Trailheads and Trails Accessed from Road 23 75
Table 8. Affected Trails 75
Table 9. Roads on the Darrington Ranger District Damaged in the 2003 and 2006 Flood Events 87
Table 10. Soil Map Units by Site Number and MPs 94
Table 11. Selected Soil Mapping Interpretations 95
Table 12. Peak Flows of the South Fork Sauk River 96
Table 13. Stream Temperature Statistics for the Lower White Chuck River 102
Table 14. Acres of Disturbed during Construction 103
Table 15. Acres of Reduction in Compacted Road Soils 103
Table 16. Magnitude, Duration, and Intensity of Losses to Soil Quality 115
Table 17. Effects Summary of Sediment Erosion 116
Table 18. Effects Summary Relative to No Action (Alternative A) and Among the Action Alternatives 117
Table 19. Cumulative Effects Determination for Projects in the White Chuck and Sauk Rivers; Pertinent to the White Chuck ERFO Road Repairs 121
Table 20. Fish Species of Management Emphasis, White Chuck River Watershed 125
Table 21. Watershed Restoration History in the White Chuck River Watershed 131
Table 22. Activities for Fish Species Cumulative Effects Analysis 148
Table 23. Existing Core Habitat and Foraging Habitat with Grizzly Bear Management Units Overlapping or Adjacent to the Project Area 161
Table 24. Wildlife Cumulative Effects Determination 179
Table 24. Wildlife Cumulative Effects Determination (continued) 180
Table 25. Visitors to Darrington Ranger District Office 192
Table 26. Race and Ethnicity and Percent of the Population below Poverty 196

LIST OF FIGURES

Figure 1. Vicinity Map 3
Figure 2. Photograph of Site #1 5
Figure 3. Photograph of Site #2 6
Figure 4. Photograph of Site #3 7
Figure 5a. Photograph of Site #4 8
Figure 5b. Interior of Blocked Culvert at Site #4 9
Figure 6. Photograph of Site #5 10
Figure 7. Photograph at Site #6 (12-foot-diameter cedar spanning Road 23) 11
Figure 8. Photograph of Site #7 12
Figure 9. Photograph of Site #8 13
Figure 10. Alternative B – Proposed Action 35
Figure 11. Engineering Drawing of Road Section at Site #1 37
Figure 12. Engineering Drawing of Proposed Plain View at Site #1 38
Figure 13. Alternative C 40
Figure 14. Alternative D 43
Figure 15. Recreation Areas 74
Figure 16. Number of People Registering at the White Chuck Trailhead, 1997 – 2006 77
Figure 17. Flood Damaged Road Repair Sites 86
Figure 18. Number of People Registering at the White Chuck, Suiattle, and North Fork Sauk Trailheads, 2000 to 2007 88
Figure 19. Fine Textured River Terrace Typical of Sites #1 (MP 1.9), #2 (MP 2.4), and #3 (MP 3.4) 93
Figure 20. Site #1 (MP 1.9), Summer 2006 98
Figure 21. White Chuck River Site #1 (MP 1.9), Flood Channel Margins for 2003 and 2006 98
Figure 22. White Chuck River Site #2 May 2006 99
Figure 23. White Chuck River Site #2 (MP 2.4), 2 Days following the November 2006 Flood 99
Figure 24. 2006 Flood Channel Effects at Sites #1 and #2 100
Figure 25. White Chuck River Site #2 (MP 2.4) 2 Days after the November 2006 Flood. 129
Figure 26. White Chuck River Site #2 (MP 2.4) during the 2008 Summer 130
Figure 27. Large Wood Delivered to the White Chuck River Channel, Site #1, 2003 Flood Event 151
Figure 28. NSO and MAMU Critical Habitat Units 164

ACRONYMS

ACS	Aquatic Conservation Strategy
APE	Area of Potential Effect
ATM	Access and Travel Management
BLM	Bureau of Land Management
BMP	Best Management Practice
BMU	Bear Management Unit
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CHU	Critical Habitat Unit
CWA	Clean Water Act
EA	Environmental Assessment
EIS	Environmental Impact Statement
EFH	essential fist habitat
ELJs	engineered logjams
ERFO	Emergency Relief for Federally Owned Roads
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FEMA	Federal Emergency Management Agency
FHWA	Federal Highways Administration
FONSI	Finding of No Significant Impact
Forest Plan	Mt. Baker-Snoqualmie National Forest Land and Resource Management Plan
Forest Service	USDA Forest Service
FSH	Forest Service Handbook
GIS	Geographical Information System
GSI	Genetic Stock Information
HPA	Hydraulic Project Approval
ID Team	Interdisciplinary Team
LSOG	late successional old-growth
LSR	Late Successional Reserve
LWD	large woody debris
MA	Management Area
MBS	Mount Baker-Snoqualmie
MIS	Management Indicator Species
ML	maintenance level
MP	milepost
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration

ACRONYMS (CONTINUED)

NRHP	National Register of Historic Place
NTU	Nephlometric Turbidity Unit
OHV	off-highway vehicle
PCT	Pacific Crest Trail
Project	White Chuck Road Repair Project
RM	River Mile
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
SRLC	Sauk River Lumber Company
USACE	United States Army Corp of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USSG	United States Surveyor General
WAC	Washington Administrative Code
WDFW	Washington State Dept. of Fish and Wildlife
WDW	Washington Department of Wildlife

This page is intentionally left blank.

1. Introduction

This Environmental Assessment (EA) analyzes the environmental effects of repairing Forest Service Road 23 (Road 23; known locally as the White Chuck Road), which was damaged during severe flood events in October 2003 and again in the fall and winter of 2006/2007. (For more information about the 2003 flood damage and past flood damage, see Appendix A.) The White Chuck Road Repair Project (Project) is proposed by the United States Department of Agriculture (USDA) Forest Service (Forest Service). Repeat damage to the road has occurred because periodic large floods funnel through the inner gorge and undermine the slope below the road at sections where it is adjacent to the White Chuck River.

The White Chuck River, a tributary of the Sauk River, lies west of Glacier Peak. The proposed Project is located in the White Chuck River drainage (Township 31N, Range11E, Sections 13, 14, 16, 17, and 18; and Township 31N, Range 12E, Section 19 Willamette Meridian, Snohomish County) on the Darrington Ranger District, Mt. Baker-Snoqualmie National Forest (referred to as the "MBS" or "the Forest" throughout this document) in Washington State.

Road 23 was damaged at eight sites located at mileposts (MPs) 1.9, 2.4, 3.4, 3.5, 5.8, 6.45, 7.2, and 8.5 (referred to as Sites #1 through #8, respectively, throughout this document). The Forest Service proposes to restore vehicle access along Road 23 to the junction with Forest Service Road 27 (Road 27; also known as Rat Trap Pass road). This would include repairs at Sites #1 through #4 (MP 1.9, MP 2.4, MP 3.4, and MP 3.5). In addition, Road 23 from the junction with Road 27 to the White Chuck Trailhead would be decommissioned to a walkable tread (approximately MP 5.8 to terminus). It has been determined that some of the flood damage qualifies for Emergency Relief for Federally Owned Roads (ERFO) funding from the Federal Highways Administration (FHWA). Based on field reviews, portions of the upper section of Road 23 (past the junction with Road 27) have been assessed as having a high risk for future damage because it crosses unstable areas.

The MBS Forest-Wide Roads Analysis (Forest Service 2003) identifies Road 23 as a *High-Need* road for recreation and access to timber management (Matrix lands) lands. This road also rates as a *High-Concern* road for aquatic resources and a *Moderate-Concern* for wildlife resources. The current operational Maintenance Level (ML) of Road 23 is ML 3 (open-maintained for low-clearance passenger vehicles, stock trucks, and horse trailers) with an Objective Level 3 (for future needs).

Road 27, a ML 3 connecting road accessed by Road 23, is designated as a *High-Need* road to provide recreational access into and out of the White Chuck watershed. The portion of Road 27 within the White Chuck watershed is also designated as *High-Need* for accessing Matrix land on the north side of the White Chuck River.

The initial assessment of repairs needed and the estimated funding required to repair the flood damage was determined and documented through the FHWA's Damage Survey Reports (located in the project record). ERFO targets funding for reconstruction of roads that have suffered damage because of a natural disaster over a wide area, or from a catastrophic failure.

White Chuck Road 23 History

The first portion of Road 23 was originally built as a railway to access the area for timber harvesting. Later, Road 23 was converted and expanded to provide a truck route for additional timber harvest. Approximately 9,300 acres of land within the 54,509-acre White Chuck drainage are allocated as Matrix; approximately 6,858 acres are accessed by Road 23. Matrix lands include lands that are available for timber harvest under the Final Environmental Impact Statement (EIS) for the Mt. Baker-Snoqualmie Land and Resource Management Plan (Forest Service 1990), as amended by the 1994 ROD (Forest Service 1994)].

For nearly a century, recreationists have used Road 23 to access trails for hiking, backpacking, and stock use. The Boulder Basin/Sitkum Glacier climbing route on Glacier Peak became popular following the extension of Road 23 to Owl Creek in the 1950s. The easy access of Road 23 supported a variety of opportunities for recreationists of all levels, including camping, pleasure driving, hunting, wildlife and bird viewing, fishing, berry picking, mushrooming, and snowplay.

From 1989 to 1996, the average number of vehicles accessing the White Chuck drainage annually was 9,064, with 8,454 of those being recreational vehicles (traffic counter records, Darrington Ranger District).

Need for Proposed Action

The Darrington District Ranger has determined that there is a need to rebuild Road 23 in such a way to provide:

- Safe access suitable for passenger cars, so that the general public can easily access recreation opportunities;
- Access for Forest Service administration of recreation sites and infrastructure;
- Vehicle access to Matrix lands designated for timber management; and
- Closure to the portions of Road 23 located on unstable slopes.

The proposed action partially meets the goals and objectives outlined in the Forest Plan, as amended, which include managing the transportation system at the minimum standard needed to support planned uses and activities, and provide for public safety (Forest Service 1990). The proposed action is supported by findings for Road 23 in the Forest-wide Roads Analysis (Forest Service 2003), which shows the road as *High-Need* for recreation and access to timber management lands, but also as a *High-Risk* road to aquatic resources and *Moderate-Risk* road to wildlife resources.

There is also a need to complete the repairs within the designated ERFO timeframe and within the approved funding.

Road 23 is part of a high-use, multi-season administrative and recreation route on the Darrington Ranger District of the MBS National Forest (Figure 1). This road provides direct vehicular access to the White Chuck Bench/Crystal Creek and Meadow Mountain (via Road 27) trailheads. The proposed action would not provide vehicular access to the White Chuck Trailhead, which is a very popular Glacier Peak Wilderness trail and climbing route to Glacier Peak; however, it would reduce the distance required to hike or bike to reach this

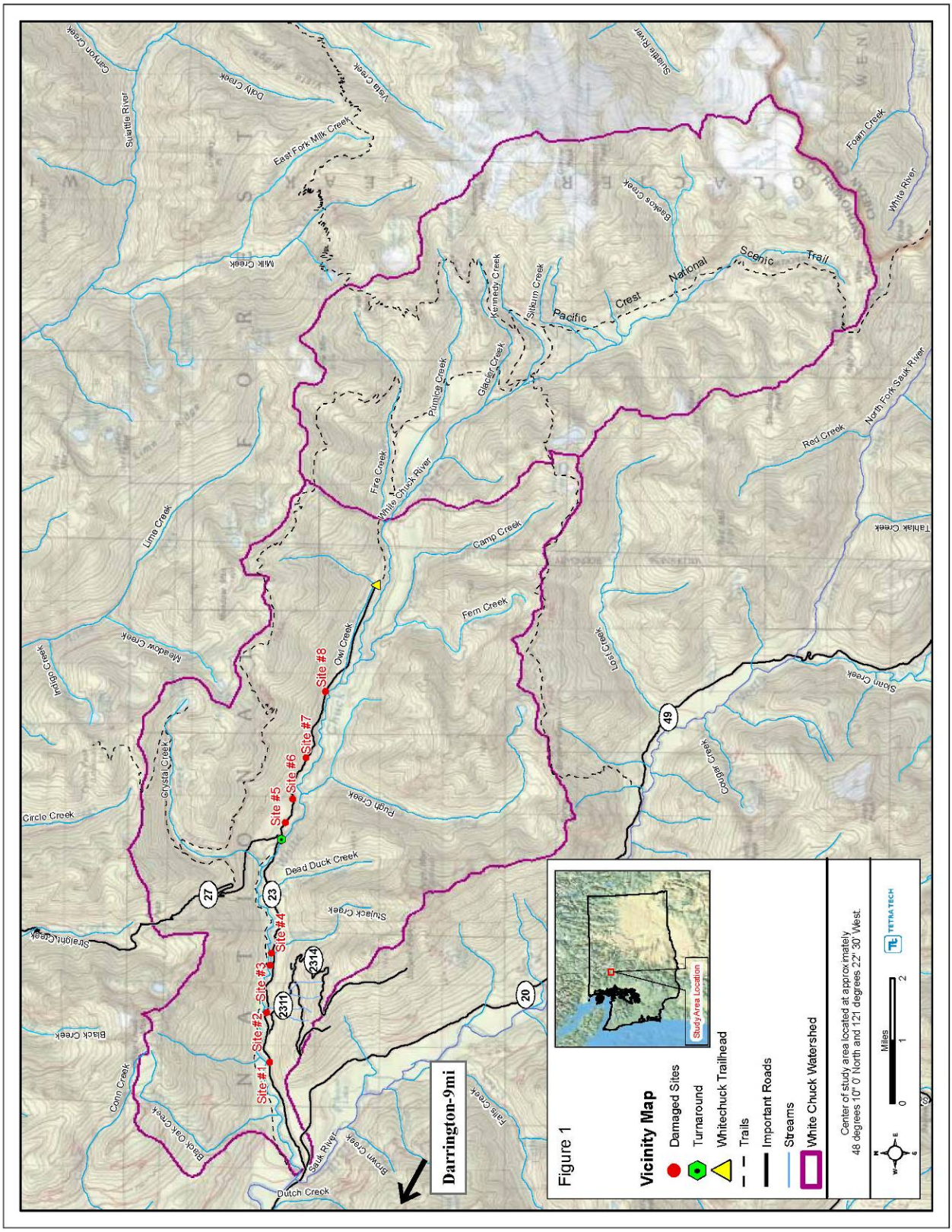


Figure 1
Vicinity Map
Damaged Sites
Turnaround
Whitechuck Trailhead
Trails
Important Roads
Streams
White Chuck Watershed
Study Area Location
Center of study area located at approximately
48 degrees 10' 0' North and 121 degrees 22' 30' West
Miles
0
1
2
TETRA TECH
Darrington-9mi
Site #1
Site #2
Site #3
Site #4
Site #5
Site #6
Site #7
Site #8
Pacific Crest National Scenic Trail
White Chuck River
Sauk River
Suiattle River
Dutch Creek
Dead Duck Creek
Owl Creek
Fire Creek
Pumice Creek
Glacier Creek
Kennedy Creek
Silkum Creek
Camp Creek
Fern Creek
Lost Creek
Red Creek
North Fork Sauk River
Foam Creek
White River
Talbak Creek
Sorn Creek
Cougar Creek
Beacos Creek
Vista Creek
East Fork Milk Creek
Milk Creek
Daily Creek
Canyon Creek
Lima Creek
Meadow Creek
Crystal Creek
Circle Creek
Straight Creek
Black Creek
Conn Creek
Black Oak Creek
Brown Creek
Falls Creek
Suiack Creek
Puch Creek
27
23
2311
2314
20
49

trail. Extensive damage to the White Chuck Bench and White Chuck Trails, however, would continue to limit hiker use until repairs are complete.

Several dispersed campsites along the road require cleaning and monitoring for unattended fires, garbage, and vandalism. Law enforcement personnel patrolling the area are responsible for randomly checking trailheads for vehicle break-ins and suspicious activities. Further, for nearly a century, fire personnel have used the roads and trails to reach natural and human-caused fires in remote wilderness areas.

Within the White Chuck drainage of the Glacier Peak Wilderness, wilderness rangers and trail maintenance crews are responsible for maintaining approximately 63 miles of trail, 136 wilderness campsites, 9 toilets, and revegetating overused areas. The rangers also provide conservation education and interpretation for visitors. Since the 2003 flood, access to many of these sites has not been possible.

Repeated loss of Road 23 has occurred in the past because large floods funnel through the steep inner gorges of the White Chuck River, undermining the slopes below the road, and because much of the upper portion of the road are built unstable slopes. The proposed action provides more stable road access up the White Chuck River drainage and closes portions of the road located on unstable slopes, thus minimizing the effects of the road on the river and minimizing the risk of continued road slumping and failure. By relocating and decommissioning portions of the road, the Proposed Action would meet the goals and objectives outlined in the Forest Plan, as amended, for soil, water, Tier 1 Key Watersheds, and Riparian Reserves.

Proposed Action

The Darrington Ranger District proposes to restore vehicular access to a portion of the White Chuck drainage, to connect Road 23 with Road 27, and to close the upper section of Road 23. The upper section of Road 23 is proposed for closure due to the Forest Leadership team's desire to reduce future repairs and road maintenance costs on roads that cross unstable slope segments (Figure 2). Vehicular access and connection of Road 23 to Road 27 would occur by making repairs to four small segments along Road 23, including a repair at Site #1 (MP 1.9), rerouting the road around Sites #2 (MP 2.4) and #3 (MP 3.4), and repairs at Site #4 (MP 3.5). In addition, Road 23 from the junction with Road 27 to the White Chuck Trailhead (MP 5.8 to the road terminus) would be decommissioned and the road prism would be left in a walkable tread. A segment of tread east of the junction of Roads 23 and 27 would be retained as a turnaround. Due to lack of parking space at this junction, the dispersed camping area east of the Upper White Chuck Bridge has been identified as a potential parking area. This would expand the current White Chuck Bench Trailhead parking area to east of the outhouse located north of Road 23. There is approximately 2 acres of area under consideration for additional parking. Details below describe the damage and repairs by site number and milepost location.

Site #1, Milepost 1.9 (T31N, R11E, Section 18). The proposed action would include repairing Site #1 (Figure 2) in-place by lowering the approach grades of the road to lessen the required fill material. A dip in the road would be constructed on large irregular rock to an elevation above the estimated 100-year flood level. Logs would be incorporated into the rock such that they would protrude into the channel to create a rough surface along the river channel.

Figure 2. Photograph of Site #1

Preliminary repair design at Site #1 indicates the potential to shift laterally into the slope to lessen the amount of riprap and material within the 100-year floodplain and lessen environmental impacts. The final design for Site #1 would incorporate field verification of site conditions in relation to design elements.

Site #2, Milepost 2.4 (T31N, R11E, Section 17). The White Chuck River moved into the hillside at Site #2 and washed out about 500 feet of roadway (Figure 3). The proposed action would include rerouting the road above the washout, utilizing 2,300 feet (0.44 mile) of Forest Service Road 2311 (Road 2311). The road relocation would begin at approximately MP 0.4 of Road 2311. New road construction would leave Road 2311 at MP 0.4 and connect back to Road 23 past the second site of road damage. Approximately 1,200 feet (0.23 mile) of new road would be constructed with a large through-cut and fill to an unnamed creek. A culvert large enough to pass a 100-year flood would be installed in the fill across the unnamed creek. Approximately 0.3 mile of Road 23 from the washout east to where the new connector road ties in, and west to the junction with Road 2311, would be decommissioned. Additionally, an existing rock pit on Road 2311-011 may be used as a rock source and waste deposition site. The rock pit is approximately 1.5 miles from the reroute for Site #2. If the proposed rock pit is used, the 2311 road corridor between the reroute and the rock pit would have routine maintenance, including blading, brushing, and ditchline clean-out.

Figure 3. Photograph of Site #2

***Site #3, Milepost 3.4 (T31N, R11E, Section 16)*.** The road near Site #3 would be rerouted around the washout just west of Stujack Creek (Figure 4). Approximately 600 feet (0.11 mile) of new road would be constructed. This new road would be placed approximately 400 feet from the White Chuck River across a 25 percent sideslope above the washout. The new road alignment would leave Road 23 approximately 300 feet before the damage site and re-enter Road 23 approximately 300 feet beyond the center of the damage site. Road drainage would be directed away from the slide area. Bypassed portions of old roadbed would be decommissioned.

Figure 4. Photograph of Site #3

Site #4, Milepost 3.5 (T31N, R11E, Section 16). Approximately 50 feet of roadway washed away in the 2003 flood due to a plugged box culvert. Bedload and debris from Stujack Creek plugged the wooden box culvert, and the creek overflowed along the road, removing much of the road fill. Stujack Creek currently flows next to the box culvert (Figure 5).

The gravel and bedload material that has plugged the upstream end of the culvert in Stujack Creek would be removed and used as fill material to rebuild the road template. A slight dip in the road grade would be installed to prevent water from flowing down the road should another culvert plugging event occur.

The stream channel would be reconstructed for 100 feet above the box culvert inlet to remove bedload material and debris to allow for a free-flowing and unobstructed stream channel into the culvert. The upstream end of the existing wooden culvert shifted approximately 3 feet during the flood event, and it would need to be re-aligned. The culvert appeared to be sound, but it may have been damaged when it was moved by the floodwaters, or it may become damaged when it is moved back into place. If the culvert is no longer serviceable, it would be replaced with an open-bottomed arch capable of passing 100-year floodwaters. The culvert itself is a fish passage barrier and would be replaced in the future with a fish passage structure as funds permit.

Figure 5a. Photograph of Site #4

Figure 5b. Interior of Blocked Culvert at Site #4

Site #5, Milepost 5.8 (T31N, R11E, Section 14). Approximately 550 feet of road has slumped at various depths at Site #5 (Figure 6). Road 23 at this damage site would be decommissioned. Decommissioning at this site would include removal of culverts and unstable fill slope materials as well as restoration of natural hillslope drainage patterns.

Figure 6. Photograph of Site #5

Site #6, Milepost 6.45 (T31N, R11E, Section 14). Approximately 275 feet of road has slumped at Site #6 (Figure 7). Road 23 at this damage site would be decommissioned. Decommissioning at this site would include removal of culverts and unstable fill slope materials as well as restoration of natural hillslope drainage patterns.

Figure 7. Photograph at Site #6 (12-foot-diameter cedar spanning Road 23)

Site #7, Milepost 7.2 (T31N, R11E, Section 13). The road at Site #7 has failed for 60 feet along the outer shoulder of the road (Figure 8). Road 23 at this damage site would be decommissioned. Decommissioning at this site would include removal of culverts and unstable fill slope materials as well as restoration of natural hillslope drainage patterns.

Figure 8. Photograph of Site #7

Site #8, Milepost 8.5 (T31N, R12E, Section 19). The road has failed at damage Site #8, causing a narrow roadway for approximately 350 feet (Figure 9). Road 23 at this damage site would be decommissioned. Decommissioning at this site would include removal of culverts and unstable fill slope materials as well as restoration of natural hillslope drainage patterns.

Figure 9. Photograph of Site #8

At the White Chuck Trailhead, the following structures would be removed: two toilets, the trailhead bulletin board, the fee use sign, and the trail registration box.

Project Scope

This EA analyzes the environmental effects of repairing four flood-damaged sites (MP 1.9, 2.4, 3.4, and 3.5) on Road 23 and decommissioning the road from MP 5.8 to the road terminus.

The Forest Service has determined that because other road damage repairs are scattered widely throughout multiple watersheds, they would constitute *similar* but *not connected* actions (see the Council on Environmental Quality [CEQ] Regulations for implementing the National Environmental Policy Act [NEPA] below). Therefore, for the purposes of site-

specific analysis required by NEPA, only the proposed repairs on Road 23 are analyzed, and their effects are disclosed in this document.

> *The CEQ Regulations for implementing NEPA define "similar actions" and "connected actions" as follows: "Similar Actions" are those that when viewed with other reasonably foreseeable or proposed agency actions have similarities that provide a basis for evaluating their environmental impacts together, such as common timing or geography. An agency may wish to analyze these actions in the same impact statement. It should do so when the best way to assess adequately, the combined impacts of similar actions or reasonable alternatives to such actions is to treat them in a single impact. "Connected Actions" are those that automatically trigger other actions that may require EISs, cannot proceed unless other actions are taken previously or simultaneously, or are interdependent parts of a larger action and depend on the larger action for justification (40 CFR 1508.25 (a)(3)).*

Process of Determining Project Scope

In 2004, the Forest Service mailed a scoping letter describing initiation of the environmental analysis of repairs to roads damaged in 2003 across the MBS National Forest.

Early in 2004, the Forest Service formed a team to assess the flood-damaged roads across the northern portion of the MBS National Forest. The team provided technical and professional expertise on how to approach the numerous road repairs, including four major arterial road systems.

The team considered the facts that far-spread road damages all resulted from the same flood event. The team also agreed that although the roads were in different geographical areas, the damages were similar in scope. Using their combined experience, familiarity with the road systems, and geography of the flood damaged areas, the team decided that making repairs to any individual road system did not depend upon repairs to another road system, concluding that each road is independent of each in terms of accessibility and drivability.

The team decided that the best approach to such a complex NEPA analysis was to group the roads by logical geographical area and analyze the roads with EAs for each road system. The additional damage in 2006/2007 has not altered this approach.

Decision Framework

The Responsible Official for this proposal is the District Ranger for the Darrington District, MBS National Forest. Based on the analysis in this document, and considering the public comments received during scoping and the 30-day EA comment period, the Responsible Official will decide whether to:

- Repair Road 23 to the junction with Road 27 and decommission the remainder of the road, including all associated standard management practices and mitigation measures;
- Repair Road 23 to the junction with Road 27 and place the remainder of the road in storage (ML 1), including all associated standard management practices and mitigation measures;

- Repair all or Road 23, including all associated standard management practices and mitigation measures; or
- Take no action at this time.

Relationship to the Forest Plan

This EA has been prepared in accordance with regulations established under NEPA. The Project tiers to the 1990 Forest Plan, as amended (Forest Service 1990), which provides management direction for the National Forest System lands within the White Chuck ERFO project area.

The Forest Plan

Major amendments to the 1990 MBS Forest Plan include:

- Final Supplemental EIS on Management of Habitat for Late Successional and Old Growth Forest Related Species within the Range of the Northern Spotted Owl and the associated Record of Decision (ROD/Northwest Forest Plan) (Forest Service and Bureau of Land Management [BLM] 1994);
- Record of Decision Amending Resource Management Plans for Seven BLM Districts and Land and Resource Management Plans for Nineteen National Forests within the Range of the Northern Spotted Owl to Clarify Provisions Relating to the Aquatic Conservation Strategy (Forest Service and BLM 2004); and
- Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (Forest Service and BLM 2001), as reinstated by U.S. District Court Order (January 9, 2006), as the ROD was amended, or modified as of March 21, 2004.[1]

The 1994 ROD includes seven land allocations, which amend the allocations described in the 1990 Forest Plan.[2] There is considerable overlap among some allocations; more than one set of standards and guidelines may apply. Where the standards and guidelines of the 1990 Forest Plan are more restrictive or provide greater benefits to late-successional forest-related species than do those of the 1994 ROD, the existing standards and guidelines apply. The 1994 Forest Plan amendment also includes forest-wide standards and guidelines, in addition to those in the 1990 Plan, and an Aquatic Conservation Strategy (ACS), designed to help improve the health of the aquatic ecosystem.[3]

Land Allocations

The White Chuck ERFO project area is located within lands allocated to Riparian Reserve; Administratively Withdrawn – Management Area (MA) 12, Mature and Old Growth Wildlife Habitat; and the following Matrix land allocations: MA 17 Timber Management Emphasis; MA 2B, Scenic Viewshed; and MA 5A, Recommended Wild and Scenic River (Recreation River).

---

[1] This same Court Order set aside the 2004 ROD, which removed or modified the survey and manage mitigation measure standards and guidelines.
[2] One of these, Managed Late-Successional Reserves, does not occur on the MBS.
[3] The ACS has four components: riparian reserves, key watershed, watershed analysis, and watershed restoration.

Riparian Reserves

All of project area at Sites #1, #3, #4, #5, and #8 and a portion of Sites #2, #6, and #7 are located within lands allocated as Riparian Reserve. This allocation includes areas along all streams, wetlands, ponds, lakes, and unstable or potentially unstable areas where the conservation of aquatic and riparian-dependent terrestrial resources receive primary emphasis, and where special standards and guidelines direct land use. Riparian Reserves generally parallel the stream network, but they also include other areas necessary for maintaining hydraulic, geomorphic, and ecological processes. Riparian Reserves overlay all other management areas; Riparian Reserve standards and guidelines apply wherever Riparian Reserves occur.

Riparian Reserve Road Management Standards and Guidelines

RF-2. For each existing or planned road, meet ACS objectives by:

- Minimizing road and landing locations in Riparian Reserves;
- Completing watershed analyses (including appropriate geotechnical analyses) prior to construction of new roads or landings in Riparian Reserves;
- Preparing road design criteria, elements, and standards that govern construction and reconstruction; and
- Minimizing disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow.

RF-3. Determine the influence of each road on the ACS objectives through watershed analysis. Meet ACS objectives by:

- Reconstructing roads and associated drainage features that pose a substantial risk;
- Prioritizing reconstruction based on current and potential impact to riparian resources and the ecological value of the riparian resource affected; and
- Closing and stabilizing or obliterating and stabilizing roads based on the ongoing and potential effects to ACS objectives, and considering short- and long-term transportation needs.

RF-4. Existing culverts, bridges, and other stream crossings determined to pose a substantial risk to riparian conditions will be improved to accommodate at least the 100-year flood, including associated bedload and debris. Crossings will be constructed and maintained to prevent diversion of streamflow out of the channel and down the road in the event of crossing failure.

RF-5. Minimize sediment delivery into streams from roads. Outsloping of the roadway surface is preferred, except in cases where outsloping would increase sediment delivery to streams or where outsloping is unfeasible or unsafe. Route road drainage away from potentially unstable channels, fills, and hillslopes.

RF-6. Provide and maintain fish passage at all road crossings of existing and potential fish-bearing streams.

Matrix

- Provide specified amounts of coarse woody debris in Matrix management;

- Manage to provide a renewable supply of large down logs well distributed across the Matrix landscape in a manner that meets the needs of species and provides for ecological functions; and
- Retain and protect coarse woody debris already on the ground to the greatest extent possible from disturbance during treatment.

Matrix-Scenic Viewshed Middleground (MA 2B) Management Area

The goal of Scenic Viewshed is to provide a visually appealing landscape as viewed from major travel corridors and use areas. In this area, Road 23 is the major travel corridor. The visual quality objective along Road 23 (within 0.25 mile of the White Chuck River) is "partial retention."

MA 2B Road Management Standards and Guidelines

- Roads within the seen area should blend with natural form, line, color, and texture; and
- Cut and fill slopes should be revegetated within 1 year of construction.

Matrix-Recommended Wild and Scenic River, Recreation (MA 5A)[4]

The goal is to protect the outstanding remarkable values and wild, scenic, and recreation characteristics of the White Chuck River from degradation, pending a decision on inclusion into the National Wild and Scenic River System. The White Chuck River was found to possess "Outstandingly Remarkable" values for the following: Scenic, Recreation, Fisheries, and Wildlife. The desired future condition within MA 5A is that evidence of a full range of management activities may exist. The river is readily accessible by road and bridge crossings. Streamside bank is generally in a natural condition. The portions of the White Chuck River associated with the proposed project area are recommended to be classified as ***recreation***, which is defined in the 1968 Wild and Scenic River Act as:

> *"Rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past."*

MA 5A Road Management Standards and Guidelines

Planning

- Plan the Forest Transportation System to serve long-term multiple resource needs as provided in Management Area direction, and
- Maintain the Forest Road Management Plan.

Construction

- Design, construct, and/or reconstruct roads according to standards appropriate to planned uses, activities, safety, economics, and impacts on lands and resources using criteria in Forest Service Handbook (FSH) 7700 and 7720 or as revised.

[4] The Visual Quality Objective for 5A is "partial retention" (see Forest Plan, p. 4-93).

Operations and Maintenance

- Operate, maintain, and/or close roads to meet established road management objectives and safety.

Location

- Location of roads should minimize impacts on dedicated or sensitive lands where practicable.

Tier 1 Key Watershed

The proposed project is located within Tier 1 watersheds. These watersheds were designated as sources for high water quality and contain at-risk anadromous fish (e.g., salmon). Key watersheds are highest priority for watershed restoration and are considered crucial for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species. There is to be no net increase for roads in key watersheds. Watershed analysis is required prior to management activities, except minor activities such as those Categorically Excluded under NEPA.

Watershed analysis for the White Chuck watershed has been completed. The White Chuck Watershed Analysis (Forest Service 2004) describes the current conditions of the river, compares historic and current conditions, describes how these ecosystems have functioned and are currently functioning, and describes how they are likely to function in the future. The findings of the White Chuck Watershed Analysis were incorporated into this EA by reference.

Other Relevant Forest Plan Standards and Guidelines and Management Direction

Forest-Wide Recreation-Dispersed

- Provide for a broad spectrum of Recreation Opportunity Spectrum settings and recreational opportunities such as hunting, fishing, gathering forest products, viewing scenery, camping, hiking, floating, etc. (p. 4-84).

Forest-Wide Roads Analysis, MBS National Forest 2003

Roads Analysis, a requirement of 36 Code of Federal Regulations (CFR) 212.5, has been completed. The forest-wide analysis is an interdisciplinary, science-based process that provides the Responsible Official critical information needed to identify and manage a minimum road system that: 1) is safe and responsive to public needs and desires; 2) is affordable and efficient; 3) is in balance with available funding for needed management actions; and 4) has minimal adverse effects on ecological processes and ecosystem health, diversity, and productivity.

Table 1 summarizes, by road segment, the need for access to Matrix and Late Successional Reserve (LSR) lands, the level of concern for resources (e.g., high concern means the road needs stabilization work), and the Roads Analysis maintenance level objective and current road maintenance level.

Table 1. Forest Road Analysis Results: Roads within the White Chuck Watershed that are Related to this Analysis

Road No.	Name	BMP	EMP	Matrix/LSR Access Need	Recreation Needs	Aquatic Concern	Wildlife Concern	Current ML	ML Obj
23	White Chuck	0	10.3	H/L	H	H	M	3	3
2300-011	Crystal Creek Campground	0	0.1	L/L	H	H	L	2	2
2300-016	Owl Creek Campground	0	0.2	L/L	H	H	L	2	2
2311	Pugh Ridge	0	5.4	H/L	L	H	M	2	2
2311-011	Pit Access Road	0	0.3	H/L	L	M	H	1	1
2314	Backside Pugh	0	2.1	H/L	L	H	M	2	2
27	Straight Creek (Rat Trap Pass)	0	3.9	L/L	H	H	H	3	3

BMP – Beginning Milepost, EMP – Ending Milepost, LSR – Late Successional Reserve, ML – Maintenance Level, Obj – Objective, L – Low, M – Moderate, H – High
Road 27 is listed as ML 3, but the road conditions are better suited to ML 2.
Source: White Chuck Watershed Analysis (Forest Service 2004)

Other Relevant Laws and Regulations

Endangered Species Act

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA), as amended, requires federal agencies to review actions authorized, funded, or carried out by them, to ensure such actions do not jeopardize the continued existence of federally listed species, or result in the destruction or adverse modification of listed critical habitat. The Forest Service consults with the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries if projects potentially could affect listed species.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act requires federal action agencies to consult with the Secretary of Commerce (NOAA Fisheries) regarding any action or proposed action authorized, funded, or undertaken by the agency that may adversely affect essential fish habitat (EFH) for species identified by the Pacific Fishery Management Council. According to EFH regulations, 50 CFR section 600.920(a)(1), EFH consultations are not required for completed actions or project-specific actions with a signed decision under the NEPA, and these regulations enable federal agencies to use existing consultation and environmental review procedures to satisfy EFH consultation requirements.

National Historic Preservation Act

National Historic Preservation Act Section 106 requires documentation of a determination of whether each undertaking will affect historic properties. The MBS National Forest operates under a programmatic agreement among the USDA Forest Service Pacific Northwest Region, the Washington State Historic Preservation Officer, and the Advisory Council on Historic Preservation for consultation on project determination.

Clean Air Act

The Clean Air Act Amendments of 1977 give federal land managers an affirmative responsibility to protect the air quality related values (including visibility) within Class 1 areas. Wilderness areas are Class 1 areas for air quality protection. Visibility is a value that is protected primarily within the boundaries of a Class 1 area, although the Clean Air Act includes provision for definition of vistas integral to a visitor's experience, even if these vistas extend beyond the boundaries of the Class 1 area.

Clean Water Act

The Clean Water Act (CWA) of 1977 and subsequent amendments established the basic structure for regulating discharges of pollutants into the waters of the United States. It gives the U.S. Environmental Protection Agency (EPA) the authority to implement pollution control programs, and to set water quality standards for all contaminants in surface waters. The CWA makes it unlawful for any person to discharge any pollutant into waters of the United States, unless a permit was obtained under its provisions. The EPA delegated implementation of the CWA to the States, and the State of Washington recognizes the Forest Service as the Designated Management Agency for meeting CWA requirements on National Forest System lands.

Executive Orders 11988 (Floodplains) and 11990 (Wetlands)

Executive Orders 11988 and 11990 (1977) address floodplains and wetlands. The purpose of these orders is to:

> *"…avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development…" and "…avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands…"*

Invasive Species Management

The Federal Noxious Weed Act of 1974 prohibits the movement, sale, or purchase of noxious weeds; allows for quarantines; specifies prevention of weed spread; and allows for cooperation with other agencies. The 1999 Executive Order on invasive species (direction found in Forest Service Manual 2080), the National and Regional strategies for noxious weed management, and the Mediated Agreement of May 24, 1989, identify prevention as the preferred strategy for managing competing and unwanted vegetation. In addition, all work on the MBS National Forest is guided by the Forest Plan, Forest-wide Standards and Guidelines, Prevention Strategies, and Best Management Practices (BMPs) for noxious weeds, including cleaning of construction equipment, prompt re-vegetation of disturbed sites, and use of weed-free mulch (Forest Service 1990, Amendment #14).

A Record of Decision has been signed for the Pacific Northwest Region Invasive Plant Program: Preventing and Managing Invasive Plants, Final EIS (Forest Service 2005). This document amends all Forest Plans in Washington and Oregon with goals, objectives, and standards related to invasive plants that complement the BMPs already in effect on the MBS

National Forest. The 2005 ROD standards also prescribe prevention, cleaning of equipment, use of weed-free straw and mulch, use of weed-free rock and gravel sources, and prompt revegetation with native species or non-invasive non-natives.

Project Record

This EA hereby incorporates by reference the Project Record (40 CFR 1502.21). The Project Record contains Specialist Reports and other technical documentation used to support the analyses and conclusions in this EA. These Specialist Reports are for Geology, Soils and Hydrology, Fisheries, Wildlife, Botany, Recreation, Timber Harvest Assessment and Financial Analysis, Engineering, Aquatic Conservation Strategy, and Cultural Resources (District files) for the White Chuck Road Repair Project. These Specialist Reports also discuss the Affected Environment section of the environmental analysis (summarized in this document), which helps establish the basis for the environmental effects section in Chapter 3 of this EA.

Relying on Specialist Reports and the Project Record helps implement the CEQ Regulations' provision that agencies should reduce NEPA paperwork (40 CFR 1500.4). The objective is to furnish enough site-specific information to demonstrate a reasoned consideration of the environmental impacts of the alternatives and how these impacts can be mitigated, without repeating detailed analysis and background information available elsewhere. The Project Record is available for review at the Darrington Ranger District.

Public Involvement

In 2004, the Forest Service mailed a scoping letter describing initiation of the environmental analysis of repairs to roads across the MBS National Forest that were damaged in 2003. The Darrington Ranger District proposed to restore vehicular access to the White Chuck drainage by making repairs to three segments along Road 23 (MP 1.9, MP 2.4, and MP 3.5). An EA was prepared for this Project and scheduled to be released in 2007 for the 30-day public comment period. However, in the spring of 2007, Forest Service staff discovered additional damage from the November 2006 flood to Road 23 (located at MP 3.4, MP 5.8, MP 6.4, MP 7.2, and MP 8.5). Since that time, the Forest Service along with FHWA staff have inventoried the new damage and documented it in Damage Survey Reports, which identify what flood damage qualifies for ERFO funding.

Forest aquatic specialists and engineers reviewed the additional damage to Road 23 after the floods in the fall and winter of 2006/2007 and determined that the upper road section from MP 5.8 to MP 8.5 of Road 23 is at high risk for continued damage from slope movement. The White Chuck River is expected to continue to erode the toe of the slope with the potential for additional slide activity. Forest Service staff discussed the options and potential costs for maintaining Road 23, and developed a proposal to repair Road 23 from the beginning of the road to the junction of Road 23 with Road 27. Given current road maintenance funding and the risk assessment, the Forest Service proposed decommissioning Road 23 beyond the junction with Road 27 to a walkable tread.

2004 Scoping Comments

The Forest Service received scoping comments in 2004 from the Skagit River System Cooperative representing the Swinomish Tribe and the Sauk-Suiattle Indian Tribes, three organizations, and seven individuals (refer to the Scoping Report in Appendix B). Comments included:

- Recommendations that Road 23 be decommissioned beyond MP 1.9 to avoid future damage to water quality and fish habitat and because it is uneconomical to try to maintain the road;
- Recommendations that Road 23 be repaired because it is important for recreation;
- Recommendations that Road 23 be relocated uphill to protect water quality and fish habitat; and
- Various recommendations that other roads in the White Chuck watershed or the Suiattle watershed be either repaired or decommissioned and various improvements made to the trail system.

2008 Scoping Comments

In April 2008, the Forest Service mailed a scoping letter describing the additional damage and initiating an environmental analysis of proposed repairs to Road 23 from both the 2003 and 2006 floods. The following preliminary issues were identified in this letter:

- Lower Road 23 repairs at MP 1.9 may have adverse effects to river and floodplain processes, with further effects on aquatic integrity, Riparian Reserve conditions, water quality, and fish habitat.
- Lower Road 23 repairs may be subject to future flood impacts and therefore not cost effective.
- Lower Road 23 repairs may be high risk because they are within a river drainage with unstable slopes and flash flows.
- Upper Road 23 decommissioning would adversely affect recreational access into the White Chuck River drainage.
- Upper Road 23 decommissioning would preclude vehicle access to some Matrix lands that are available for timber management.

The Forest received comments from 6 organizations and 13 individuals (refer to the Scoping Report in Appendix B).

As part of its government-to-government responsibility to consult with Native American tribes, the Forest Service, in April 2008, sent letters to representatives of the Lummi Nation, Samish Indian Nation, Sauk-Suiattle Indian Tribe, Stillagaumish Indian Tribe, Swinomish Indian Tribe, Tulalip Tribes, and Upper Skagit Tribe. The Samish Tribe responded stating that they are not interested in participating as a consulting party on the Road 23 repair project at this time. In addition, the Forest received a letter from a member of the Sauk-Suiattle Tribe in response to the Suiattle Access Travel Management scoping effort; the letter included comments on the importance of roads in the White Chuck to tribal members.

Significant Issues

Using the comments from the public, other agencies, and tribes, the Interdisciplinary Team (ID Team) developed a list of issues to address the five significant topics identified during the 2004 scoping period. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Other issues raised by the public were identified as non-significant because they were: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence.

The Forest Service identified the following six significant issues for this analysis based on the 2007 scoping efforts:

Issue 1: Aquatic Resources

Road 23 repairs at MP 1.9 may have adverse effects on river and floodplain processes, with further effects on aquatic integrity, Riparian Reserve conditions, water quality, and fish habitat.

Measurement Criteria/Indicators:

- Sediment and erosion quantities recorded from similar activities.
- Effects of sedimentation on threatened fish.
- Changes to large woody debris functions and connectivity of floodplains.

Issue 2: Cost-Effectiveness

Road 23 repairs may be subject to future flood impacts and therefore not cost effective.

Measurement Criteria/Indicators:

- Professional judgment on the risk of future road damage.

Issue 3: Risk of Repairs

Road 23 repairs may be high risk because they are within a river drainage with unstable slopes and flash flows.

Measurement Criteria/Indicators:

- Past damage and repair records.
- Professional judgment on the likelihood on potential for future road failure.

Issue 4: Recreation

Upper Road 23 decommissioning may limit recreational access into the White Chuck River drainage by limiting vehicles and changing access.

Measurement Criteria/Indicators:

- Changes in access to trails and trailheads.
- Impacts to access for hikers, climbers, and stock users.
- Impacts to outfitter/guide access and expected use.
- Impacts to wilderness access and use.

- Impacts to dispersed recreation opportunities dependent upon motorized access.

Issue 5: Timber Management

Upper Road 23 decommissioning may preclude vehicle access to some Matrix lands that are available for timber management.

Measurement Criteria/Indicators:

- Number of acres accessible to Matrix land allocations by Alternative.
- Findings and recommendations in the Forest-wide Roads Analysis and Forest Plan (as amended).

Issue 6: Low elevation Trails

Road management activities may limit access to low elevation trails and trailheads, which are limited on the Forest.

Measurement Criteria/Indicators:

- Changes in access to low elevation trails and trailheads, and impacts on users.

2. Alternatives

This chapter describes and compares the alternatives considered for the Road 23 Repair Project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., full bench road construction versus sidecast) and some of the information is based upon the environmental, social, and economic effects of implementing each alternative (i.e., the amount of erosion or cost of reconstructing the road).

Alternatives Considered but Eliminated from Further Study

In the project planning process for the repair of Road 23, several alternatives to the proposed action were examined for lower cost or lower environmental risk to the repair in-place option. These options, including a proposal to close the road permanently, were examined and discussed at length by the ID Team. A description of the alternatives, and the rationale as to why each was eliminated from detailed study, is disclosed below.

Alternative 1. Reroute Road 23 to the North Side of White Chuck River

This alternative would not have included repairs to the damaged sites on White Chuck Road; instead the road would have been rerouted to the north side of the White Chuck River. This reroute would have utilized approximately 0.5 mile of Road 22 and 1.5 miles of Road 2200-013. It would have required about 0.5 mile of new road construction on a former historic railroad grade[5] and about 5.0 miles of new road construction over the existing White Chuck Bench Trail #731 (also an old railroad grade). Upon returning to the south side of the White Chuck River and the remaining portion of Road 23, the road would have utilized the Upper White Chuck Bridge as a crossing to Road 23.

New road construction would have required crossing at least five active avalanche chutes, a deep-seated (blue clay) landslide near Crystal Creek, and four large drainages, including Black Oak Creek and Crystal Creek. Road 23 would have been blocked to eastbound traffic at MP 1.6 and at MP 3.5 to westbound traffic. By not repairing Road 23, access for maintenance of Roads 2311 and 2314 would have been lost, and eventually, these roads could deteriorate and fail.

- The Forest Service road maintenance staff would decide upon a permanent closure point at a good turnaround location, and the road would be physically blocked. Closure signs would be posted at the beginning of Road 23 and at the turnaround point. This closure would be part of routine road maintenance for public safety and not associated with this Project. Fully implemented, this alternative would have cost $2.27 million dollars.

[5] Sauk River Timber Company

This alternative was considered but eliminated from detailed study for the following reasons:

- Not consistent with the Forest Plan, as amended, Tier 1 Watershed standard and guideline requiring no net increase in the amount of roads in key watersheds (ROD C-7). Implementing this alternative would have resulted in a net increase of 5.2 miles of road within a key watershed.
- Not consistent with standards and guidelines for lands designated as late-successional old-growth (LSOG). New road construction would result in the removal of approximately five acres of LSOG in the central portion of the route. The road construction would not have been consistent with the Forest Plan, as amended, because it is not neutral or beneficial to the creation and maintenance of late-successional habitat.
- Not consistent with standards and guidelines for MA 15 (designated as Mountain Goat winter range) under the Forest Plan, as amended, because the construction would have been adjacent to MA 15 and would provide easier access to this area with potential for illegal take of mountain goats. The goal of the Forest Plan, as amended, is to protect and manage habitat to maintain or increase mountain goat populations. Under the Forest Plan, as amended, no new roads should be constructed that access winter range.
- The need to retain current access to Matrix lands designated for timber management would not have been met. Access would have been lost to approximately 1,100 acres of Matrix lands (Roads 2311 and 2314).
- This alternative, if implemented, would have caused unreasonable loss or environmental harm to aquatic resources. There would have been high risks to aquatic resources due to stream crossings and extremely steep, wet, and unstable soils particularly Black Oak Creek—a fish-bearing stream. At this creek, the route would have crossed soils considered extremely unstable and these are generally considered as unavailable for road construction under the Forest Plan, as amended (p. 4-117). Refer to MBS Forest Supervisor's memos (File Code 2550) from June 10, 1988, and January 2, 1990. In addition to Black Oak Creek, impacts to aquatic resources would have eventually arisen on the abandoned sections of Roads 2311 and 2314 because there would have been no decommissioning or restoration efforts associated with this alternative. Approximately 8.1 miles of road would have been inaccessible for road maintenance.
- The road would be built on top of the White Chuck Bench Trail and would obliterate the trail.

Alternative 2. Reroute at Site #1 (MP 1.9) by Using Road 2088

The difference between this alternative and the proposed action is that it would have included a reroute of Road 23 upslope and around Site #1 rather than repairing the damage in-place. This would have been accomplished by reconstructing 0.9 mile of Road 2088 (about 0.5 mile east of the terminus of Road 23 on the Mountain Loop National Scenic Byway). It would have required approximately 1.0 mile of new road construction to join Road 2088 to Road 2311.

Road 2311 would have been used to continue the reroute above Site #2 (MP 2.4), returning to a stable portion of the road beyond Site #2. As described in the proposed action, Site #3 (MP 3.4) would have been rerouted, and Site #4 (MP 3.5) would have been repaired in-place.

A very steeply graded switchback curve located on Road 2088 caused concern in terms of public safety. This particular switchback exceeds 12 percent grade, which is the threshold where a road is no longer considered safe for recreational traffic (Forest Service Road Regulations, FSH 7709.56.4.32 Maximum Allowable Road Grade for Recreational Traffic on a Road).

The 1.0 mile of new road would have been constructed with balanced cut and fill on gentle slopes where possible (at the beginning and ending points of construction); however, the majority of the new construction would have been a full bench road on side slopes greater than 50 percent. Cutslopes on the steepest sideslope and full bench-constructed sections would have been more than 100 feet in depth (28-foot road width and a ratio of 1:1 constructed cutslope angle). Retaining structures may have been required to maintain cutslope stability.

Excavated material would have been hauled to a stable disposal area outside of Riparian Reserves. Road 23 would have been decommissioned from approximately MP 1.6 to MP 2.6. Road 23 would have been blocked to eastbound traffic at MP 1.6 where a vehicle turnaround would have been constructed. Closure signs would be posted at the beginning of Road 23 and at the turnaround point. This closure would be part of routine road maintenance for public safety.

Approximately 7.0 acres of mixed conifer-hardwood forest (including late-successional habitat) would have been impacted by new road construction. This alternative would have cost an estimated $2.13 million to implement.

This alternative was considered but eliminated from detailed study because:

- A portion of reconstructed Road 2088 would exceed maximum Forest Service Regulations of 12 percent road grade (FSH 7709.56), making the road unsuitable for passenger cars and livestock trailers. This alternative does not meet the need to provide safe, passenger car and stock trailer access for the general public for recreational opportunities in the drainage.
- The reroute would disturb additional riparian areas, alter the hillslope hydrology, and remove large trees in the riparian reserves, which would be locally inconsistent with the ACS.

Alternative 3. Reroute at Site #1 (MP 1.9) by Using Road 2090

The difference between this eliminated alternative and the proposed action is that it would have included a reroute of Road 23 upslope and around Site #1 rather than repairing the damage in-place. The reroute would have been via Road 2090, which would have required reconstruction of its entire length of 1.8 miles.

New road construction of 1.0 mile would have been required to connect Road 2090 and Road 2314. From there, Road 2311, a junction of Road 2314, would have been used to continue the reroute above Site #2 and to return the route to a stable portion of Road 23 beyond Site

#2. As described in the proposed action, Sites #3 would have been rerouted, and Site #4 would have been repaired in-place.

The new road construction associated with repairs at Site #1 would have been a full-bench construction for the entire length, with the majority of new construction on side slopes greater than 50 percent. Cutslopes on the steepest sideslope would have been more than 100 feet in depth (28-foot road width and a ratio of 1:1 constructed cutslope angle). Retaining structures may have been required to maintain cutslope stability. Excavated material would have been hauled to a stable disposal area outside of Riparian Reserves.

Road 23 would have been blocked to eastbound traffic at MP 1.6 where a vehicle turnaround would have been constructed. Closure signs would be posted at the beginning of Road 23 and at the turnaround point. This closure would be part of routine road maintenance for public safety.

Approximately 7.0 acres of mixed conifer-hardwood forest (including late-successional habitat) would have been impacted by new road construction. This alternative, if implemented, would cost an estimated $2.09 million.

This alternative was considered but eliminated from detailed study because:

- Even with reconstruction, there would have been two switchback curves on Road 2090 with grades in excess of 12 percent, exceeding Forest Service road grade regulations for recreation traffic. Implementing this alternative would not meet the need to provide safe, passenger car and stock trailer access to the public for recreational opportunities in the White Chuck drainage.
- The reroute would disturb additional riparian areas, alter the hillslope hydrology, and remove large trees in the riparian reserves, which would be locally inconsistent with the ACS.

Alternative 4. Reroute at Site #1 (MP 1.9) Upslope Using Newly Constructed Road

This eliminated alternative differs from the proposed action by rerouting Road 23 upslope from the washout at Site #1 rather than repairing the site in-place. As in the proposed action, Road 23 would have been rerouted at Site #2 using Road 2311 and rerouted and fixed in-place at Sites #3 and #4, respectively. Additionally, Road 23 would have been decommissioned between MP 1.6 and MP 2.0 as well as between MP 2.2 and MP 2.6.

At approximately 0.25 mile before the washout at Site #1, the road would have been moved to the south (upslope). The reroute would travel approximately 0.5 mile before connecting back into Road 23 approximately 0.1 mile beyond the washout. The reroute would pass approximately 100 to 150 horizontal feet upslope from the top of the washout slope scarp and across sideslopes that vary from nearly flat at the two ends to 75 percent slope above the washout.

The road grades would have been nearly 10 percent in grade to climb and descend around the washout. The road would have been constructed with balanced cut and fill on gentle slopes, where possible, but mostly as a full-bench construction on side slopes greater than 50 percent. Cutslopes on the steepest sideslope and full bench-constructed sections would have been more

than 100 feet in depth (28-foot road width and a ratio of 1:1 constructed cutslope angle). Retaining structures may have been required to maintain cutslope stability. Excavated material would have been hauled to a stable disposal area outside of Riparian Reserves.

Seven small streams would have been crossed as well as three additional wet areas. Drainage culverts would have been required at 5 to 10 additional sites. The hillside supports a mixed conifer-hardwood forest with several shrub (vine maple, devils club, and salmonberry) openings. Approximately 7.0 acres of mixed conifer-hardwood forest (including late-successional habitat) would have been impacted from new road construction. This alternative, if implemented, would cost approximately $1.84 million.

This alternative was considered but eliminated from detailed study because:

- The reroute would likely have been unsafe for long-term public access with passenger vehicles and trailers because the reroute at Site #1 would have been at high risk of future failure given the existing unstable slope. The slope will migrate toward the river and potentially reach the proposed reroute at Site #1 within 10 years. Implementing this alternative would not meet the need to provide safe, passenger car and stock trailer access to the public for recreational opportunities in the drainage.
- The reroute would disturb additional riparian areas, alter the hillslope hydrology, and remove large trees in the riparian reserves, which would be locally inconsistent with the ACS.

Alternative 5. Repair Road 23 In-Place at Sites #1, #2, #3, and #4

This eliminated alternative differs from the proposed action because implementation would include repairing the road damage at Site #2 and Site #3 in its original alignment. As in the proposed action, Sites #1, and #4 would have been repaired in-place. Some small trees and vegetation near Site #2 would have been impacted during reconstruction activity.

The White Chuck River channel now occupies the area where the hillside once supported the road at Site #2; therefore, the river would have to be “pushed back” across the valley and away from the road alignment to put the road fill back in-place. The fill replacement would have constricted the existing channel by about 120 feet to rebuild the fill. In addition, to accomplish the repair, heavy equipment would have been required within the wetted channel. The fill height would have been extremely high, and even by lowering the grade by 10 feet or so would do little to lower the number of cubic yards of materials that would have been necessary to rebuild the fill. The estimate of fill replacement is about 250,000 cubic yards (a dump truck holds about 10 cubic yard of material).

As under the proposed action, the base of the fill would have been built out of large irregular riprap (with logs placed onto the riprap at some locations) to give a rough surface to the face of the fill and to mitigate adverse effects on fish. Approximately 500 feet along the length of the fill would have been hardened to limit the chance of future failure. The repaired road would have a sustained grade of over 10 percent, but would have likely met the objectives for ML 3 (access for passenger vehicles). This alternative, if implemented, would cost an estimated $2.82 million.

This alternative was considered but eliminated from detailed study because:

- Reconstruction would have pinched off the floodplain, creating a potentially hazardous situation in another flood event and likely causing failure of the road system in the future. Implementing this alternative would not meet the need to provide safe, passenger car and stock trailer access to the public for recreational opportunities in the White Chuck drainage.

Alternative 6. Access the White Chuck Drainage by Road 27 (Rat Trap Pass)

Implementing this alternative would not include repairs to Road 23 and instead utilize State Route 530, and Forest Service Roads located in the Suiattle drainage. It would also include crossing the Suiattle River by way of the Suiattle Boundary Bridge. Once across the river, the route would continue on Roads 25 and 27, over Rat Trap Pass, and into the White Chuck drainage. This route would have provided seasonal access to the White Chuck drainage.

Before this route would be useable, repairs would have to be made at MP 6.0, damaged in the 2006 flood event, and to the Boundary Bridge, also damaged in the 2003 flood event. Currently, the FHWA is completing a separate environmental analysis on the repair of Road 25.

Even if access to Road 25 were restored, the use of Road 27 for permanent access into the White Chuck drainage is unlikely. Although Road 27 currently has an objective to be managed as an ML 3 road (passenger car access), it has deteriorated to ML 2 (high clearance vehicle road). Road 27 is located on steep, unstable slopes with a grade of greater than 12 percent (FSH 7709.56, 1987), and has a high risk of failure.

Under this alternative, Road 23 would have been permanently blocked at MP 1.6 to eastbound traffic and MP 3.5 to westbound traffic. Forest Service road maintenance staff would decide upon a permanent closure point at a good turnaround location, and the road would be physically blocked. Closure signs would be posted at the beginning of Road 23 and at the turnaround point. This closure would be part of routine road maintenance for public safety and not associated with this Project.

There would have been no access to Roads 2311 or 2314 for maintenance or to reach Matrix land. Without access to Roads 2311 and 2314 (approximately 8.1 miles), the roads would not have been maintained, placed in storage, or decommissioned. Eventually, the roads would have deteriorated and potentially failed. This alternative, if implemented would have cost $768,750.

This alternative was considered but eliminated from detailed study because:

- Matrix land designated for timber management would have not been accessed. Steep adverse grades would inhibit or prohibit timber haul out of the White Chuck drainage without reconstruction and repairs to Road 27. Access and timber management opportunity would be completely lost to approximately 1,100 acres of Matrix lands associated with Roads 2311 and 2314.
- Whether Road 27 were reconstructed or not, use as permanent access is questionable as the road is located on steep, unstable slopes and may fail in the future. There are safety concerns due to narrow road width, poor alignment, and steep grade, and

maintenance and stability complications of avalanche chutes, unraveling cut slopes, and the location of the road near the Straight Creek fault zone.

- Implementing this alternative would not meet the need to provide safe, passenger car and stock trailer access to the public for recreational opportunities in the White Chuck drainage. The highest level the road could be maintained to would be ML 2, for high-clearance vehicles, which exceeds the standard for passenger cars.

Alternative 7. Close Road 23 Permanently and Build a Trail

Another alternative considered but eliminated from detailed study included permanently blocking Road 23, constructing a trailhead area and a turnaround area designed to accommodate vehicles with trailers at MP 1.6, and building a trail on the closed portion of the road.

This alternative was recommended during the public scoping process. Similar to Alternative 1, Road 23 would have been converted to a trail all the way to the end of the road and a trailhead and camping area would have been constructed near the beginning of the trail. However, this alternative would not have met the purpose and need for the project, which includes restoring motorized vehicle access for recreational use, administrative management, and law enforcement within a portion of the White Chuck River drainage. Also, this alternative was eliminated from detailed consideration because of lack of funds and because this is an EFRO project. EFRO funds are not intended for recreation development.

> *Note: Closing Road 23 and converting it to a trail was considered in detail as an alternative in the 2001 ERFO repair environmental assessment. During that assessment, the Deciding Official chose to repair the road, meeting the purpose and need of that proposed action. The trail concept considered in that assessment included creating a new trailhead, and construction that would convert the road to a trail footprint. At that time, the cost of a new trailhead that would "accommodate 50 vehicles, including stock trailers, and would include campsites and a stock corral" was estimated at $450,000, with no funds available for the trailhead construction (p. 2-3 to 2-4, White Chuck ERFO Environmental Assessment 2001). A similar scenario exists at this time.*

Roads 2311 and 2314 (8.1 miles of access to Matrix and dispersed recreation) would have been abandoned because, unless Road 23 is repaired at Site #1, there would have been no roaded access to decommission these roads, leaving them to deteriorate and potentially fail.

The following is a brief summary of the trail construction that would have been needed to implement this alternative. Refer to FSH 2309 for additional trail design requirements and guidelines; also see Universal Access to Outdoor Recreation, A Design Guide (PLAE, Inc. 1993).

To close the damaged sections of Road 23 prior to trail construction, access would be needed for heavy machinery to:

- Remove culverts and replace them with other drainage structures, depending upon the type of trail to be built (e.g., fords, footbridges, etc.);
- Stabilize the slopes around the damaged sites, pulling road fill back from the edge closest to the river;

- Create adequate drainage for the abandoned road (to prevent other resource damage);
- Decommission the road surface and haul away excess materials; and
- Remove the vault toilets from the Owl Creek and Crystal Creek Campgrounds because there would no longer be vehicle access to these sites for pumping.

To provide this access, road repairs would have been needed to circumvent the washout sites. This reconstruction would have needed to be wide enough and strong enough to handle the heavy equipment and hauling of excess soils and materials off site, and would have involved the similar work as described for the proposed action, with similar effects. The only difference would be that the road constructed for the decommissioning would have been obliterated following use.

Once the approximately 8.6-mile segment of Road 23 was closed, a trail would have been developed on the old roadbed. Parking and a turnaround would have been constructed near MP 1.6, which would have involved approximately 5.0 acres of clearing, leveling, and surfacing (with crushed rock) to create an area large enough to accommodate all anticipated traffic.

New segments of trail would have been needed to hike around Sites #1 (MP 1.9) and #2 (similar in location to the proposed road reroutes described in Alternative Eliminated #4 above). Trail construction would have needed to meet Forest Service Handbook standards for trail clearing and tread widths, depending on the type of trail (FHS 2309.18). With repairs, Forest Roads 25, 26, and 27 (Rat Trap Pass) would provide seasonal vehicular access for high-clearance vehicles to the White Chuck drainage.

Even if access on Roads 25 and 26 were restored, the use of Road 27 for permanent access into the White Chuck drainage would not be likely. Although Road 27 currently has an objective to be managed at ML 3 (suitable for passenger cars), it has deteriorated to ML 2, (suitable for high clearance vehicles) and cannot be maintained for passenger cars without an expensive upgrade.

The road is located on steep, unstable slopes and has potential for future failure. Road 27 is a safety concern due to narrow road width and maintenance and stability complications of avalanche chutes, unraveling cut slopes, and the location of the road near the Straight Creek fault zone. In addition, providing permanent and safe access on Road 27 in to the White Chuck drainage is likely to be a very expensive upgrade endeavor in order to meet road safety standards and resource protection. Therefore, implementation of this alternative would not have included reconstructing Road 27. This alternative would have cost an estimated $1.05 million to implement.

This alternative was considered but eliminated from detailed study because:

- Regardless of the type of trail constructed, this alternative would not have met the need for action. Closing this road and building a trail around the damaged segments would not meet the Forest Plan, as amended, desired future condition for the White Chuck area (refer to Forest Service 1990, p. 4-71, 4-74), nor would it meet access recommendations found in the Roads Analysis and the White Chuck Watershed Analysis (Forest Service 2003).

- This alternative would not have met the project need to retain current access to Matrix lands designated for timber management. The steep grades of Road 27 would cause an adverse timber haul route from the White Chuck drainage. Repairs and reconstruction would be required in order to use this route for timber hauling purposes. Access to manage 5,600 of Matrix lands would be difficult, unreliable, less safe, and seasonally accessible.
- Regardless if Road 27 is reconstructed or not, use as permanent access is questionable because the road is located on steep, unstable slopes and may fail in the future. There are safety concerns due to narrow road width, poor alignment, and steep grade, and maintenance stability complications of avalanche chutes, unraveling cut slopes, and the location of the road near the Straight Creek fault zone.
- Implementing this alternative would not have met the project need to restore multiple season access for passenger cars and vehicles towing stock trailers into the White Chuck drainage due to deterioration of Road 27, which allows only high-clearance vehicles.
- A better location for trail access to the White Chuck would be via the White Chuck Bench Trail.

Alternatives Considered in Detail

Alternative A – No Action

Under Alternative A (No Action), no repairs to the eight damage sites would be made. The road would be blocked at MP 1.6. This would preclude vehicular access to Roads 23, 2311, and 2314.

Road 23 would not be passable beyond MP 1.9. The portion between MP 3.5 and MP 5.8 would be accessible via Rat Trap Pass if Road 27 is repaired. Road 27 would provide high-clearance vehicle access to a portion of the White Chuck River drainage as well as access to Meadow Mountain, the White Chuck Bench/Crystal Creek trailheads, and other associated trails. This route under current maintenance levels would limit access for many stock and passenger vehicles. The Road 27 route would not be desirable for timber hauling from Matrix lands in the White Chuck drainage due to the steep grade and roughness of the road, and the cost associated with this adverse haul route.

If implemented, this alternative would leave the damaged road sections on Road 23 between MP 1.9 and the Owl Creek Bridge as is, with no further repairs, construction, or reconstruction. Roads 2311 and 2314 would no longer be accessible for maintenance. A portion of Matrix land accessed by Roads 2311 and 2314 would not be available for potential timber management. Access to 918 acres of second growth timber allocated to Matrix would be precluded under this alternative.

The remaining road prism of Road 23 would exist as it does today with no obliteration efforts, no culvert removal, no ditch removal, no eroded road segments pulled back, and no erosion control measures taken. The road would eventually grow in with vegetation and some areas would be left vulnerable to erosion problems.

If no action takes place, in the future, the Forest Service road maintenance staff would decide upon a permanent closure point at a serviceable turnaround location, and the road would be physically blocked. Closure signs would be posted at the beginning of Road 23 and at the turnaround point. This closure would be part of routine road maintenance for public safety and not associated with this Project in terms of leaving the road in its current state. Alternative A would have the lowest financial cost.

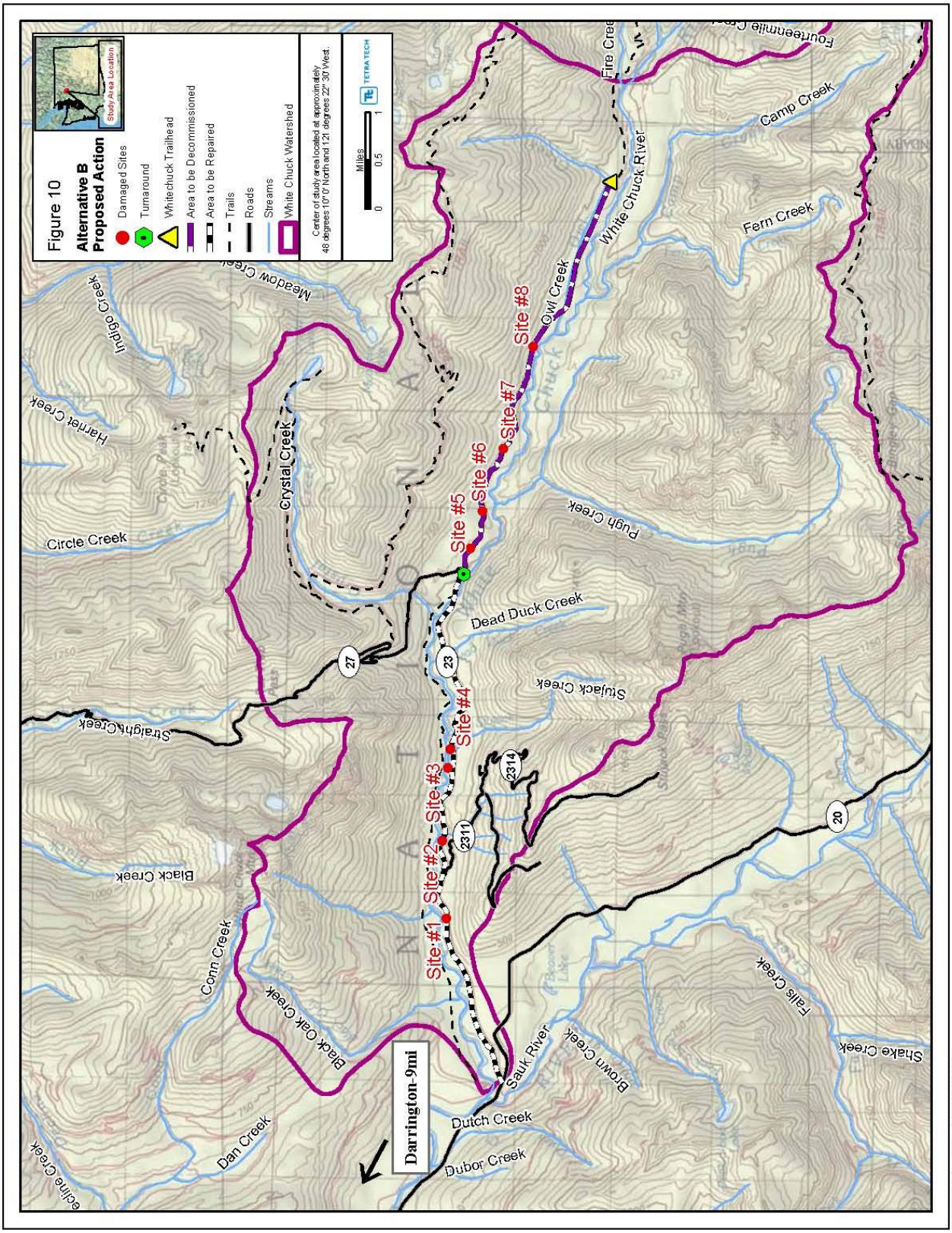
Alternative B – Restore Road 23 to MP 5.8 and Decommission the Remaining Part of the Road (Proposed Action)

The proposed action consists of restoring vehicle access in the White Chuck watershed to the junction with Road 27, with repairs at four sites along Road 23: MP 1.9, MP 2.4, MP 3.4, and MP 3.5. In addition, Road 23 from the junction with Road 27 to the White Chuck Trailhead (approximately MP 5.8 to the road terminus) would be decommissioned (Figure 10). Culverts would be excavated and removed, and unstable fillslope would be pulled. The concrete bridge at Owl Creek would not be removed, and the decommissioned road prism would be left in a walkable tread. A site west of the junction of Roads 23 and Road 27 would be considered as a turnaround. Due to lack of parking space at this junction, the dispersed camping area east of the upper White Chuck Bridge has been identified as a potential parking area. This would expand the current White Chuck Bench Trailhead parking east of the outhouse located north of Road 23. There is approximately 2 acres of area under consideration for additional parking. All buildings and signs would be removed from the White Chuck Trailhead (repairs to the White Chuck Trail are not included in this alternative). Details below describe the damage and repairs by site number and milepost location.

This alternative would partially meet the goals and objectives outlined in the Forest Plan, as amended, which include managing the transportation system at the minimum standard needed to support planned uses and activities, and provide for public safety (Forest Service 1990). However, it would not access all Matrix land in the drainage and would not provide road access to the White Chuck Trailhead. While it would contribute to aligning road maintenance for Road 23 with current projections of availability of road maintenance funding, it would not contribute toward meeting the desired conditions for Road 23 as described in the Forest-wide Roads Analysis (Forest Service 2003), which includes maintaining the entire road for passenger vehicle use. This alternative if implemented would cost $2.07 million.

Preliminary repair design at Site #1 indicates the potential to shift laterally into the slope to lessen the amount of riprap and material within the 100-year floodplain and lessen environmental impacts. The final design for Site #1 will incorporate field verification of site conditions in relation to design elements.

Repeated loss of Road 23 has occurred in the past because large floods funnel through the steep inner gorges of the White Chuck River and undermine the slopes below the road. The proposed action provides more stable road access up the White Chuck River drainage and closes portions of the road located on unstable slopes, thus minimizing the effects of the road on the river and minimizing the risk of continued road slumping and failure. By relocating and decommissioning portions of the road, the Proposed Action would meet the goals and



Last Saved: Tuesday, January 27, 2009
File: P:\projects_2008\White_Chuck_EA\maps\Alternative_C.mxd

objectives outlined in the Forest Plan, as amended, for soil, water, Tier 1 Key Watersheds, and Riparian Reserves.

This alternative includes the following actions:

- At MP 1.9, the road would be repaired in-place by lowering the approach grades of the road to lessen fill material. The dip in the road would be constructed on large, irregular-shaped rock to an elevation above the 100-year flood level. Logs would be incorporated into the rock to provide a rough surface along the river channel (Figures 11 and 12).
- At MP 2.4, the road would be rerouted above the washout, utilizing 2,300 feet (0.44 mile) of Road 2311. At about MP 0.4 of Road 2311, new road construction would leave the existing Road 2311 and connect back to Road 23 past the second site of road damage. Approximately 1,200 feet (0.23 mile) of new road would be constructed with a large through-cut and fill to an unnamed creek. A culvert large enough to pass 100-year floodwaters would be installed in the fill across the unnamed creek. Approximately 0.3 mile of Road 23 from the washout east to where the new connector road ties in, and west to the junction with Road 2311, would be decommissioned. Additionally, a potential rock removal and waste deposition site is proposed at an existing rock pit on Road 2311-011—1.5 miles from the reroute for Site #2. If the proposed rock pit is used, the 2311 road corridor between the reroute and the rock pit would have routine maintenance, including blading, brushing, and ditchline clean-out.
- At MP 3.4, the road would be rerouted around the washout before Stujack Creek. The reroute would construct approximately 600 feet (0.11 mile) of road across a 25 percent sideslope above the washout—400 feet from the White Chuck River. The new road alignment would leave Road 23 about 300 feet before the project site and re-enter Road 23 at 300 feet beyond the center of the damaged site. Road drainage would be directed away from the slide area.
- At MP 3.5, the gravel and bedload material plugging the upstream end of the culvert in Stujack Creek would be removed. This material would be used as fill material to rebuild the approximate 50 feet of road washed away in the 2003 flood due to the plugged culvert. A slight dip in the road grade would be installed to prevent water from flowing down the road should another culvert-plugging event occur. The stream channel would be reconstructed for 100 feet above the box culvert inlet to remove bedload material and debris to allow for a free-flowing and unobstructed stream channel into the culvert. The upstream end of the existing wooden culvert shifted approximately 3 feet during the flood event and would have to be re-aligned. The culvert appears to be sound, but it may have been damaged when it was moved by the floodwaters, or it may be damaged when it is moved back into place. If the culvert were no longer serviceable, it would be replaced with an open-bottomed arch capable of passing 100-year floodwaters.
- At MP 5.8, approximately 550 feet of road has slumped at various depths. Decommissioning at this site would include removal of culverts and unstable fill slope materials and restoration of natural hillslope drainage patterns.

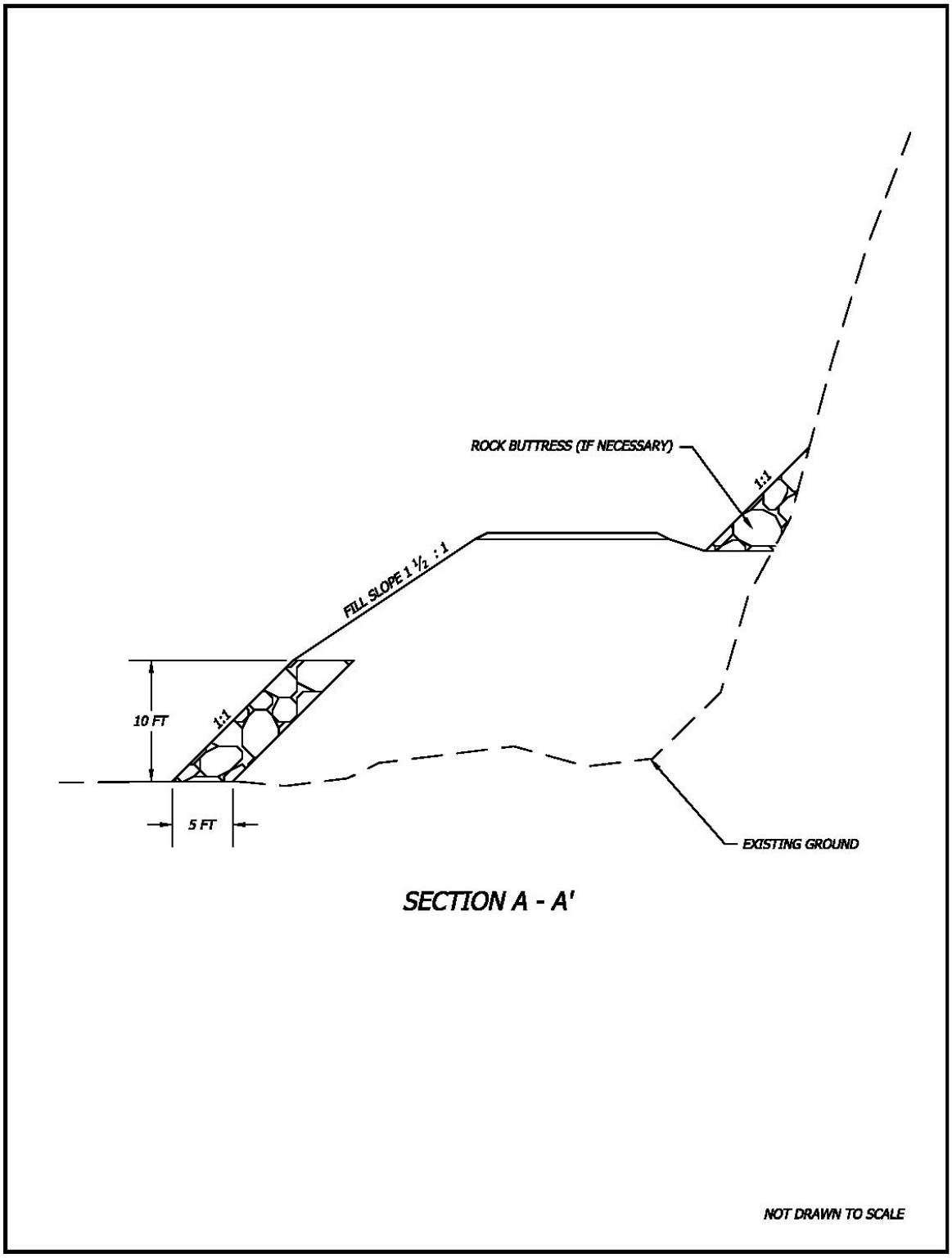


Figure 11. Engineering Drawing of Road Section at Site #1

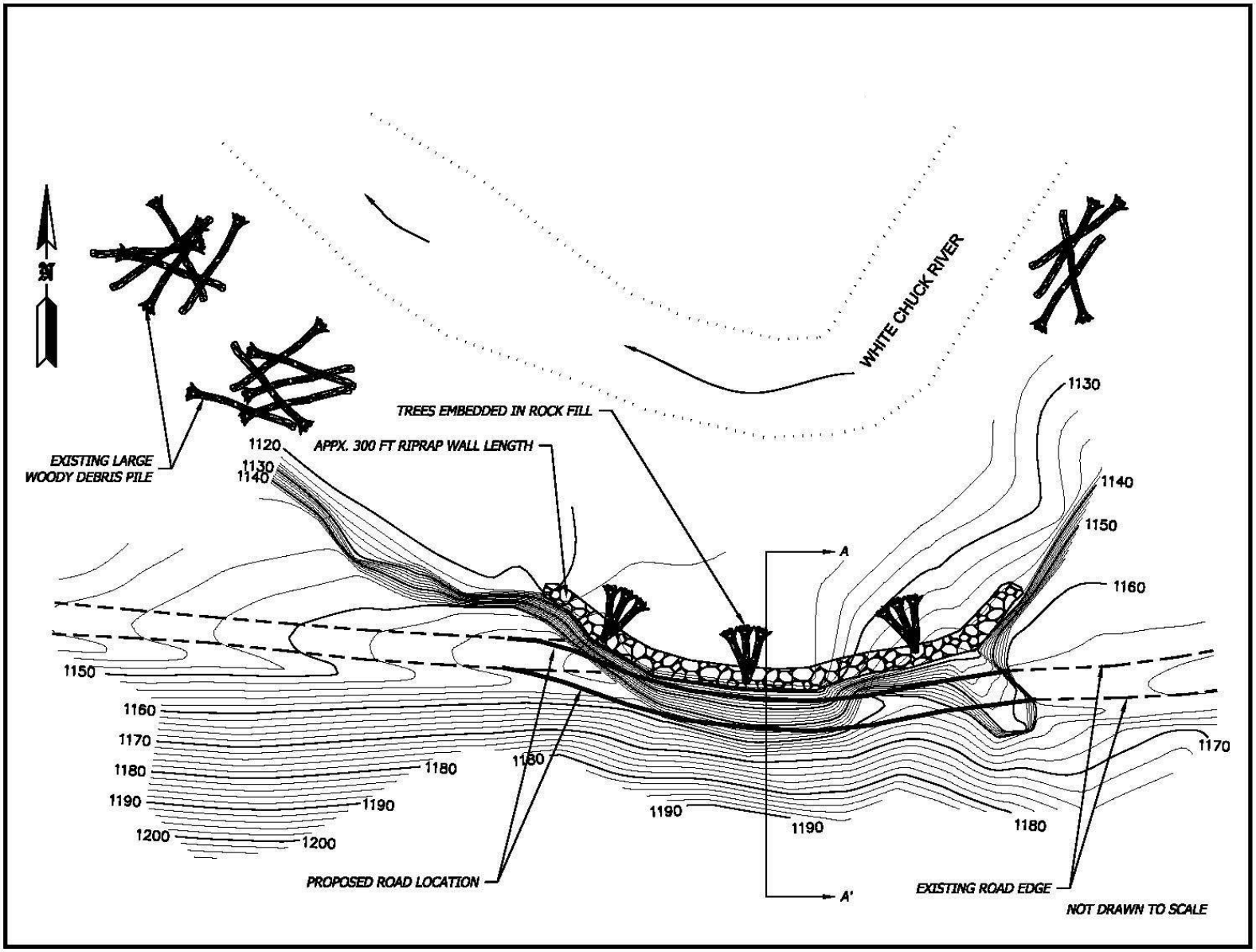


Figure 12. Engineering Drawing of Proposed Plain View at Site #1

- At MP 6.45, the road has slumped for 275 feet. Decommissioning at this site would include removal of culverts and unstable fill slope materials and restoration of natural hillslope drainage patterns.
- At MP 7.2, the road fill has failed for 60 feet along the outer shoulder. Decommissioning at this site would include removal of culverts and unstable fill slope materials and restoration of natural hillslope drainage patterns.
- At MP 8.5, the road fill slope has failed causing a narrow roadway for approximately 350 feet. Decommissioning at this site would include removal of culverts and unstable fill slope materials and restoration of natural hillslope drainage patterns.
- Between MPs 5.8 and 10.3, the bridge at Owl Creek and 15 culverts were identified during the field survey in 2008. Although the concrete bridge at Owl Creek would not be removed, the 15 culverts between MPs 5.8 and 10.3 would be excavated and removed, and unstable fillslope material would be pulled. Although 15 culverts were identified between MPs 5.8 and 10.3 during the 2008 field survey, the survey was not an exhaustive evaluation of all culverts along Road 23. Therefore, at the time of road decommissioning, any additional culverts on this section for Road 23 would be excavated and removed, and unstable fillslope material would be pulled.
- At the White Chuck Trailhead, structures to be removed include two toilets, the trailhead bulletin board, fee use sign, and trail registration box for the White Chuck Trailhead.

Alternative C – Restore Road 23 to MP 5.8 and Put the Remaining Part of the Road in Storage

Alternative C is similar to Alternative B. It consists of restoring vehicle access in the White Chuck River drainage to the junction with Road 27, with repairs at four sites of Road 23 (MP 1.9, MP 2.4, MP 3.4, and MP 3.5) as described under Alternative B (Figure 13). However, the upper portion of Road 23, from the junction with Road 27 to the White Chuck Trailhead (MP 5.8 to MP 10.3), would be placed in storage and closed to vehicle traffic (ML 1) by removing culverts and fill at Sites #4 through #8 (MPs 5.8, 6.45, 7.2 and 8.5) rather than decommissioning the upper road, as under Alternative B. A walkable tread (a path 4 to 5 feet wide) would be retained to by-pass these sites. On the remaining portion of upper road, larger live culverts (culverts with water running through them most of the year) would be removed. Smaller live culverts would either be removed or have most of the fill material removed over the pipe, dips would be placed on the uphill side of every culvert left in the roadway, additional dips would be installed every 100 to 200 feet, and unstable fill slopes would be pulled back and the material would be hauled to stable areas for disposal. Unstable material would be removed to reduce the risk of erosion or mass wasting. The concrete bridge at Owl Creek would not be removed. A site west of the junction of Roads 23 and Road 27 would be considered as a turnaround. Due to lack of parking space at this junction, the dispersed camping area east of the upper White Chuck Bridge has been identified as a potential parking area. This would expand the current White Chuck Bench Trailhead parking east of the outhouse located north of Road 23. There is approximately 2 acres of area under consideration for additional parking. All

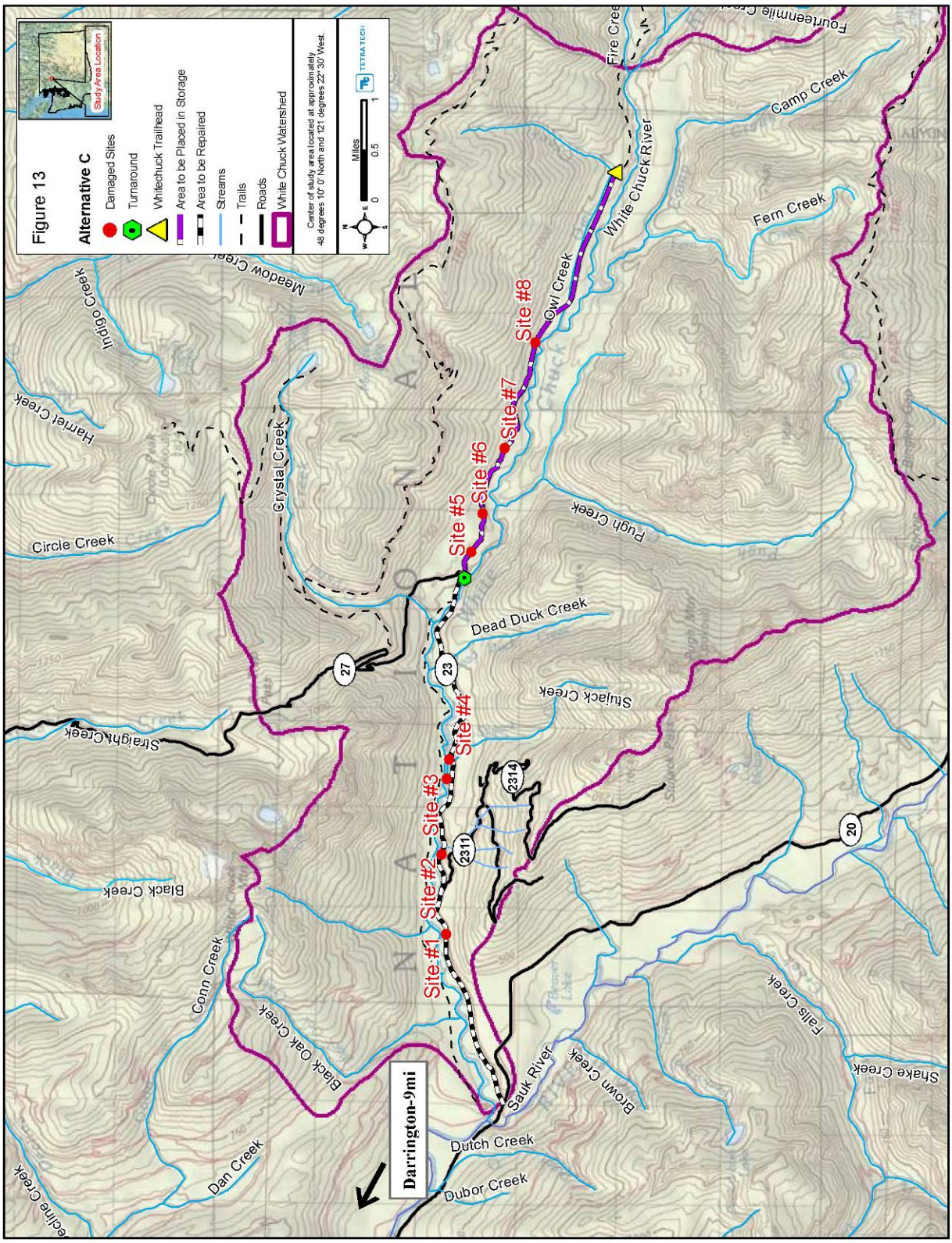


Figure 13
Alternative C
Damaged Sites
Turnaround
Whitechuck Trailhead
Area to be Placed in Storage
Area to be Repaired
Streams
Trails
Roads
White Chuck Watershed
Study Area Location
Center of study area located at approximately
48 degrees 10' 0" North and 121 degrees 22' 30" West.
Miles
0
0.5
1
TETRA TECH
Site #1
Site #2
Site #3
Site #4
Site #5
Site #6
Site #7
Site #8
Darrington-9mi
Sauk River
Dutch Creek
Dubor Creek
Brown Creek
Falls Creek
Shake Creek
Black Oak Creek
Conn Creek
Black Creek
Straight Creek
Dan Creek
Circle Creek
Hamlet Creek
Indigo Creek
Meadow Creek
Crystal Creek
Dead Duck Creek
Stujack Creek
Pugh Creek
Owl Creek
White Chuck River
Fire Creek
Fourteenmile Creek
Camp Creek
Fern Creek
27
23
2311
2314
20

trailhead structures and signs would be retained until a decision is made on the White Chuck Trail (repairs to the White Chuck Trail are not included in this Project).

Placing the upper portion of Road 23 in storage retains the option to re-construct this section of road in the future, depending on future Forest needs in the upper drainage and available funds. This alternative would partially meet the goals and objectives outlined in the Forest Plan, as amended, which include managing the transportation system at the minimum standard needed to support planned uses and activities (Forest Service 1990, p. 4-7). However, it would not access all Matrix land in the drainage and would not provide road access to the White Chuck Trailhead. While it would contribute to aligning road maintenance for Road 23 with the projected availability of road maintenance funding, it would not contribute at this time toward meeting the desired conditions for Road 23 described in the Forest-wide Roads Analysis (Forest Service 2003), which includes maintaining the entire road for passenger vehicle use. However, it maintains the option of restoring access in the future. This alternative if implemented would cost $1.89 million.

Preliminary repair design at Site #1 indicates the potential to shift laterally into the slope to lessen the amount of riprap and material within the 100-year floodplain and lessen environmental impacts. The final design for Site #1 will incorporate field verification of site conditions in relation to design elements.

This alternative is the same as for Alternative B, except:

- At MP 1.9, logs would be placed along the rock rather than incorporated into the rock to provide a rough surface along the river channel. Additionally, two engineered logjams would be constructed between 500 and 650 feet upstream of Site #1. Twenty to fifty logs retrieved from areas cleared for road repair or relocation or from an off-site location would be used inside and along the left bank margins of the existing bankfull channel and would supplement an existing collection of logs that has begun to form a floodplain. Each logjam would contain a minimum of 10 pieces of wood that are greater than 2.5 feet in diameter and 66 feet in length. The construction of the logjams would assist in trapping sediment and debris and shifting the river away from the base of the repaired road at Site #1.
- At MP 5.8, storage at this site would include removal of culverts and unstable fill slope materials and restoration of natural hillslope drainage patterns. A walkable tread would be installed.
- At MP 6.45, storage at this site would include removal of culverts and unstable fill slope materials and restoration of natural hillslope drainage patterns. A walkable tread would be installed.
- At MP 7.2, storage at this site would include removal of culverts and unstable fill slope materials and restoration of natural hillslope drainage patterns. A walkable tread would be installed.

- At MP 8.5, storage at this site would include removal of culverts and unstable fill slope materials and restoration of natural hillslope drainage patterns. The hillside above the road would be stabilized. A walkable tread would be installed.
- At the 15 culverts between MPs 5.8 and 10.3, the larger live culverts (culverts with water running through them most of the year) would be removed. The smaller live culverts would either be removed or have most of the fill material removed over the pipe, dips would be placed on the uphill side of every culvert left in the roadway, additional dips would be installed every 100 to 200 feet, and unstable fill slopes would be pulled back and the material would be hauled to stable areas for disposal. Unstable material would be removed to reduce the risk of erosion or mass wasting. As previously noted under Alternative B, any culverts, besides those identified during the 2008 field survey, on this section of Road 23 would be excavated and removed, and unstable fillslope material would be pulled.

Alternative D – Repair all of Road 23

Alternative D would restore motorized vehicle access to the White Chuck drainage and the White Chuck Trailhead (Figure 14). Restoring the entire road rather than decommissioning the upper road or placing it in storage would more fully meet the goals and objectives outlined in the Forest Plan, as amended, which include managing the transportation system at the standard needed to support planned uses and activities (described in the Forest-wide Roads Analysis; Forest Service 2003). Specifically, it would provide passenger vehicle access to popular recreation areas and access Matrix lands for timber management. However, it would not contribute to aligning road maintenance needs with the projected availability of road maintenance funding. The upper road has a 4-decade history of road failures and future problems are likely to require additional costly repairs. ERFO funds would not be available for repairs to sites at MPs 6.45, 7.2, and 8.5.

The White Chuck Trail was seriously damaged in 2003, and there is currently no funding or timeline identified for repair of this trail. The White Chuck Trail was an important link to the Pacific Crest Trail (PCT), which had a portion of its route through Glacier Peak Wilderness damaged by the 2003 and 2006 storm events. The PCT in White Chuck River drainage has been repaired, and sections of the PCT in the Suiattle drainage are scheduled for repair in the near future. Kennedy Hot Springs, another popular destination for recreationists using Road 23, was buried by the 2003 storm event and is not currently a recreation destination. Walking or biking on the roads beyond the junction of Road 23 and Road 27 is still utilized by some for access to the PCT, other trails in the drainage, and the Glacier Peak climbing route. The number of hikers using the White Chuck Trailhead to access the PCT could be expected to return to pre-flood levels, if funding to repair the White Chuck Trail is secured and repairs are made. Additionally, the popular Boulder Basin climbing route would once again be accessible (assuming that the White Chuck Trail is repaired). Trail reconstruction is not part of this Project. If implemented, this alternative would cost $2.04 million.

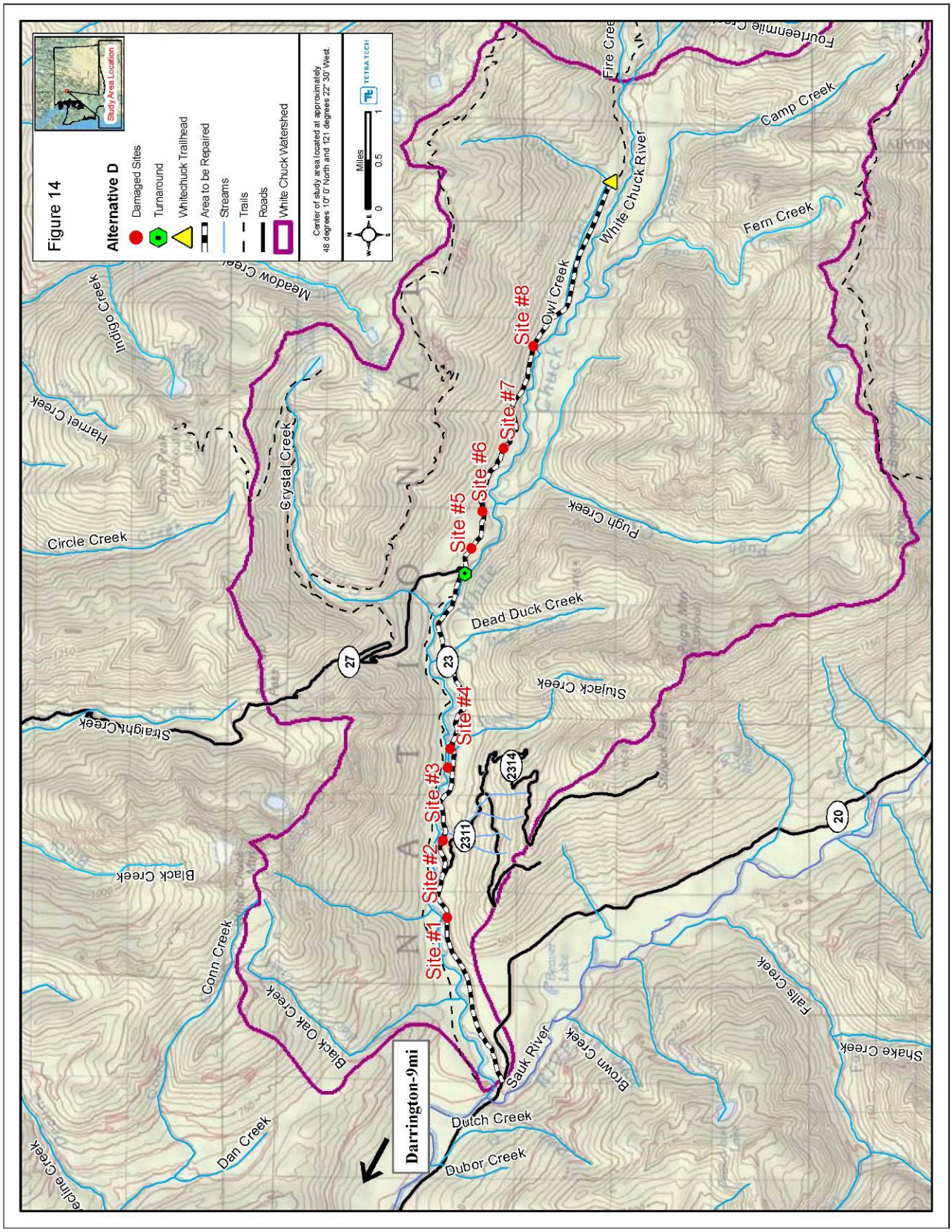


Figure 14
Alternative D
Damaged Sites
Turnaround
Whitechuck Trailhead
Area to be Repaired
Streams
Trails
Roads
White Chuck Watershed
Study Area Location
Center of study area located at approximately 48 degrees 10' 0" North and 121 degrees 22' 30" West.
Miles
0
0.5
1
TETRA TECH
Site #1
Site #2
Site #3
Site #4
Site #5
Site #6
Site #7
Site #8
Darrington-9mi
Meadow Creek
Indigo Creek
Harriet Creek
Circle Creek
Crystal Creek
Straight Creek
Black Creek
Conn Creek
Black Oak Creek
Dan Creek
Dutch Creek
Dubor Creek
Sauk River
Brown Creek
Falls Creek
Shake Creek
Dead Duck Creek
Stujack Creek
Pugh Creek
Owl Creek
White Chuck River
Fern Creek
Camp Creek
Fourteenmile Creek
Fire Creek
27
23
2311
2314
20

This alternative includes the following actions:

- At MP 1.9, the road would be repaired in-place by lowering the approach grades of the road to lessen fill material. The dip in the road would be constructed on large irregular shaped rock to an elevation above the 100-year flood level. Logs would be placed along the rock to provide a rough surface along the river channel. Two engineered logjam would be constructed between 500 and 650 feet upstream of Site #1. Twenty to fifty logs retrieved from areas cleared for road repair or relocation or from an off-site location would be used inside and along the left bank margins of the existing bankfull channel and would supplement an existing collection of logs that has begun to form a floodplain. Each logjam would contain a minimum of 10 pieces of wood that are greater than 2.5 feet in diameter and 66 feet in length. The construction of the logjams would assist in trapping sediment and debris and shifting the river away from the base of repaired road at Site #1.

Preliminary repair design at Site #1 indicates the potential to shift laterally into the slope to lessen the amount of riprap and material within the 100-year floodplain and lessen environmental impacts. The final design for Site #1 will incorporate field verification of site conditions in relation to design elements.

- At MP 2.4, the road would be rerouted above the washout, utilizing 2,300 feet (0.44 mile) of Road 2311. At about MP 0.4 of Road 2311, new road construction would leave the existing Road 2311 and connect back to Road 23 past the second site of road damage. Approximately 1,200 feet (0.23 mile) of new road would be constructed with a large through-cut and fill to an unnamed creek. A culvert large enough to pass 100-year floodwaters would be installed in the fill across the unnamed creek. Approximately 0.3 mile of Road 23, from the washout east to where the new connector road ties in and west to the junction with Road 2311, would be decommissioned. Additionally, a potential rock removal and waste deposition site is proposed at an existing rock pit on Road 2311-011—1.5 miles from the reroute for Site #2. If the proposed rock pit is used, the 2311 road corridor between the reroute and the rock pit would have routine maintenance including blading, brushing, and ditchline clean-out.
- At MP 3.4, the road would be rerouted around the washout before Stujack Creek. The reroute would construct approximately 600 feet (0.11 mile) of road across a 25 percent sideslope above the washout, 400 feet from the White Chuck River. The new road alignment would leave Road 23 about 300 feet before the project site and re-enter Road 23 at 300 feet beyond the center of the damaged site. Road drainage would be directed away from the slide area.
- At MP 3.5, the gravel and bedload material that is plugging upstream end of the culvert in Stujack Creek would be removed. This material would be used as fill material to rebuild the approximate 50 feet of road washed away in the 2003 flood due to the plugged culvert. A slight dip in the road grade would be installed in order to prevent water from flowing down the road should another culvert-plugging event occur. The stream channel would be reconstructed for 100 feet above the box culvert inlet to remove bedload material and debris to allow for a

free flowing and unobstructed stream channel into the culvert. The upstream end of the existing wooden culvert shifted approximately 3 feet during the flood event and would have to be re-aligned. The culvert appears to be sound but it may have been damaged when it was moved by the floodwaters, or it may be damaged when it is moved back into place. If the culvert is no longer serviceable, it would be replaced with an open-bottomed arch capable of passing 100-year floodwaters.

- At MP 5.8, approximately 550 feet of road has slumped at various depths. The road would be shifted into the hillside to bypass the slumping portion of the road. Excavation material would be used as embankment. The new construction would begin 100 feet before the slump begins and end 100 feet after the slump ends. Three culverts would be installed as cross drains for the newly constructed ditch.
- At MP 6.45, the road has slumped for 275 feet. The road would be shifted into the hillside to bypass the slumping portion of the road. Excavation material from this site and from MP 7.2 would be used to bring the road up to grade. Avoid large trees at the west end of the site. Reconstructed the ditch and replace lost surfacing.
- At MP 7.2, the road fill has failed for 60 feet along the outer shoulder. The road would be shifted 10 to 20 feet into the hillside for a distance of 200 feet to bypass the slumping portion of the road. Excavation material would be used at other repair sites. The new construction would begin 100 feet before the slump begins and end 100 feet after the slump ends. Reconstructed the ditch. Install a rock riprap retaining wall along the damaged fill slope to stabilize the road.
- At MP 8.5, the road fill slope has failed causing a narrow roadway for approximately 350 feet. In addition, a small landslide has covered a portion of the road. Lose and eroded shoulders would be repaired. Rock riprap retaining walls would be installed at three locations.

Standard Management Practices and Mitigation Measures

Mitigation measures include actions taken to avoid, minimize, reduce, eliminate, rectify, or compensate for adverse impacts of management activities proposed under Alternative B, C, and D. The following is a summary of standard management practices and general mitigation measures that would apply to this proposed project. Detailed description of methods, monitoring, and contractor responsibility would be implemented through Forest Service requirements, the CWA, and other regulatory directives.

In response to public comments and issues identified during ID Team meetings, standard management practices were identified and mitigation measures were developed to reduce or eliminate potential resource impacts. Table 2 lists these standard management practices and mitigation measures.

The following mitigation measures and standard management practices and requirements for the protection of the resources are an integral part of Alternative B, C, and D, and are incorporated in the effects analysis in Chapter 3. NEPA regulations (40 CFR 1508.20 Mitigation) state the following:

Mitigation includes:

- Avoiding the impact altogether by not taking a certain action or parts of an action,
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation,
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment,
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action, and
- Compensating for impact by replacing or providing substitute resources or environments.

Mitigation effectiveness is rated as follows for this project:

High. The mitigation is highly effective (estimated at greater than 90 percent) at meeting the objective, and one or more of the following types of documentation is available:

- Research or literature,
- Administrative studies,
- Experience: professional judgment of an expert, or
- Fact: evident by logic or reason.

Moderate. The mitigation is moderately effective (estimated at 60 to 90 percent), and its effectiveness is supported either by evidence or logic. Implementation of this mitigation needs to be monitored, and the mitigation may be modified if needed to achieve its objective.

Low. The mitigation is somewhat effective (estimated at less than 60 percent), but its effectiveness is not supported by substantial evidence; or professional judgment indicates limited success in implementation or meeting objectives. Implementation of this mitigation needs to be monitored, and the mitigation may be modified if necessary to achieve its objective. Table 2 below lists the standard management requirements (from the Forest Plan, as amended) and the mitigation measures (developed by the ID Team for this project). They apply to each action alternative (Alternatives B, C, and D).

The following are in addition to the mitigation measures in Table 2:

- A pump would be placed at Site #1 to pump turbid water if water is intercepted when placing the bottom layers of riprap for the roadway embankment, and for placing portions of the logs. If the water inflow rate exceeds pump capacity, excavation and riprap placement may occur in the water. Release of turbid water is expected during and immediately after riprap installation is completed. A pump would also be needed at any culverts that are repaired, realigned, replaced, or removed to pump any water out of the project area. When feasible, a water diversion would be installed and the area would be dewatered prior to in-water work to limit the potential for turbidity and in-stream disturbance. Some in-water work may occur when a stream diversion is not feasible or practical.
- Logs would be placed in or along the riprap at Site #1 for modifying high streamflow characteristics along the riprap. A hydrologist would be on site during reconstruction to direct placement of the logs.

Table 2. Management Requirements and Mitigation Measures

Mitigation Measure or Project Design Feature	Objective	Effectiveness and Basis	Forest Plan Standard & Guideline	Enforcement
Soil, Water Resources, and Fisheries				
A Stormwater Pollution Prevention Plan and an erosion control plan will be developed and implemented to minimize erosion and sedimentation; the plans will be in place and all components activated prior to ground disturbing activities.	Reduce erosion and prevent silt-laden water from entering streams or other waterbodies. Prevent and minimize effects to water quality.	MODERATE (Implementation of Stormwater Pollution Prevent Plans are an industry standard)	Forest Plan S&Gs Soil Resource #2 and Water Resources and Riparian Areas #2 and 5	Contract Administrator
Reduce risk of erosion and sediment transport using methods that may include, but are not limited to: straw bales, silt fencing, sand bags, filter fabric, temporary sediment ponds, check dams of pea gravel-filled burlap bags or other material, and/or immediate mulching of exposed areas. Sediment traps should be incorporated into ditches.	Prevent silt-laden water from entering the streams or other waterbodies.	MODERATE (Brown 2002)	ROD S&G RF-5	Contract Administrator
Detailed inspections shall be made with the onset of the rainy season and immediately after the first heavy rain following construction. During construction, all erosion controls should be inspected daily during the rainy season and weekly during the dry season to ensure they are working adequately. If inspection shows that any of the erosion controls are ineffective, work crews should be mobilized immediately to make repairs, install replacements, or install additional controls as necessary. Sediment should be removed from erosion controls once it has reached 1/3 of the exposed height of control. Any necessary corrective measures will be immediately taken to ensure all erosion control devices are properly function.	Minimize sedimentation to fish-bearing waters	MODERATE (Logic)	Forest Plan S&Gs Soil Resource #2 MOU between FS and WDFW for hydraulic projects (2005)	Contract Administrator
If wet weather conditions during project operations result in transporting sediment to flowing waters, stream channels, or other water bodies, especially those having high potential to deliver to salmonid habitats, and the erosion control methods are not preventing the sediment transport, then cease operations until the weather conditions improve, unless delaying operations would increase the risk of storm or high flow erosion. Coordination with Forest Services aquatic specialists should be part of this decision process.	Minimize sedimentation to fish-bearing waters and protect aquatic resources Avoid rutting and compaction to susceptible wet soils	MODERATE (Avoids activity when impact would occur)	Forest Plan S&Gs: Soil Resources #1,2,3, Fish Habitat Management #1	Contract Administrator

Table 2. Management Requirements and Mitigation Measures (continued)

Mitigation Measure or Project Design Feature	Objective	Effectiveness and Basis	Forest Plan Standard & Guideline	Enforcement
A Spill Prevention, Control, and Countermeasures (SPCC) Plan will be implemented during construction activities to reduce the potential for chemical spills and transport to nearby stream. Have hazardous spill cleanup materials and trained operators on site. Fuel trucks must also carry spill cleanup materials. Prior to starting work each day, check all machinery for leaks (fuel, oil, hydraulic fluid, etc); make all necessary repairs before leaving the vehicle staging area and entering a Riparian Reserve.	Prevent and minimize effects to water quality.	MODERATE (Implementation of spill plans are an industry standard)	Forest Plan S&Gs Soil Resource #2; Water Resources and Riparian Areas #2	Contract Administrator
All machinery maintenance involving potential contaminants (fuel, oil, hydraulic fluid, etc.) shall occur at a site greater than 150 feet from stream channels, water bodies, or wetlands, or at a prior approved site. Equipment operated instream should be cleaned before beginning operations below the bankfull elevation to remove all external oil, grease, dirt, and mud. Stationary power equipment (e.g., generators, cranes) operated within 150 feet of any stream, water body, or wetland should be diapered to prevent leaks.	Prevent and minimize effects to water quality and aquatic resources.	MODERATE (Implementation of spill machinery maintenance and operation are an industry standard)	Forest Plan S&Gs Soil Resource #2; Water Resources and Riparian Areas #2	Contract Administrator
Excess material (spoils) shall be disposed of and stabilized so it does not enter flowing waters, stream channels, or other water bodies.	Prevent and minimize effects to water quality.	MODERATE (Logic)	Forest Plan S&Gs Soil Resource #2; Water Resources and Riparian Areas #2 USFWS Biological Opinion and Conference Report (August 16, 2005) and USDC (NOAA/NMFS) Biological and Conference Opinion (October 28, 2005)	Contract Administrator
Wastewater from project activities and water removed from within the work area shall be routed to an area landward of the 100-year floodplain to allow removal of fine sediment and other contaminants prior to being discharged to the stream.	Minimize sedimentation to fish-bearing waters and protect aquatic resources.	MODERATE (Logic)	USFWS Biological Opinion and Conference Report (August 16, 2005) and USDC (NOAA/NMFS) Biological and Conference Opinion (October 28, 2005); Forest Plan S&Gs Fish Habitat Management #; ROD S&G RF-51	Contract Administrator

Table 2. Management Requirements and Mitigation Measures (continued)

Mitigation Measure or Project Design Feature	Objective	Effectiveness and Basis	Forest Plan Standard & Guideline	Enforcement
Stabilize all work areas within 3 days following the construction period.	Minimize sedimentation to fish-bearing waters. Protect stream bank integrity and aquatic resources.	MODERATE (Burroughs 1989)	Forest Plan S&Gs Soil Resources #5; USFWS Biological Opinion and Conference Report (August 16, 2005) and USDC (NOAA/NMFS) Biological and Conference Opinion (October 28, 2005)	Contract Administrator
Site restoration and cleanup includes protection of bare earth by seeding, planting, mulching, and fertilizing. All damage areas at the project site are to be restored to pre-work conditions including restoration of the pre-flood conditions, including channel bank slope and contours, to the extent practicable. Minimize channel bank grading to revegetate and restore bank conditions.	Minimize sedimentation to fish-bearing waters. Protect stream bank integrity and aquatic resources.	MODERATE (Burroughs 1989; Switalski et al. 2004)	Forest Plan S&Gs Soil Resource #4; USFWS Biological Opinion and Conference Report (August 16, 2005) and USDC (NOAA/NMFS) Biological and Conference Opinion (October 28, 2005)	Contract Administrator
All disturbed ground shall be reclaimed using appropriate best management practices. Retain measures to prevent sediment from reaching streams until the soil is secure. If appropriate, native species should be used in revegetation. Disturbed ground where runoff has the potential to drain into stream channels shall be revegetated or protected from surface erosion by seeding, mulching, or other methods prior to the fall rainy season. Within 1 year after project completion, disturbed stream banks would be revegetated with woody vegetation to maintain soil stability and provide shade and future sources of instream large woody debris (LWD).	Prevent silt-laden water from entering streams. Prevent and minimize effects to water quality. Protect stream bank integrity and aquatic resources.	MODERATE (Burroughs 1989; Madej 2001; Switalski et al. 2004)	Forest Plan S&Gs Soil Resource #5; ROD for preventing and managing invasive plants in the Pacific NW S&G #13 (Forest Service 2005); BMPs R-12; USFWS Biological Opinion and Conference Report (August 16, 2005) and USDC (NOAA/NMFS) Biological and Conference Opinion (October 28, 2005)	Contract Administrator
Segments of the road decommissioned, placed in storage, or disturbed by construction activities will be revegetated	Prevent silt-laden water from entering the streams or other waterbodies. Reduce the effects of lost soil productivity.	MODERATE (Luce 1997; Burroughs 1989; Switalski et al. 2004)	ROD S&G RF-2, RF-3, RF-4, RF-5	Contract Administrator

Table 2. Management Requirements and Mitigation Measures (continued)

Mitigation Measure or Project Design Feature	Objective	Effectiveness and Basis	Forest Plan Standard & Guideline	Enforcement
When constructing or decommissioning roads: • Outslope the roadway surface unless outsloping would increase sediment delivery to streams or where outsloping is infeasible. • Route road drainage away from channels and potentially unstable hill slopes. • Where necessary, install water bars to route water away from streams to allow removal of fine sediment and other contaminants before discharge to the stream.	Limit water accumulation and/or concentration, erosion, and sediment delivery to streams to protect water quality.	MODERATE (Years of use by agency) HIGH (Water bars are an industry standard and have been shown to be effective on closed roads)	ROD S&G RF-5; BMPs R-1, R-3, R-4, R-5, R-7, R-8, R-9, R-11, R-12, R-14	Contract Administrator
All non-treated wood present in the river/stream shall be left in place (a measure designed to protect existing large woody debris in the stream channel).	Protect stream bank integrity and aquatic resources.	HIGH (Avoids damage that would occur if trees were removed)	ROD S&G FA-2; Forest Plan S & G's Water Resources and Riparian Reserves 2, 7, and 8; USFWS Biological Opinion and Conference Report (August 16, 2005) and USDC (NOAA/NMFS) Biological and Conference Opinion (October 28, 2005)	Contract Administrator
Any trees greater than 12 inches diameter at breast height to be felled within reach of the stream shall be considered for felling toward the stream and left in place or utilized to armor disturbed stream banks, if feasible. The disposition of down wood, such as blowdown or felled hazard trees would be determined based on the Forest woody debris policy with priority given to retaining onsite or stockpiled for use in restoration projects. Move LWD at all streamside construction sites, and place along the riprap where feasible, if this would protect structures and improve stream habitat. A Forest Service aquatic specialist will coordinate with FHWA prior to construction to obtain the limits of clearing and perform a field review of the trees that should be felled and those that should remain.	Protect stream bank integrity and aquatic resources. Maintain routing of large wood in channel network.	HIGH (Avoidance) LOW (Experience shows wood is often broken during removal and placement is often difficult)	Forest Plan S&Gs Water Resources and Riparian Reserves 2, 5, 8; USFWS Biological Opinion and Conference Report (August 16, 2005) and USDC (NOAA/NMFS) Biological and Conference Opinion (October 28, 2005) ACS Obj. 6	Contract Administrator
Stream banks shall be properly sloped to an angle of stability (natural repose) when removing culverts.	Protect stream bank integrity and aquatic resources.	MODERATE (MBS Forest roads experience)	ROD S&G RF-4	Contract Administrator

Table 2. Management Requirements and Mitigation Measures (continued)

Mitigation Measure or Project Design Feature	Objective	Effectiveness and Basis	Forest Plan Standard & Guideline	Enforcement
Boundaries of the clearing limits associated with site access and construction shall be flagged to prevent ground disturbance of critical riparian vegetation, wetlands, and other sensitive sites beyond the flagged boundaries.	Protect riparian and other sensitive habitats; protect aquatic resources.	HIGH (Avoidance)	USFWS Biological Opinion and Conference Report (August 16, 2005) and USDC (NOAA/NMFS) Biological and Conference Opinion (October 28, 2005)	Contract Administrator
When breaking up natural (boulder/bedrock) or man-made (bridge decking, piers, abutments) materials using hydraulic breaker, or test drilling, the following measures shall be done (when appropriate): • Prevent spoils from operations from entering the active channel • Monitor the underwater sound/vibration effects of hydraulic breaker operations at the various horizontal distances from the site using underwater sound-detection equipment	Protect aquatic resources.	MODERATE (Logic)	USFWS Biological Opinion and Conference Report (August 16, 2005) and USDC (NOAA/NMFS) Biological and Conference Opinion (October 28, 2005)	Contract Administrator
Minimize roads in Riparian Reserves. The location, design, and reconstruction of necessary crossings should minimize disruption to natural hydrologic paths and adverse effects to aquatic resources. Avoid sidecasting of loose material. Accommodate at least the 100-year flood, and associated bedload and debris.	Maintain surface hydrology and Riparian Reserve function and integrity.	HIGH (Avoidance)	ROD S&G RF-2, RF-4; BMPs T-8, T-10, T-11, R-1, R-6, R-11, R-12, R-14; Forest Plan S&Gs Water Resources and Riparian Reserves #6	Contract Administrator
Post-construction measures requiring ground disturbing work likely to cause erosion shall be implemented during the dry season of the year but still must fall within the designated in-water work windows.	Minimize sedimentation to fish-bearing waters.	HIGH (Logic)	MOU between FS and WDFW for hydraulic projects (2005)	Contract Administrator
A qualified Forest Service biologist would perform periodic site inspections during construction to ensure that the project is progressing as planned and that there are no unintended consequences to fish, wildlife, plants, and their habitats.	Protect aquatic resources and fish, wildlife, plants, and their habitats.	MODERATE (Logic)	Forest Plan S&Gs Fish Habitat Management #1; USFWS Biological Opinion and Conference Report (August 16, 2005) and USDC (NOAA/NMFS) Biological and Conference Opinion (October 28, 2005)	Contract Administrator

Table 2. Management Requirements and Mitigation Measures (continued)

Mitigation Measure or Project Design Feature	Objective	Effectiveness and Basis	Forest Plan Standard & Guideline	Enforcement
Wildlife				
To minimize the likelihood of adverse effects to nesting marbled murrelet, all project activities would occur between 2 hours after sunrise and 2 hours before sunset, from May 1 to September 15 each year. Timing restrictions are considered successful by eliminating sources of disturbance during the critical breeding period. The timing restrictions that would be implemented reduce potential adverse effects to post-incubating murrelets, but would not mitigate possible effects on incubating birds.	Eliminate sources of disturbance during the critical breeding period.	HIGH [MBS Forest experience, Biological Opinion (USFWS 2005) In the post-incubation stage, 90 percent of feedings by adults occur within two hours of sunrise and sunset; therefore, mitigation measure would dramatically reduce the potential disruption of feeding. During the incubating season, adults would be at the nest site continuously, so the mitigation measure would be ineffective.	Biological Opinion of the Effects of the Mount Baker-Snoqualmie National Forest Program of Activities for 2003-2007 on Marbled Murrelets and Northern Spotted Owls (USFWS 2002a)	Contract Administrator
Botany				
If any previously undiscovered Threatened, Endangered, and Sensitive (or other rare or uncommon) vascular plants, bryophytes, lichens, or fungi are discovered, before or during project implementation, halt work until a Forest Service botanist is consulted and necessary mitigation measures are enacted.	Prevent impact to TES or S&M plants	HIGH (logic)	Forest Plan S&G Threatened, Endangered, and Sensitive Species #1	Contract Administrator
Equipment brought on to the National Forest must be free of weeds and weed seeds. If weeds are present in the project area, all equipment and gear should be cleaned before leaving the area to avoid spreading the infestation further.	Prevent introduction of weeds Prevent weed spread	MODERATE (Forest Service 2005) HIGH (Logic)	Forest Plan S&G Wilderness – (Vegetation) #1; Forest Plan S&Gs Vegetation Management #2; ROD for preventing and managing invasive plants in the Pacific NW S&G #2 (Forest Service 2005)	Contract Administrator; District Botanist
All gravel, fill, and borrow material sources must be weed free.	Prevent introduction of weeds	MODERATE (Forest Service 2005)	ROD for preventing and managing invasive plants in the Pacific NW S&G #7 (Forest Service 2005)	Contract Administrator; District Botanist
Use weed free straw and mulch for all projects conducted or authorized by the Forest Service on National Forest System lands.	Prevent introduction of weeds	HIGH (Forest Service 2005)	ROD for preventing and managing invasive plants in the Pacific NW S&G #3 (Forest Service 2005)	Contract Administrator; District Botanist

Table 2. Management Requirements and Mitigation Measures (continued)

Mitigation Measure or Project Design Feature	Objective	Effectiveness and Basis	Forest Plan Standard & Guideline	Enforcement
For known infestations of noxious weeds, schedule appropriate weed treatments including R6-approved herbicides, using KV funds until all plants are gone.	Eradicate known infestations	HIGH (Forest Service 2005)	ROD for preventing and managing invasive plants in the Pacific NW S&G #16 (Forest Service 2005)	Contract Administrator; District Botanist
Any seed used for revegetation shall be tested using standards of the Association of Official Seed Analysis (WSCIA 2003) and pass State standards for noxious weeds prior to use (WAC 16-302-100).	Prevent introduction and spread of weeds	HIGH (Forest Service 2005)	ROD for preventing and managing invasive plants in the Pacific NW (Forest Service 2005)	Contract Administrator; District Botanist
Abandoned roads and new cut and fill slopes will be seeded and mulched to deter the establishment of noxious weeds. Fertilizer is not recommended. Seed and straw mulch must be free of weeds and weed seeds. One to two inches of weed free straw should be placed over the seed. The seed mix to use consists of the following: • Tufted hairgrass (*Deschampsia caespitosa*) @ 4 lbs/acre • Annual ryegrass (*Lolium multiflorum*) @ 10 lbs/acre • Winter triticale (*Triticum aestivum* x *Secale cereale*) @ 60 lbs/acre • Alsike clover (*Trifolium hybridum*) @ 2 lbs/acre	Prevent introduction and spread of weeds	HIGH (Forest Service 2005)	Forest Plan Best Management Practices; ROD for preventing and managing invasive plants in the Pacific NW S&G #3 (Forest Service 2005)	Contract Administrator; District Botanist
The location of any soil material moved off-site must be made known to the Botanist for monitoring purposes.	Prevent introduction and spread of weeds and to treat new infestations quickly.	HIGH (Logic)	ROD for preventing and managing invasive plants in the Pacific NW S&G #8 (Forest Service 2005)	Contract Administrator; District Botanist
Heritage Resources				
If a previously unidentified heritage resource were discovered during project implementation, or if an identified resource were affected in an unanticipated way, the Forest Heritage Specialist would be notified and the Forest will fulfill its responsibilities in accordance with the Programmatic Agreement between the Forest Service and the State Historic Preservation Office regarding cultural resource management on National Forests in the State of Washington.	Protect cultural resources	MODERATE (Experience)	Forest Plan, Archaeology Protection, p. 4-99 36 CFR 800 regulations of the National Historic Preservation Act.	Contract Administrator; Forest Heritage Specialist

Comparison of Alternatives

Table 3 displays the four alternatives considered in detail for the eight damaged sites on the White Chuck Road. Alternatives are compared in terms of the purpose and need and significant issues as well as environmental impacts.

Table 3. Comparison of Alternatives

Purpose and Need Element	Alternative A, No Action	Alternatives B and C, Repair Road 23 to Junction with Road 27[1/]	Alternative D, Repair all of Road 23
1. Provide safe access suitable for passenger cars, so that the general public can easily access recreation opportunities.	Multi-seasonal vehicle access to the end of Road 23 would not be possible. Road 23 would be blocked at MP 1.6 and access for passengers cars and the general public to recreation opportunities, such as pleasure driving, hiking, snowmobiling, cross-country skiing, horseback riding, and camping, would be precluded along Road 23. Under this alternative there would continue to be no passenger car access to the White Chuck Bench/Crystal Creek and White Chuck trailheads and trail systems. Access to the Meadow Mountain Trailhead would be seasonal via Forest Roads 25, 26, and 27 (after the approach to Boundary Bridge is repaired). Access to Road 23 between MP 3.5 and 5.8 would be available for HIGH-CLEARANCE vehicles via Road 27.	Access for passenger cars along Road 23 to the junction with Road 27 would be restored Access for the general public to dispersed recreation opportunities such as pleasure driving, hiking, snowmobiling, cross-country skiing, horseback riding, and camping, would be restored along these stretches of road. Access for the general public to the White Chuck Bench/Crystal Creek and Meadow Mountain trailheads would be restored (though extensive damage to the White Chuck Bench Trail would continue to limit hiker use until repairs are made). Vehicular access to the popular White Chuck Trailhead would still be precluded.	Passengar car access along the entire length of Road 23 would be restored. Direct vehicular access to the White Chuck Trail in addition to the White Chuck Bench/Crystal Creek, Meadow Mountain and associated trails would be restored (though extensive damage to the White Chuck Bench Trail and White Chuck Trail would continue to limit hiker use until repairs are made). Access for the general public to dispersed recreation as opportunities such as those described under Alternatives B and C would be restored along all of Road 23. The Darrington loop drive (that includes Roads 25, 27, and 23) would be possible under this alternative (after the approach to Boundary Bridge is repaired).
2. Provide access for Forest Service administration of recreation sites and infrastructure.	Forest Service access for administration of recreation sites and infrastructure along Road 23 would not be restored.	Administrative access along Road 23 from MP 1.6 to the junction with Road 27 would be restored. Motorized access for Forest Service maintenance and patrol of recreation sites along the restored section of Road 23 would be possible. Timely law enforcement, search-and-rescue, and fire emergency response would also be restored along this portion of Road 23. Administrative access from MP 5.8 to the road terminus would be improved compared to the current condition, but access would be limited to foot or mountain bike.	Administrative access along Road 23 from MP 1.6 to the road terminus would be restored. Access for Forest Service administration of recreation sites and infrastructure would be restored along the entire length of Road 23.
3. Provide vehicle access to Matrix lands designated for timber management.	Only a small portion of Matrix land in the watershed would be available for timber management. No timber could be accessed by the White Chuck Road and Matrix land along Roads 2311 and 2314 would no longer be accessible. Road 27, a steep, rough road, would included as part of the main haul-route. 918 acres of matrix lands would be precluded.	Vehicle access to portions of Matrix lands designated for timber management in the project area would be possible Partial access to Matrix land would be possible by vehicles on Road 23 from MP 0.0 to MP 5.8. . Hauling conditions would be better under these alternatives than under Alternative A, the no action alternative. 74 acres of Matrix land would be precluded	Vehicle access to Matrix lands designated for timber management along the length of Road 23 would be restored. Hauling conditions would be similar to conditions under Alternatives B and C and better than under Alternative A. No acres of Matrix lands would be precluded.
4. Close portions of Road 23 located on unstable slopes.	Current conditions would continue. All of Road 23, including areas located on unstable slopes, would remain closed to vehicular access. However, no obliteration, cultert removal, or other repairs would be made and unstable slopes on Road 23 would be left vulnerable to catastrophic failure and erosion problems.	Road 23 would be closed from MP 5.8 to the road terminus (MP 10.3) and decommissioned (Alternative B) or placed in storage (Alternative C) so that the risk of continued road slumping and failure on unstable slopes (S-8 soils) of this section of road would be eliminated. Removal of culverts and unstable fill slope materials and restoring natural hillslope drainage patterns would occur under both Alternatives to reduce the risk of erosion and mass wasting.	The entire length of Road 23 would be repaired and, thus, portions of Road 23 located on unstable slopes above MPs 5.8 would not be closed.
Issue	**Alternative A, No Action**	**Alternatives B and C, Repair Road 23 to Junction with Road 27[1/]**	**Alternative D, Repair all of Road 23**
1. Road 23 repairs at MP 1.9 may have adverse effects to river and floodplain processes, with further effects on aquatic integrity, Riparian Reserve conditions, water quality, and fish habitat.	Current conditions would continue. Steep slopes at Site #1 would remain open to erosion by the river, which may result in some sediment being added to the river during flood events. Sediment production would depend on the river meander and materials eroded from raw slopes at Site #1. Sediment is not expected to have a discernible effect on threatened fish, water quality, or aquatic integrity. No manipulation of large wood in the channel would occur but some addition of large wood could occur if the river erodes further into the bank. Floodplain connectivity would not be affected. There would be no additional effects to the Riparian Reserve other than natural erosion of the streambank.	Steep slopes at Site #1 would be armored to reduce erosion by the river; however, some sediment would be added to the river during reconstruction. No measurable effects on turbidity and sediment in the White Chuck River are expected. Minor amounts of sediment are not expected to have a discernible effect on threatened fish, water quality, or aquatic integrity. Floodplain connectivity could be affected for 200 to 300 feet by placing material in a zone accessed by the river. The road segment at MP1.9 (Site #1) would remain in the Riparian Reserve but no new portions of the reserve would be affected and natural erosion of the streambank at this site would be reduced. Large wood would be added to the channel as part of the reconstruction design. In addition, two engineered logjams would be added upstream of Site #1 under Alternative C The logjams and large wood would increase fish habitat complexity and assist in further developing the floodplain at MP 1.9 (Site #1).	Effects under Alternative D would be the same as those described for Alternative C.

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

Table 3. Comparison of Alternatives (continued)

Purpose and Need Element	Alternative A, No Action	Alternatives B and C, Repair Road 23 to Junction with Road 27[1/]	Alternative D, Repair all of Road 23
2. Road 23 repairs may be subject to future flood impacts, and therefore not cost effective.	No repairs woud be made at this time; therefore, no direct costs would be incurred at this time.	The risk of future floods causing additional road damage at the repair sites would be reduced by lowering the road profile, armoring the bank, and placing large wood (and engineered logjans under Alt. C) at Site #1; shifting the road away from the river at Sites #2 and #3, and decommissioning (Alt. B) or storing (Alt. C) the upper road. The new section of road at Site #2 would have a culvert large enough to pass 100-year floodwaters. Restoring the box culvert at Site #4 to its pre-2003 condition carries a risk of similar damage in the future. The culvert has become plugged before; however, by installing a dip in the road to help prevent water from going futher down the road in the event the culvert is plugged, the risk of damage to the road would be reduced. The long-term intent is to replace the existing culvert with a fish-passage compliant pipe-arch culvert capable of passing debris. Other repair sites would have culverts capable of passing 100-year floodwaters. This alternative would generally meet watershed analysis recommendations and Forest Plan direction to provide vehicle access to the watershed while alligning road maintenance needs with available funding.	Risks would be the same as for Alt. C for the lower road (Sites # 1 to #4). Risks of additional slumping and erosion, which would adversely affect the road, are high for portions of Road 23 located on unstable slopes . The road, including the section above MP 5.8, crosses unstable slopes and has a history of road failure. This alternative would meet watershed analysis recommendations and Forest Plan direction to provide vehicle access to the watershed but it would not contribute to aligning road maintenance needs with current projections of available road maintenance funding. The road would require a high level of regular maintenance to respond to slumps or drainage needs to retain the road in a safe condition.
3. Road 23 repairs may be high-risk because they are within a river drainage with unstable slopes and flash flows.	No repairs woud be made at this time. Future floods would be expected to result in additional adverse effects to the road. Without maintenance the portions of Road 23 located on unstable slopes are likely to deteriorate further.	The risk for additional damage would be reduced by lowering the road profile, armoring the bank, and placing large wood (and engineered logjans under Alt. C) at Site #1; shifting the road away from the river at Sites #2 and #3; installing a dip in the road to allow water to pass over the culvert at Site #4 in the event it is plugged; and decommissioning (Alt. B) or storing (Alt. C) the upper road.	Risks would be the same as for Alternative C for the lower road (Sites # 1 to #4). Risks of additional slumping and erosion, which would adversely affect the road, are high for the portions of Road 23 located on unstable slopes above MP 5.8. The section above MP 5.8 crosses unstable slopes and has a history of road failure.
4. Upper Road 23 decommissioning may adversely affect recreational access into the White Chuck River drainage.	Forest Plan direction to provide vehicle access to the watershed for recreation would not be met.	Forest Plan direction would generally be met by restoring vehicle access to most of the watershed.	Forest Plan direction would be met by fully restoring vehicle access to the watershed.
Trails and Trailheads	No repairs would be made to Road 23 and there would continue to be no vehicular access to the White Chuck trailheads and trail systems. Access to the White Chuck Bench/Crystal Creek and Meadow Mountain Trailhead would be seasonal via Forest Roads 25, 26, and 27 (after the approach to Boundary Bridge is repaired).	Vehicular access would be restored along Road 23 to the junction with Road 27. Access would be restored to the White Chuck Bench/Crystal Creek and Meadow Mountain trailheads and trail systems. Vehicular access would not be restored to the White Chuck Trailhead.	Same as for Alt. B and C except vehicular access would be restored along the entire length of Road 23, all the way to the White Chuck Trailhead.
Hikers, Climbers, and Stock Users	Same as above for Trails and Trailheads. Additionally, some hikers may continue to access the White Chuck Bench/Crystal Creek, Meadow Mountain, and White Chuck trailheads and trail systems by walking or biking Road 23, but trail use would be expected to remain low. However, the initial damage sites (Sites 1 to 3) are difficult to pass and the road would eventually grow in with vegetation and trees would fall across the road, so walking or biking would become difficult over time.	Use of trails accessed via the White Chuck Bench/Crystal Creek and Meadow Mountain trailheads would likely return to pre-flood levels. Some hikers may access the White Chuck Trailhead and trail system by walking or biking the upper section of Road 23, but trail use would be expected to remain low. Under these alternatives, there would be no maintenance of the trail tread and it would eventually grow in with vegetation and trees would fall across the road, so walking or biking would become difficult over time.	Trail use in the affected area could return to pre-flood levels following trail repairs. The White Chuck Trail suffered extensive damage and repairs to the trail are not part of this proposal and are not currently funded.

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

Table 3. Comparison of Alternatives (continued)

Issue	Alternative A, No Action	Alternatives B and C, Repair Road 23 to Junction with Road 27[1/]	Alternative D, Repair all of Road 23
	Most climbers would access Glacier Peak via the Disappointment Peak and North Fork Sauk Trail.	Same as Alternative A.	Climbers would be able to access Glacier Peak via the Boulder Basin/Sitkum route and the more technically challenging Frostbite Ridge route. Diverted use of the Disappointment Peak and North Fork Sauk Trail would likely decrease.
	Stock users would be precluded from accessing the White Chuck Bench/Crystal Creek, Meadow Mountain, and White Chuck trailheads because Road 23 would remain impassable. Limited alternative access may be possible via Forest Roads 25, 26, and 27 (after the approach to Boundary Bridge is repaired).	Stock users would be able to access the White Chuck Bench/Crystal Creek and Meadow Mountain trailheads via Road 23. Access to the White Chuck Trailhead would not be restored.	Stock users would have vehicular access to the White Chuck Bench/Crystal Creek, Meadow Mountain, and White Chuck trailheads and trail systems. The White Chuck Trail suffered extensive damage and repairs to the trail not part of this proposal and are not currently funded.
Outfitter/Guide Use	Outfitter/guides would likely continue to access the Glacier Peak Wilderness from other trailheads and access points, or request use elsewhere on the Forest.	Same as Alternative A.	Repair of Road 23 would restore access to the White Chuck Trailhead and would restore Road 23 as a means for outfitter/guides to access Glacier Peak Wilderness and could result in outfitter/guide use returning to pre-flood levels providedrepairs are made to the White Chuck Trail (provided trail repairs are made; repairs to the White Chuck Trail not part of this proposal).
Wilderness	Visitation to the affected part of the Glacier Peak Wilderness would be expected to remain low. Opportunities for solitude in this part of the Forest would remain high.	The number of recreationists accessing the Glacier Peak Wilderness via Road 23 would be expected to remain low.	Restored access to the White Chuck Trailhead would restore Road 23 as a means for recreationists to access the wilderness and could result in use returning to pre-flood levels (provided repairs are made to the White Chuck Trail. Repairs to the trail are not part of this proposal and are not currently funded).
Dispersed Recreation	Dispersed recreation opportunities requiring motorized access to the area would continue to be low.	Dispersed recreation opportunities requiring motorized access would be available along the lower restored section of Road 23.	Dispersed recreation opportunities requiring motorized access would be available along the entire length of Road 23 and use could return to pre-flood levels..
	The loop drive from Darrington via Rat Trap Pass, Road 23, and the Mountain Loop Highway would continue to be unavailable.	The Darrington loop drive would be possible under this alternative (after the approach to Boundary Bridge is repaired).	Same as Alternatives B and C.
5. Upper Road 23 decommissioning may preclude vehicle access to some Matrix lands that are available for timber management.	The road would not be decommissed at this time. However, this Alternative would not meet Forest Plan direction or Roads-Analysis recommendations to provide access to Matrix lands in the watershed. 918 acres of Matrix land precluded.	Alternatives B and C would partially meet Forest Plan direction and Roads-Analysis recommendations to provide access to Matrix lands in the watershed. 74 acres of Matrix land precluded	Alternatives D would fully meet Forest Plan direction and Roads-Analysis recommendations to provide access to Matrix lands in the watershed. No acres of Matrix land precluded.
6. Road management activities may affect low elevation trails and trailheads, which are limited on the Forest.	Overall effects to trailhead and trail access under this alternative are summarized under Issue 4. Road 23 would not be maintained as a trail, but would be available for use by recreationists seeking low elevation trail opportunities. However, the initial damage sites (Sites 1 to 3) are difficult to pass and the road would eventually grow in with vegetation. Access to the low elevation White Chuck Bench and White Chuck trails would be possible by walking or biking Road 23, but trail use would be expected to remain low.	Same as Alternative A., except damage Sites 1-3 would be passable . The upper road would eventually grow in with vegetation. Use of the low elevation White Chuck Bench Trail would likely return to pre-flood levels (provided trail repairs are made).	Overall effects to trailhead and trail access under this alternative are summarized under Issue 4. Road 23 would be used as a road under this alternative and not available for use by recreationists seeking low elevation trail opportunities. Use of the low elevation White Chuck Bench and White Chuck trails would likely return to pre-flood levels, as under Alternatives B and C (provided trail repairs are made).

Note:

1/Alternative C is similar to B, and as a result, the impacts of the two alternatives are summarized together. The main difference is that Alternative C would involve placing the upper section of Road 23 in storage, rather than decommissioning it. The impacts under Alternative C would be similar to those summarized for Alternative D, if the Forest Service exercised the option to re-construct the upper section of the road at some point in the future.

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

THROW OUT THIS PAGE

3. Environmental Consequences

This section summarizes the physical, biological, social, and economic environments of the affected project area as well as the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for the comparison of alternatives presented in the chart above.

Access and Road Management Affected Environment

Prior to the flood damage in 2003, Road 23 was a high use, multi-seasonal administrative and recreation route on the Darrington Ranger District. Visitors have used this route for driving pleasure and to access numerous trails in the watershed. Road 23 provides access for hiking, sightseeing, dispersed camping, berry and mushroom picking, hunting and fishing, snowmobiling, snowshoeing, skiing, and collecting special forest products.

There is a limited land base for production of commercial timber products on the MBS National Forest. Timber harvest provides wood products and supports jobs and income in the local economy. Road 23 is the only suitable haul route for timber management in the White Chuck watershed. This relatively low elevation road has played an integral part in managing forest resources including vegetation (timber sales, thinning, stand exams, etc.) and wildlife (survey efforts, habitat treatments). The affected area includes Roads 23, 2300011, 2300016, 2311, 231011, 2314, and all of the area that they access.

Roads Analysis Findings, Maintenance Level

Forest-wide roads analysis, a process used to inform decisions related to road management, has been completed for the MBS National Forest Roads Analysis. The Roads Analysis of 2003 assessed Forest transportation management needs, long-term funding, and expected ecosystem, social, and economic effects. Each road segment on the Forest was assessed both for access need (e.g., needed for recreation, vegetation management, etc.) and by concern for resource impacts. Road 23 and Road 27, accessible by Road 23, were rated as a *High-Need* for access for recreation and administrative uses. The Forest Roads Analysis (Forest Service 2004) rated Road 23 and Road 2311 as *High-Need* for access to Matrix lands. It rated Road 23 as *Low-Need* for access to LSR (Table 1).

The Road 23 system was rated as a *High-Concern* for aquatic resources due to the road systems on the lower slope in proximity to fish bearing waters and the potential for sediment delivery. The Road 23 system was rated as a *Moderate-Concern* for wildlife due to the Prairie Bear Management Unit having limited amounts of core habitat for grizzly bear. See the Environmental Consequences Sections on aquatics, hydrology, and wildlife for more information on resource considerations in relation to Roads 23, 2311, 2314, and 27.

Current road management objectives and operational levels for the White Chuck road system come from the Forest INFRA database and were included in the Roads Analysis (and were also discussed in the 2004 Watershed Analysis for the White Chuck [Forest Service 2004]) (database available at Darrington Ranger Station). The current Operational Maintenance

Level (ML defined below) of Road 23 is ML 3, maintained for passenger vehicles (at low speed—20 mph, and with single lane roads with turnouts).

> ***ML 1:*** *Intermittent service roads managed as closed to vehicular traffic. They are kept in storage until the next project access need; the closure period must exceed one year.*
>
> ***ML 2:*** *Roads open for use by high clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses.*
>
> ***ML 3:*** *Roads open and maintained for travel by a prudent driver in a standard passenger car. Roads are typically low speed, single lane with turnouts and spot surfacing with aggregate (gravel).*
>
> ***ML 4:*** *Roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced; however, some may be single lane. Paved surfaces or dust abatement may be used.*
>
> ***ML 5:*** *Roads that provide a high degree of user comfort and convenience. These roads are normally double lane and paved, although some may be aggregate surfaced and dust abated.*

The future maintenance level (Objective) for Road 23 is ML 3 from the Mountain Loop Highway to the end of the road. The following table displays the road information, from the Sauk/Sauk Forks Watershed Analysis (Forest Service 1996) and White Chuck Watershed Analysis (Forest Service 2004), and roads analysis results on all roads in this drainage.

Past Flood Damage

Past flood damage was reviewed for impacts to road systems within the project area (Table 4). In the past, flood repairs were often made at the same location with in-kind repairs. Since 1995 and the signing of the Northwest Forest Plan, there has been more opportunity with ERFO projects to design repairs to meet site conditions and resource considerations. Less flood damage to road systems in the area may be attributed to a decade of road restoration efforts (e.g., decommissioning, storm proofing, and upgrading) on the MBS National Forest. The following table displays the past road damage repaired with ERFO funding, and the current condition of the road at those repair sites.

Table 4. Road 23 Flood Damages

Flood Year/Road No.	Repair	Mile Post	Cubic Yards	Cost Estimate	Current Condition
1974-Road 23	Replace culvert and road fill	7.25	100	$1,000	Undamaged
1974-Road 23	Replace road fill and fix ditchline	7.50	150	$11,000	Undamaged
1980-Road 23	Replace road fill	2.76	300	$43,000	Undamaged
1980-Road 23	Clean culvert and fix ditchline	3.68	130	$4,000	Undamaged
1980-Road 23	Replace road fill	5.22	1000	$27,000	Undamaged
1989-Road 23	Replace culvert and road fill	7.00	100	$9,000	Undamaged
1996-Road 23	Replace road fill	5.70	130	$5,400	Damaged
1996-Road 23	Replace road fill and repair channel	6.80	700	$12,000	Undamaged
1996-Road 23	Fix low water ford inlet and outlet	7.50	150	$10,000	Undamaged
1996-Road 2311	Clean culvert and fix ditchline	0.50	450	$15,000	Undamaged
1996-Road 23	Replace road fill	6.50	20	$24,360	Undamaged
1996-Road 23	Replace culvert with bridge	7.80	0	$97,000	Undamaged
1999-Road 23	Channel encroachment,move road	6.68	200	$131,090	Undamaged
2003-Road 23	Channel encroachment repair road in place with slight realignment into hillside	1.90	16,000	$426,500	Not yet repaired
2003-Road 23	Channel encroachment, relocate road	2.40	30,000	$1,026,400	Not yet repaired
2003-Road 23	Plugged wood culvert	3.50	54	$17,000	Not yet repaired
2003-Road 23	Channel scour removed riprap	5.70	130	$15,000	Did not qualify for funding, unrepaired
2006 – Road 23	Channel encroachment, re-locate road	3.4	21,000	$227,380	Not yet repaired
2006 – Road 23	Fill failure, shift road; into hillside	5.8	3,436	$167,151	Not yet repaired
2006 – Road 23	Fill failure, shift road; into hillside	6.45	277	$19,921	Did not qualify for funding, unrepaired
2006 – Road 23	Replace road fill; install retaining wall	7.2	877	$54,776	Did not qualify for funding, unrepaired
2006 – Road 23	Replace road fill; install retaining wall	8.5	767	$92,262	Did not qualify for funding, unrepaired

Access and Road Management Environmental Consequences

Alternative A

Multi-Seasonal Access: Alternative A, if implemented, would not provide multi-seasonal vehicle access to the end of Road 23 (Owl Creek Campground and White Chuck Trailhead). If no action is taken to repair washout Sites #1 through 8, limited drivable road miles would be available, although some portions would be open seasonally and when passable.

MP 0.0 to MP 1.6 would remain open and drivable by passenger vehicles in its current state. As part of routine road maintenance and to provide for public safety concerns, it is likely that a barrier would be installed prior to MP 1.6, at a logical location where vehicles can turn around before reaching the Site #1 washout[6].

[6] Barriers would be placed and turnarounds constructed as part of routine road maintenance, which is aside from this environmental assessment. This type of road maintenance along Road 23 does not require an environmental assessment and should be considered an activity that is separate from the "No Action" alternative. Barriers and turnarounds are mentioned to give the reader a full picture of what would become of Road 23 if no action is taken to make repairs.

Access to the White Chuck Watershed from Darrington via the Suiattle River Road

Travel Time and Distance

Under the No Action alternative, access to a portion of the White Chuck drainage would occur from the Suiattle River Road, once that road is repaired. Table 5 summarizes the access from Darrington[7] to the junction of Roads 27 and 23. Road 27 is designated as ML3, but because of its poor condition, it is more representative of a ML2 road. The narrow road, with plunging banks, sharp corners, and steep grades over 3,200 foot Rat Trap Pass, limits the type of vehicle that can safely use the road. The threshold of grade suitable for passenger, recreational, and stock-hauling vehicles (Forest Service Handbook 7709.56, 1987) is 12 percent. Vehicle speeds average 10 to 15 mph. *Note: The Suiattle Route would depend on replacement of the Boundary Bridge.*

Table 5. Alternative A No Action Route

Alternative A Access to Junction of 23 and 27 via the Suiattle Route:		
Road	**Distance (mi.)**	**Comments**
Highway 530	7.0	Paved State Highway
Road 26 Suiattle River	10.0	Mostly paved narrow 2-lane road; poor condition
Road 25 south side Suiattle River	3.0	ML 3; gravel, single lane with turnouts. Must cross Boundary Bridge, current condition, unknown.
Road 27 Rat Trap Pass	10.5	ML 3; gravel, single lane with turnouts. Steep (12% and greater) grades, current condition, unknown. (Road functions as a ML 2)
Total	30.5	
Travel time: 60 to 90 minutes Elevation range: Darrington 550 feet, Rat Trap Pass 3,200 feet Summer and fall vehicle access to Crystal Creek Trailhead; Crystal Creek Campground, and a small portion of the White Chuck drainage between Stujack Creek and MP 5.8.		

Multi-seasonal passenger vehicle access would not be possible due to several limitations:

- Road 27 is available only seasonally due to its topography and elevation, becoming impassable with the first fall snow and through the winter;
- Those vehicles traveling over Road 27, would be limited to drivers and passengers who are at ease with steep, rugged mountain routes, with rock fall and narrow roads; and
- Stock vehicles and logging trucks have a difficult drive with this route because of its tight corners, rough terrain, and narrow road conditions.

Road System Maintenance Levels, Driving Conditions, and Costs. There will be no repair cost associated with the No Action Alternative. Road 23 was designed as an operational ML3, suitable for passenger cars. Most of the (spur) roads that branch off from Road 23 are designed as operational ML2, maintained for high clearance vehicles. Driving conditions on

[7] The starting point of reference for comparison of mileages to access Road 23 from the town of Darrington is the 4-way intersection of Highway 530 and the Mountain Loop National Scenic Byway, which is also MP 0.0 for the Mountain Loop National Scenic Byway (referred to as Road 20). The junction of Road 23 and Road 27 is the ending point of reference located mid-way on Road 23. These locations were chosen to demonstrate consistent mileages.

the remainder of Road 23 would be passable by passenger cars; however, the surfacing is worn and has not been recently replaced.

Recreation Access. With no action, vehicle access to the portion of White Chuck Road between MP 0.0 and MP 1.6 and MP 3.5 and MP 5.8 (if Road 27 is repaired) would be accessible under the No Action Alternative. Under the No Action Alternative, the road would be blocked at MP 1.6; there would be vehicular access to the White Chuck Bench/Crystal Creek, and White Chuck trailheads and associated trails would be from Road 27 over Rat Trap. Some hikers may continue to access these trails by walking or biking along Road 23. However, damage Sites #1 to #3 are difficult to pass and, while the remaining road prism would continue to exist as it does today, the road would not be maintained as a trail and would eventually grow in with vegetation. During summer and fall months, access to the White Chuck Trailhead could be possible from the Suiattle road system (once repaired), which is dependent upon northwest weather conditions. Because of the higher elevation of this route, there is reasonable concern for safe travel conditions in the fall months where snowfall on Road 27 would make conditions difficult or precarious for travel.

Dispersed Recreation. Seasonal vehicular access to dispersed recreational activities such as fishing, picnicking, and camping along Road 23 would be limited to only the drivable portions of Road 23, including MP 0.0 to the blockade at MP 1.6; the Road 27 junction west to the blockade at Site #4 (about 2.8 miles); and from the Road 27 junction east to the blockade at Site #5 (about 0.1 mile).

Timber Hauling. Under the No Action Alternative, 918 acres of second growth timber lands in the Matrix allocation would have no open road for vegetation management or potential timber harvesting. Road 23 would no longer access the Matrix land along Roads 2311 and 2314, and any timber or other forest products would be removed using the Suiattle Route, which includes Road 27 as a main haul route. Timber removed by way of Road 27 would be considered an adverse haul route because of the steep and rough road, and the cost associated with this adverse haul route. Road 27 would also need to be reconstructed in order to facilitate log trucks.

Administrative Access. Law enforcement, fire patrols, firefighters, search-and-rescue, and administrative personnel would not be able to respond to incidents in the same timeframe as prior to the flood. Forest Service staff would incur the same increased time, and seasonal access as others traveling over Rat Trap Pass.

Alternative B

Alternative B would restore vehicular access along Road 23 to the junction with Road 27 with repairs to four damaged segments along Road 23 at Site #1, Site #2, Site #3, and Site #4 (Figure 2, Alternative B). Road 23 from the junction with Road 27 to the White Chuck Trailhead (MP 5.8 to the road terminus) would be decommissioned. This alternative, if implemented, would provide multi-seasonal access to portions of the White Chuck drainage.

This alternative would partially meet the goals and objectives outlined in the Forest Plan, as amended, which include managing the transportation system at the minimum standard needed to support planned uses and activities (Forest Service 1990). However, it would not access all Matrix land in the drainage and would not provide road access to the White Chuck Trailhead. While it would contribute to aligning road maintenance for Road 23 with the

projected availability of road maintenance funding, it would not contribute toward meeting the desired conditions for Road 23 described in the Forest-wide Roads Analysis, (Forest Service 2003), which includes maintaining the entire road for passenger vehicle use.

Access to White Chuck Watershed from Darrington via the Mountain Loop National Scenic Byway

Travel Time and Distance

Under Alternative B, access would be restored to portions the White Chuck watershed from the Mountain Loop National Scenic Byway (Road 20). Table 6 summarizes the access from Darrington to the junction of Roads 23 and 27 using Road 20. The maximum grade on this route would be 10 percent, with a travel time around 25 minutes and a maximum elevation of 1,200 feet.

The new route around Sites #2 and #3 would result in approximately 1,000 feet more driving distance from the pre-2003 flood conditions.

Road Maintenance Level, Driving Conditions, and Cost: Road maintenance objectives for the first 5.8 miles of Road 23 route would remain at ML 3. Road grades would increase to 12 percent along the rerouted section of road at Site #2, but conditions for hauling logs would be considerably improved ***when*** compared to the limited access that Road 27 would provide with the No Action Alternative.

Recreation Access: Alternative B would restore vehicular access along Road 23 to the junction with Road 27. This would provide direct vehicular access to the White Chuck Bench/Crystal Creek and Meadow Mountain trailheads and associated trails. Extensive damage to the White Chuck Bench Trail would continue to limit hikers use until repairs are made. Although this alternative would not provide vehicular access to the White Chuck Trailhead, it would reduce the distance that hikers presently hike or bike to get to the White Chuck Trailhead, from about 10.3 miles to about 4.5 miles. In addition, a walkable tread (a path 4 to 5 feet wide) would be retained around Sites #5 through #8. These conditions suggest that Alternative B would lead to an increase in use from current levels at the White Chuck Trailhead, even though vehicular access would not be fully restored to that point. Because no maintenance of the trail tread is planned, this route would eventually grow in with vegetation and trees would fall across the road.

Table 6. Alternative B Route

Alternative B Access from Darrington to Junction of Roads 23 and 27 using Road 20 (Mountain Loop National Scenic Byway):		
Road	**Distance (mi.)**	**Comments**
Road 20 (Mountain Loop National Scenic Byway)	10.0	2-lane paved
Road 23 White Chuck	2.3	ML 3; gravel, single lane with turnouts
Reroute (around washout at MP 2.3)	0.7	ML 3; gravel, single lane with turnouts; grades to 10%
Road 23 from reroute to junction with Road 27	3.5	ML 3; gravel, single lane with turnouts
Total	16.5	
Travel Time: 25 minutes Elevation Range: Darrington 550 feet, Road 27/23 junction 1,200 feet. Multi-Seasonal Access to White Chuck Bench/Crystal Creek Trailhead; Meadow MountainTrailhead; Crystal Creek Campground.		

Dispersed Recreation. Vehicular access to dispersed recreational activities such as fishing, picnicking, and camping along Road 23 would be restored along Road 23 from MP 1.6 to the junction with Road 27.

Timber Hauling: If Alternative B is implemented, the White Chuck Drainage would once again be open for Timber haul on Road 23 up to MP 5.8. Partial access to Matrix land located in the project area would be accessible by Road 23 from MP 0.0 to MP 5.8. Hauling conditions would be better than the no action alternative.

Administrative Access: Under Alternative B, administrative access would be restored along Road 23 from MP 1.6 to the junction with Road 27. The time to travel to this portion of the project area would be comparable to the pre-flood access using Road 23, providing for timely law enforcement search-and-rescue and fire emergency response time. Administrative access along Road 23 from MP 5.8 to the road terminus (MP 10.3) would be improved compared to the current condition; it would be limited to foot or mountain bike access.

Alternative C

Alternative C is similar to Alternative B and would restore vehicular access along Road 23 to the junction with Road 27, with repairs to four damaged segments along Road 23 at Sites #1 through #4 (Figure 11, Alternative C). Road 23 from the junction with Road 27 to the White Chuck Trailhead (approximately MP 5.8 to the road terminus) would be placed into storage and closed to motor vehicle traffic (ML1). This alternative, if implemented, would provide multi-seasonal access to portions of the White Chuck drainage.

Placing the upper portion of Road 23 in storage retains the option to re-construct this section of road in the future, depending on future Forest needs in the upper drainage and available funds.

This alternative would partially meet the goals and objectives outlined in the Forest Plan, as amended, which include managing the transportation system at the minimum standard needed to support planned uses and activities (Forest Service 1990). Alternative C would contribute to aligning road maintenance for Road 23 with the projected availability of road maintenance funding, but it would not contribute at this time toward meeting the desired conditions for Road 23 described in the Forest-wide Roads Analysis (Forest Service 2003), which includes maintaining the entire road for passenger vehicle use. However, it maintains the option of restoring access in the future.

Access to White Chuck Watershed from Darrington via the Mountain Loop National Scenic Byway

Travel Time and Distance

Under Alternative C, access would be restored to portions the White Chuck watershed from the Mountain Loop National Scenic Byway (Road 20). Travel times and road conditions, as well as access for recreation, timber management, and administration, would be the same as under Alternative B.

Alternative D

Alternative D would restore vehicular access and would provide multi-seasonal access to the White Chuck drainage and to the White Chuck Trailhead.

If implemented, Alternative D would restore vehicular access for all of Road 23 to the road terminus (MP 10.3) with repairs to eight damaged segments along Road 23 at Sites #1 through #8 (Figure 12, Alternative D).

Restoring the entire road rather than decommissioning the upper road or placing it in storage would more fully meet the goals and objectives outlined in the Forest Plan, as amended, which include managing the transportation system at the minimum standard needed to support planned uses and activities as described in the Forest-wide Roads Analysis (Forest Service 2003). Specifically, it would provide passenger vehicle access to popular recreation areas and access Matrix lands for timber management (however, this alternative does not include restoring Kennedy Hot Springs or rebuilding the White Chuck Trail). Alternative D would not contribute to reducing future road maintenance needs to better align projected road maintenance needs with the projected availability of road maintenance funding. Road 23, including the upper section, has a four-decade history of withstanding major flood events, but it is likely to continue to have various road spot failures that will require costly repairs. ERFO funds are not available for all repairs to the upper road.

Access to White Chuck Watershed from Darrington via the Mountain Loop National Scenic Byway

Travel Time and Distance

Under Alternative D, access, travel times and road conditions, as well as access for recreation, timber management, and administration, would be the same as under Alternative B for the portion of Road 23 below its junction with Road 27. In addition, access would be restored to the White Chuck Trailhead (however, this alternative would not restore the White Chuck Trail).

Road Maintenance Level, Driving Conditions, and Cost: Road maintenance objectives for the repaired section of Road 23 route would remain at ML 3. Road grades would increase to 10 percent along the rerouted section of road at Site #2, but conditions for hauling logs would be considerably improved when compared to the limited access that Road 27 would provide under the No Action Alternative.

Recreation Access: Alternative D would restore vehicular access to all of Road 23. This would provide direct vehicular access to the White Chuck Bench/Crystal Creek, Meadow Mountain, and White Chuck trailheads and associated trails. Damage to the White Chuck Bench and White Chuck Trails would continue to limit hikers use until repairs are made. Use of the trails accessed from these trailheads by hikers could, as a result, return to pre-flood levels after trail repairs are implemented.

Timber Hauling: If Alternative D is implemented, the White Chuck Drainage would once again be open for timber haul on the entire length of Road 23. Access to Matrix land located in the project area would be accessible along Road 23 from MP 0.0 to the road terminus. Hauling conditions would be better than the no action alternative.

Administrative Access: The time to travel to the area would be comparable to the pre-flood access using Road 23, providing for timely law enforcement search-and-rescue and fire emergency response time.

Access and Road Management Cumulative Effects

The affected area for access and road management cumulative effects includes the White Chuck River and Sauk River drainages. Road reconstruction would again allow access to the White Chuck drainage (to MP 5.8 under Alternatives B and C and to the road terminus under Alternative D) for recreation, timber haul, and administrative access to national forest lands. Damage areas would be stabilized, resulting in less effect on the White Chuck River and fish populations. The repairs would contribute to the cumulative management of the MBS National System roads, which is consistent with the MBS Roads Analysis.

Current and foreseeable projects in the White Chuck River drainage that contribute to cumulative effects on access and road management include repair to the PCT and repair of the White Chuck Bridge. Other actions in the Sauk River drainage include: the Suiattle River road flood site repairs, the Boundary Bridge replacement, Snohomish County Sauk road repair and the Gold Mountain ERFO road repair. Another option being discussed with the County is an extension of Road 22 from the south, which would include a 0.25-mile reconstruction of road to provide access to the private and county road systems.

The cumulative effects of this project and the other 2003 and 2006 ERFO road repair projects (road repairs, upgrades of culverts, bridges, and other crossings to current standard, etc.) would provide a portion of the road system to serve a range of recreation traffic, administrative needs, emergency response, fire management, and timber management needs. Total road mileage in the White Chuck and Sauk River drainages after flood response repairs would be a road system decreased by approximately 4.5 miles. In 2009, the Forest is pursuing a Suiattle River drainage Access and Travel Management (ATM) EA. This assessment will identify roads to be retained, roads to be put into storage, and roads to be decommissioned in the Suiattle river drainage. A decrease in maintained road mileage is displayed in the scoping letter for all action alternatives for the Suiattle River ATM. Future thinning and salvage sales in the White Chuck area could also contribute toward road maintenance if implemented.

Cumulatively, the new culverts, new bridges, and other improved stream crossings would result in main arterial road systems that are better equipped to withstand future debris and bedload associated with large flood events, and would improve appropriate channeling of hydrologic flows to minimize sediment delivery to fish bearing waters. The improved roads would meet the standards and guidelines described in the Forest Plan, as amended.

The cumulative effects of this project, together with other foreseeable projects, would result in upgrading the proposed road systems to current standards, closing and placing roads in storage or decommissioning roads. This would result in a road system better situated to meet the needs of recreationists, emergency responders, fire management staff, and general administration of the Forest.

Consistency with the Forest Plan

In Alternatives B, C and D, the road treatments utilized and described in this analysis would meet road maintenance standards and guidelines of the Forest Plan, as amended.

Timber and Vegetation Management Affected Environment

The analysis area for direct and indirect effects of this project to timber management is the White Chuck watershed. While a substantial portion of the White Chuck River watershed is in wilderness (71 percent), there are portions of the White Chuck drainage, outside of the Glacier Peak wilderness area, classified as Matrix land, where timber management may occur (Forest Service and BLM 1994; Forest Service 2004). Approximately 9,400 acres (17 percent) of the 54,500-acre White Chuck watershed are allocated as Matrix lands. The Matrix allocation, designated in the 1994 Record of Decision, overlaps with the 1990 Forest Plan Management. Matrix land acres tributary to Road 23 represent about 3.9 percent of the total Matrix on the MBS National Forest. Forest Plan land allocations included in these 6,858 of Matrix are: MA17, Timber emphasis, 444 acres; MA 1D, Roaded Natural Dispersed Recreation, 470 acres; MA 2A and 2B, Scenic Viewshed; Foreground and Middle ground, 3,661 acres; and MA 5A, Recommended Wild and Scenic River, 2,283 acres. In the Matrix allocation, scheduled timber harvest may occur, with both full and partial yields depending on the above Forest Plan emphasis. Matrix also includes non-forested areas and lands that are technically unsuitable for timber harvest.

Of the approximate 9,400 Matrix acres, 6,858 acres (73 percent of Matrix lands) are tributary to Road 23 and the connecting Roads 27, 2710, 2720, 2311, and 2314. Tributary means that these roads would be used to yard to and/or haul logs by truck. Not all of these 6,858 acres, however, are available for timber management. For example, Riparian Reserves overlap Matrix allocations. Approximately 47 percent (3,241 acres) of Matrix acres tributary to Road 23 are also mapped (using Geographic Information System [GIS]) as being within Riparian Reserves. With very specific exceptions (see 1994 ROD, page C-32), timber harvest is generally prohibited in Riparian Reserves (Forest Service 2004). There are also about 471 acres of Matrix (MA 1D) that is currently inaccessible by vehicle due to the closure of Road 2710-011, which was added to the trail system.

There are approximately 918 acres of second growth timber in the White Chuck watershed that are accessible by roads. Nearly all harvest on the MBS National Forest designed and implemented since the Forest Plan was amended by the Northwest Forest Plan in 1994 has been thinning in second growth forest. Access to these Matrix land it is important to meeting the goals of the Forest Plan, as amended (Forest Service 1990; Forest Service and BLM 1994).

Environmental Consequences

Alternative A

If Alternative A were implemented, access to the 918 acres of second growth and other stands allocated to Matrix would not be available, limiting the possibilities of future stand-management activities in areas designated for timber management.

Timber Haul Route

Under Alternative A, no timber could be accessed by the White Chuck Road 23. Minor amounts of timber would be accessible using Road 27, along with Roads 26 and 25, which are located in the Suiattle River drainage, and State Route 530. The expected repairs of the Boundary Bridge across the Suiattle River and Road 27 repairs would provide seasonal access to the upper White Chuck watershed by using Road 27 over Rat Trap Pass. However, Road 27 is not favorable as a timber haul route because of its steep grade.

Hauling cost would increase, as log loads harvested from the White Chuck watershed would have to be adversely hauled up and over the steeper, rougher and slower Road 27. The Suiattle haul route is also longer than the Road 23 route, adding time for each truckload to travel over the route.

Road 27 would require upgrades and reconstruction to facilitate timber hauling. The cost of the necessary road reconstruction, the additional mileage associated with the haul route, and the adverse (steep uphill) haul, would make this route economically unreasonable.

In addition, use of Road 27 as the primary haul route would be seasonally limited. Due to the elevation (approximately 3,200 feet) of Road 27 at Rat Trap Pass, use is generally restricted by snow late spring through fall. This period often conflicts with timing restrictions on logging and other management activities to protect federally listed species and prevent damage to standing trees during sap flow periods. Logging and other management activities often must be scheduled only in the fall and winter months in order to protect federally listed species.

Densely Stocked Stands

Many timber stands in the Matrix are too densely stocked with trees to obtain good volume growth. Where Matrix would remain inaccessible, stand development would be slow with continued mortality and tree and stand stagnation. Dominant and co-dominant trees would continue to develop at a slow rate, releasing from competition when adjacent smaller stems succumb to density related mortality.

Densely stocked stands would probably continue to decline in growth, vigor, and health, making them more susceptible to wind, insect, disease and fire disturbances. Consequently, with Alternative A, Matrix land would remain inaccessible, and the timber management objectives of the Forest Plan, as amended, would not be attained.

Alternatives B and C

Restoring the road access provides opportunity to meet the timber management objectives in the Forest Plan on most manageable lands in the watershed. Approximately 74 acres of second growth timber (available for harvest) would not be accessible under Alternative B and C (Harvest Assessment and Financial Analysis Specialist Report 2008).

Under Alternatives B and C, timber haul costs from Matrix land tributary to Road 23 and the connecting roads would be less than with the No Action Alternative. Road 23 has a much gentler gradient providing a favorable haul route for log loads coming out of the White Chuck watershed. Hauling timber on Road 27 to Road 23 would be downhill, reducing the adverse haul. Overall, Road 23 would provide a more efficient, reliable, and safer haul route than Road 27. Because regulations require that most timber harvest take place in fall and winter months, Road 23 and its connector roads provide multi-season administrative access to Matrix.

Alternative D

Restoring the road access to pre-2003 conditions provides opportunity to meet the timber management objectives in the Forest Plan on all 918 acres of second growth and on most other Matrix lands in the watershed (Harvest Assessment and Financial Analysis Specialist Report 2008).

Under Alternative D, timber haul costs from Matrix land tributary to Road 23 and the connecting roads would be the same as under Alternatives B and C (and less than with the No Action Alternative). Road 23 has a much gentler gradient providing a favorable haul route for log loads coming out of the White Chuck watershed. Hauling timber on Road 27 to Road 23 would be downhill, reducing the adverse haul. Overall, Road 23 would provide a more efficient, reliable, and safer haul route than Road 27. Because regulations require that most timber harvest take place in fall and winter months, Road 23 and its connector roads provide multi-season administrative access to Matrix.

Timber and Vegetation Management Cumulative Effects

Past Actions

Approximately 471 acres of Matrix are no longer accessible in the White Chuck River drainage for timber management due to the closure of Road 2710-011, which was added to the trail system.

Ongoing and Foreseeable Actions

The Wild Sky Wilderness Bill was passed into law in May 2008. The newly designated Wilderness is located several drainages south of the project area and shifted Matrix lands to congressionally designated wilderness where no timber harvest is permitted. This designation resulted in a decrease of 1,800 acres of Matrix land available for timber harvest Forest-wide.

Alternative A

The No Action Alternative would increase the amount of Matrix cumulatively inaccessible to vehicles for stand management in the watershed. With Alternative A, approximately 918 acres of second growth (outside of Riparian Reserves) would not be accessible by vehicle, as well as approximately 4,100 acres of old-growth forest. Most of the White Chuck watershed would continue to be inaccessible to vehicles for stand management.

Alternatives B, C, and D

Alternative D would not contribute to cumulative reductions in the amount of land available for timber management on the MBS National Forest as access to Matrix lands in the White Chuck drainage would be restored. Alternatives B and C would contribute to only a minor reduction in the amount of Matrix land available for timber harvest on the MBS National Forest because there is relatively little second growth in the upper White Chuck drainage accessible by Road 23.

Consistency with the Forest Plan

Alternative A would be *in*consistent with the Forest Plan, as amended, because access to Matrix land for timber management would be precluded. Alternatives B and C would generally be consistent with the Forest Plan, as amended, because access to a portion of

manageable lands in the watershed would be restored. Alternative D would be consistent with the Forest Plan, as amended, because full access to Matrix lands in the watershed would be restored.

Recreation Affected Environment

The affected area for direct and indirect effects to Recreation is the White Chuck River drainage and the west side of Glacier Peak Wilderness. Road 23 has long supported recreational access to the White Chuck drainage. Recreation activities along or accessed from Road 23 include developed camping, dispersed camping, hiking, driving for pleasure, hunting, mushroom picking, berry picking, mountain biking, snow shoeing, cross country skiing, snowmobiling, and other dispersed activities. Road 23 is a major entry point into the Glacier Peak Wilderness where recreation activities include hiking, climbing, horseback riding, fishing, hunting, and camping (Figure 15).

Trails

Two trailheads are directly accessed from Road 23: the White Chuck Bench/Crystal Creek and White Chuck trailheads. Road 23 also provides access to a third trailhead located on Road 27: the Meadow Mountain Trailhead. These trailheads and the main trails they provide access to are identified in Table 7 and described in the following paragraphs. Summary data are provided for the affected trails in Table 8.

These trailheads could also be accessed via Road 26 (Suiattle Road) over the Boundary Bridge on Road 25 and then on Road 27. To reach the White Chuck Trailhead via this route is about 13 miles further than using the lower section of Road 23 and involves passing through the 3,200-foot Rat Trap Pass. Prior to the 2003 flood event, because of road conditions and steepness this route was much slower (by at least an hour) than driving the Mountain Loop Highway and White Chuck Road to reach the White Chuck Trailhead. Road 26 was washed out at MP 6.0 during the winter of 2007, but a detour has been constructed around the washout. The 2003 flood event washed out the approach to Boundary Bridge, leaving the bridge intact, but not drivable and cutting off access to Road 25 and Road 27.

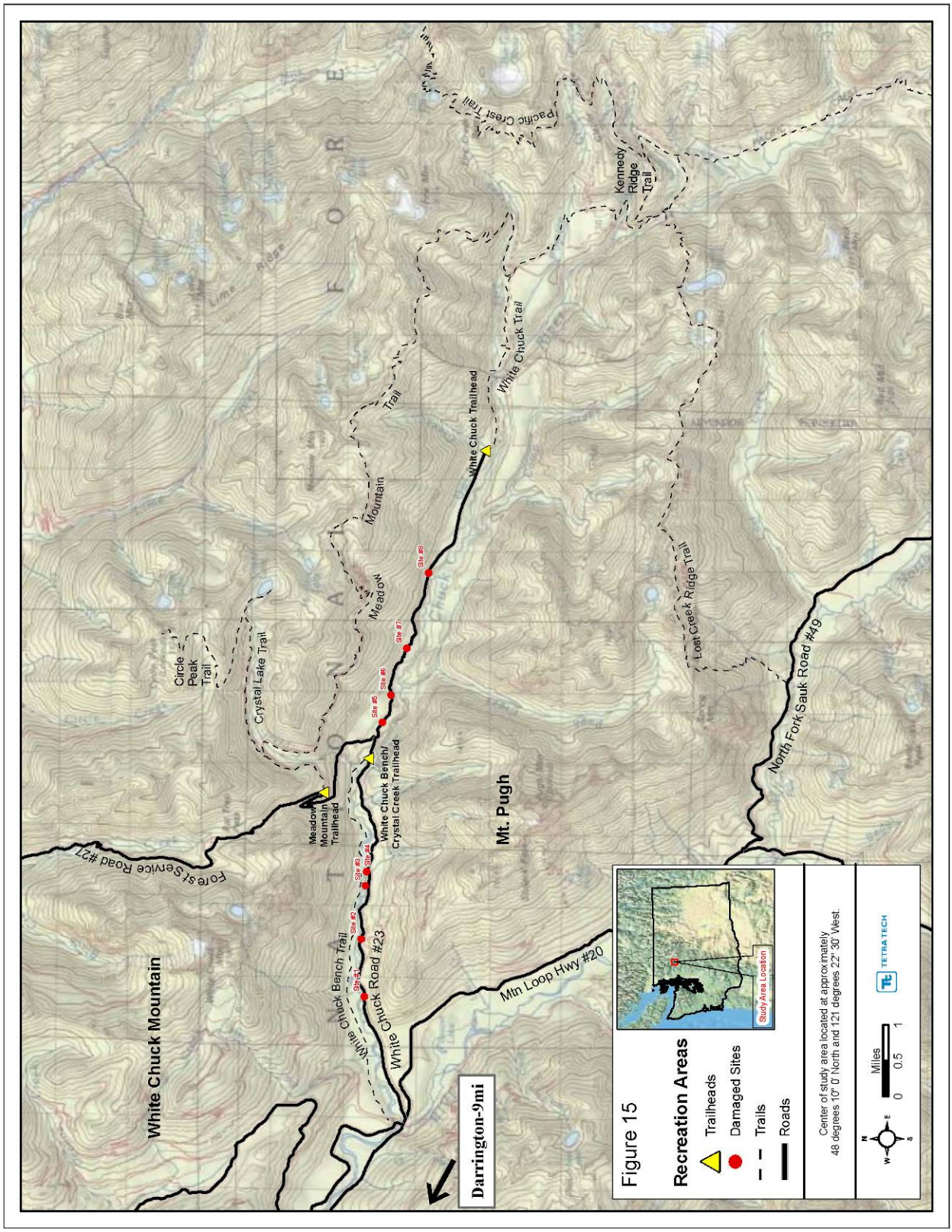

White Chuck Mountain
Darrington-9mi
White Chuck Bench Trail
White Chuck Road #23
Min Loop Hwy #20
Forest Service Road #27
Meadow Mountain Trailhead
White Chuck Bench/ Crystal Creek Trailhead
Site #1
Site #2
Site #3
Site #4
Site #5
Site #6
Site #7
Site #8
Site #9
Circle Peak Trail
Crystal Lake Trail
Meadow Mountain Trail
White Chuck Trailhead
White Chuck Trail
Mt. Pugh
Pacific Crest Trail
Kennedy Ridge Trail
Lost Creek Ridge Trail
North Fork Sauk Road #49
Study Area Location
Figure 15
Recreation Areas
Trailheads
Damaged Sites
Trails
Roads
Center of study area located at approximately
48 degrees 10' 0" North and 121 degrees 22' 30" West.
Miles
0 0.5 1
TETRA TECH

Table 7. Trailheads and Trails Accessed from Road 23

Trailhead	Trails	Connected Trails
White Chuck Bench/Crystal Creek	White Chuck Bench Trail #731	None
Meadow Mountain	Meadow Mountain Trail #657	Crystal Lake Trail #638
		Circle Peak Trail #638.1
		White Chuck Trail #643
White Chuck	White Chuck Trail #643	Meadow Mountain Trail #657
		Kennedy Ridge Trail #639
		Lost Creek Ridge Trail #646
		Pacific Crest National Scenic Trail #2000

Notes:
1/ White Chuck Bench/Crystal Creek Trailhead is located on Road 23 at MP 5.5.
2/ Meadow Mountain Trailhead is located on Road 27, two miles from the Road 23/27 junction.
3/ White Chuck Trailhead is located at the end of Road 23.

Table 8. Affected Trails

Trail Number[1/]	Trail Name	Primary Uses	Difficulty Level	Visitor Use Level[2/]	Length (miles)
638	Crystal Lake	Hiking, stock	More Difficult	Low	2.5
639	Kennedy Ridge	Hiking	More Difficult	Medium	2.0
643	White Chuck	Hiking, stock	Easy	Heavy	6.9
646	Lost Creek Ridge	Hiking	More Difficult	Low	11.0
657	Meadow Mountain	Hiking, stock	More Difficult	Medium	17.5
731	White Chuck Bench	Hiking	Easy	Low	6.4
2000[3/]	Pacific Crest Trail	Hiking, stock	Easy to Moderate	Heavy	47.0

Notes:
1/ Data are not available in this format for Circle Peak Trail #638.1.
2/ Visitor use levels are for use prior to the October 2003 flood event.
3/ This information applies to the section of the Pacific Crest Trail that extends from White Pass to Suiattle Pass.

White Chuck Bench/Crystal Creek Trailhead

The White Chuck Bench/Crystal Creek Trailhead is located on Road 23 at MP 5.5. This trailhead provides access to the east end of White Chuck Bench Trail #731, a low elevation trail which follows the north side of White Chuck River approximately 6.5 miles west back toward the Mountain Loop Highway. A second trailhead located just off the Mountain Loop Highway (on Road 22-13) provides access to the west end of White Chuck Bench Trail #731. Access to the west end of the trail from Gold Hill was restored in 2006; easier access was restored in 2008 with the completion of the White Chuck Bridge on Road 22.

No use figures have been collected for this trail, but use was believed to have been less than 200 people per year prior to the 2003 flood. Now that access is restored to one end of the trail, some use is expected to have returned. However, extensive flood damage to the White Chuck Bench Trail will continue to limit its use until it repairs are made.

Meadow Mountain Trailhead

The Meadow Mountain Trailhead is located on Road 27, two miles north of its intersection with Road 23. This trailhead provides access to Meadow Mountain Trail #657. This trail

extends approximately 17.5 miles to the White Chuck Trailhead, joining White Chuck Trail #643 about 1.5 miles from the trailhead. Meadow Mountain Trail forks about 1.5 miles from the Meadow Mountain Trailhead. The left fork, Crystal Lake Trail #638 continues another 2.5 miles to Crystal Lake. This trail also forks with Circle Peak Trail #638.1; it branches off to the left and provides access to Circle Peak (see Figure 15).

Average annual use of this trailhead prior to the 2003 flood was about 300 people (estimated from trailhead registers from 2000 to 2002). According to the trailhead registration information, about 40 percent of registered visitors were going to Crystal Lake. There is no known storm damage to the Meadow Mountain, Crystal Lake, or Circle Peak trails.

White Chuck Trailhead

The White Chuck Trailhead is located at the end of Road 23, approximately 10 miles east of the road's intersection with the Mountain Loop Highway. This trailhead provides access to White Chuck Trail #643, a portion of which is considered low elevation and extends approximately 7.5 miles east where it joins the Pacific Crest National Scenic Trail #2000 (PCT). Prior to the October 2003 flood event, the White Chuck Trail was one of the most popular and heavily used trails within the Glacier Peak Wilderness. Trail users included Glacier Peak climbers, day hikers and campers at Kennedy Hot Springs, and hikers and stock accessing the PCT. Most trail use occurred from mid-May to October, with visitation increasing as the snow melted in the White Chuck valley. In the fall, the trail was popular for those participating in the High Buck Hunt, which typically involves hunters traveling on foot or with stock animals.

The October 2003 flood washed out large sections of the White Chuck Trail between MP 2.0 and MP 4.5. In 2006/2007, there was a major washout at MP 0.7. A potential new location for the trail has been identified, but there are not funds for a new route to be further analyzed.

The White Chuck Trail connects with four other trails, including Meadow Mountain Trail #657 and the PCT, as noted above. The White Chuck Trail also connects with the Kennedy Ridge Trail #639 and Lost Creek Ridge Trail #646, approximately 5.0 miles and 5.3 miles from the trailhead, respectively (Table 6). The Kennedy Ridge Trail ascends a steep two miles to join the PCT. Lost Creek Ridge Trail leads west a short distance to the former site of Kennedy Hot Springs camp and cabin. Kennedy Hot Springs camp and cabin were destroyed in the October 2003 flood, which also buried the hot springs and surrounding area under a thick layer of mud and debris. From this point, the Lost Creek Ridge Trail climbs 2.0 miles west to Lake Byrne and traverses the ridge west and south another 9.0 miles on Lost Creek Ridge to Road 49 (North Fork Sauk Road) (Figure 15).

White Chuck Trail was the shortest westside access to and from the PCT between Stevens Pass to the south and Rainy Pass to the north. Sections of the PCT in the White Chuck and Suiattle areas were also damaged during the flood. A temporary 50-mile detour around this section of the PCT has been designated on the Okanogan-Wenatchee National Forest until repairs are completed. According to the PCT Association's web site, approximately 300 backpackers known as "through-hikers" attempt to hike the 2,600-mile PCT from April to September, and approximately 60 percent are successful (Pacific Crest Trail Association 2008). However, most backpackers, stock users, and permitted Outfitter Guides who use the PCT are "section hikers" spending shorter periods hiking specific sections or loops.

Prior to the 2003 flood event, the most popular and quickest climbing route to the summit of Glacier Peak was via Forest Service Road 23 and the White Chuck Trail. Climbers using this route could drive to the trailhead and backpack in one day to Boulder Basin, a popular base camp on the west flank of Glacier Peak, summit the following morning, and return to their vehicles that day. Due to the 2003 flood damage to the Suiattle and White Chuck roads and trails, climbing use on this route has dropped to nearly zero. Now, the most popular climbing access to Glacier Peak is via the North Fork Sauk Trail and the Disappointment Peak route on the south flank of the volcano. This route was less popular than Boulder Basin prior to the 2003 flood event due to the longer approach hike and less desirable ski or snowboard descent. In addition, Frostbite Ridge, which was accessed from the White Chuck or Suiattle trails, is a more technically challenging route that was used by experienced climbers and permitted outfitter guide companies.

Recreational use of the White Chuck Trailhead has declined sharply since the damage caused by the October 2003 flood event. The number of people who registered at the White Chuck Trailhead from 1997 through 2006 is shown graphically in Figure 16. Prior to the October 2003 flood event, the number of people registering ranged from 1,247 in 1998 to 2,334 in 1997 (Figure 16). The numbers of registered users in 2004, 2005, and 2006 were 29, 31, and 13, respectively. No data were collected for 2007 or 2008.

Outfitter/Guide Use

Five outfitter guide companies are permitted to use Glacier Peak Wilderness and the PCT, providing backpacking and climbing trips for youth and adults. These outfitter/guides have been operating on the east side of Glacier Peak Wilderness since the October 2003 flood.

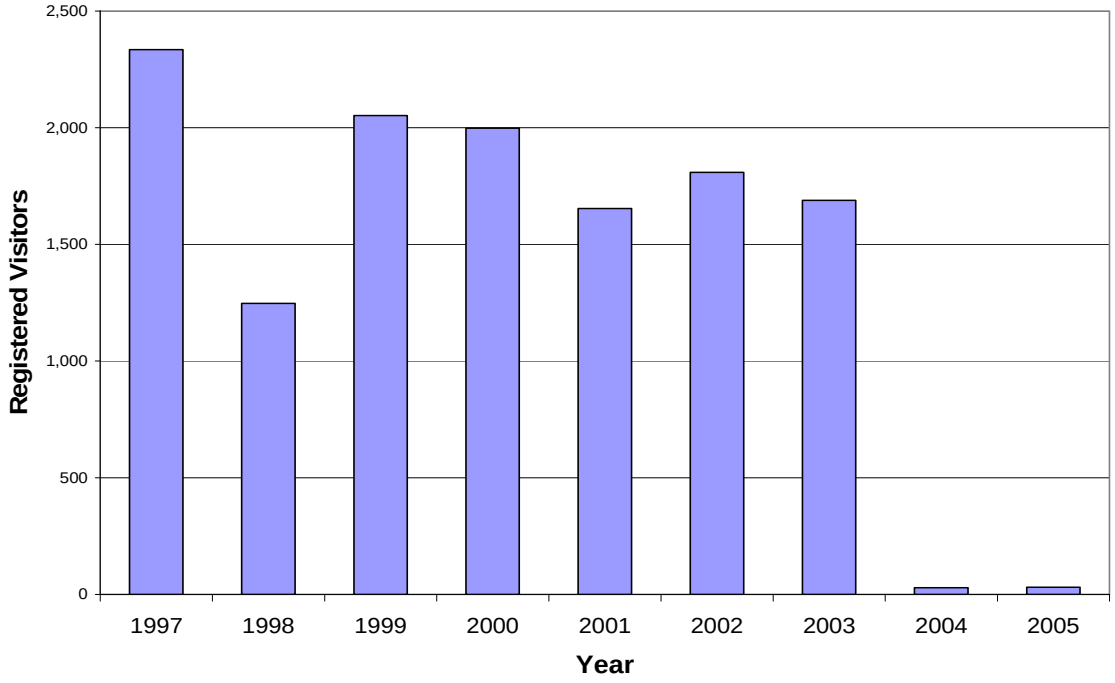


Figure 16. Number of People Registering at the White Chuck Trailhead, 1997 – 2006

Note: Factors affecting the number of people registering from 1997 through 2003 likely included accessibility due to snow or windfall across the road, and summer weather patterns. In addition, registration data collections varied depending upon access to the registration box and staffing availability to set up and close the data collection boxes at the beginning and end of each season.

Wilderness

Following the flood, visitation to the part of the Glacier Peak Wilderness accessed via Road 23 dropped off to a very low level. Damage to the PCT necessitated the establishment of a temporary detour of the PCT onto trails on the east side of the wilderness, which further reduced visits to this area. Repairs have partially been completed on the PCT and use has been increasing in this area. Damage to the bridges over the White Chuck River near the former Kennedy Hot Springs has limited the number of parties attempting to reach this area from the Lost Creek Ridge Trail.

Road access to the Meadow Mountain and Crystal Lake Trails was similarly cut off. Although these trails were not impacted by flood damage, the part of the wilderness accessed from these trails has also experienced a very low use level since the roads accessing the trails were damaged.

Opportunities for solitude have been exceptional in the part of the wilderness accessed from Road 23 and associated trails since the flood occurred. Few persons have hiked the longer routes to reach the former trailheads and hike/backpack on the unmaintained trails, which have not been logged out. These trails have also suffered flood damage such as loss of bridges over stream crossings or lost trail sections. Forest Service crews working in the White Chuck drainage gathering data for trail repairs, have reported seeing minimal evidence of hikers in the area.

The flood event destroyed all 20 campsites in the Kennedy Hot Springs area, and the three sites at the old-growth forest camp area at Pumice Creek, as well as the three sites at "The Beach" nearby.

Dispersed Recreation

Pleasure Driving on Road 23: Prior to the October 2003 flood, Road 23 was used for motorized access and driving for pleasure, providing views of mountain peaks, lush forested landscape, and glimpses of wildlife. Road 23 and its connecting roads also provided important motorized access to traditional hunting and fishing areas during those seasons. In the spring, summer, and fall, visitors would go to the White Chuck area to pick wild mushrooms and berries, while others gathered forest products such as firewood, transplants, and ferns. Two traffic counters installed on Road 23 from 1989 to 1996 identified annual traffic counts that ranged from 8,454 to 11,168 vehicles per year. No traffic counts are available after 1996. In 1998 and 1999, the upper part of Road 23 (MP 6.7) was damaged, but access to the White Chuck Trailhead at the end of the road was still possible.

Pleasure Driving on Road 27: Road 27 is a key link in a 46 mile-long driving loop from Darrington up Suiattle Road, over Rat Trap Pass, along Road 23 to the Mountain Loop Highway, and back to Darrington. It is one of only three loop drive opportunities available on the MBS National Forest (Mountain Loop and Beckler/North Fork Skykomish are the others). Road 27 also provided an alternate access route to the Meadow Mountain and White Chuck trailheads prior to the 2003 flood. The approach to Boundary Bridge across the Suiattle River, which provides access to Road 27, was washed out during the flood and is presently impassable. Repair of the approach to this bridge is currently in the planning phase. Once repaired, this road would re-establish the alternate route to the White Chuck area. However, the snow free season is shorter on the Suiattle Road and Rat Trap Pass route,

and it is a much longer and rougher drive to reach the White Chuck Trailhead. Vehicles towing stock trailers usually avoid this route due to narrow sections, with periodic rockslides and steep drop-offs.

Dispersed Camping: Several dispersed camp sites exist along Road 23 and the White Chuck River. The sites at the White Chuck and White Chuck Bench/Crystal Creek trailheads each feature dispersed campsites. There are several dispersed campsites along Road 27 near Rat Trap Pass and the Meadow Mountain Trailhead. There are toilets at both the Crystal Creek and White Chuck trailheads. Since the 2003 flood occurred, there has been very little use of these sites and no maintenance of the toilets. Off-highway vehicles (OHV) have managed to find access into this area by driving around the flood damage.

Other Dispersed Use: Other dispersed use includes backcountry mountain bikers who enjoy cycling along the forest roads that allow for miles of rides ranging from easy to challenging grades. During the winter months, the snow-covered road and trails are used for snowmobiling, snow shoeing, and cross-country skiing.

Recreation Environmental Consequences

Trails

Alternative A

Alternative A, if implemented, would mean that no repairs would be made to Road 23. The road would be blocked at MP 1.6 and there would be no vehicular access to the White Chuck Bench/Crystal Creek and White Chuck trailheads and associated trails (Tables 6 and 7). Some hikers may continue to access these trails by walking or biking along Road 23. However, the initial damage sites (Sites #1 to #3) are difficult to pass and, while the remaining road prism would continue to exist as it does today, the road would not be maintained as a trail and would eventually grow in with vegetation. Other hikers would continue to go elsewhere to seek similar experiences, low elevation trails, or to access the PCT. Trail use would be expected to remain at current low levels. Seasonal access would be provided to the Meadow Mountain Trailhead from Roads 25, 26, and 27 following flood damage repairs to the approach to the Boundary Bridge (Road 25) and repairs along Road 27 over Rat Trap Pass. Access via this route would typically occur later in the year than it would if Road 23 were accessible.

Any future reconstruction of the White Chuck Trail #643 would be difficult due to the distance to move equipment and personnel to the sties. Logistics becomes more difficult when the supply line is stretched, which would increase costs.

Most climbers would access Glacier Peak via the Disappointment Peak route and the North Fork Sauk Trail. Access to Frostbite Ridge would most likely be cross-country from Fire Mountain to the PCT and Upper Pumice Creek trails. Stock users would be permanently discouraged from accessing the White Chuck and Meadow Mountain trails from the White Chuck drainage because Road 23 would remain impassable for stock trailers. Seasonal access for high clearance vehicles may be re-established on Roads 25 and 27 over Rat Trap Pass, but the long climb and tight switchbacks on Road 27 would likely preclude most stock users from using this alternative means of access to the White Chuck drainage.

Alternative B

Alternative B would restore vehicular access along Road 23 to the junction with Road 27. This would provide direct vehicular access to the White Chuck Bench/Crystal Creek and Meadow Mountain trailheads and associated trails (see Tables 6 and 7). Use of these trails by hikers could return to or even exceed pre-flood levels. Extensive damage to the White Chuck Bench Trail, a low elevation trail, would continue to limit hiker use until repairs are made. Use at the Meadow Mountain Trailhead would likely increase above pre-flood levels due to displacement of recreationists from the White Chuck Trail and other trails formerly accessed via the White Chuck Trailhead. This potential increase in use could result in increased demand for parking at the Meadow Mountain Trailhead.

Any future reconstruction of the White Chuck Trail #643 would be costly under this alternative with the last 4.5 miles of Road 23 decommissioned. Vehicles and construction equipment would be unable to access the White Chuck Trailhead, so access for trail repairs would be costly. The number of hikers using this route (Road 23 and the White Chuck Trail) to access the PCT would not be expected to increase over current levels. Similarly, the number of climbers using this route to access the summit of Glacier Peak would also not be expected to increase.

Some hikers may continue to access the White Chuck Trailhead by walking or biking along the decommissioned upper section of Road 23. A new turnaround would be constructed at the junction of Road 23 and Road 27. Due to lack of parking space at this junction, the dispersed camping area east of the upper White Chuck Bridge has been identified as a potential parking area. This would expand the current White Chuck Bench Trailhead parking east of the outhouse located north of Road 23. There is approximately 2 acres of area under consideration for additional parking. Hikers could also follow the loop formed by the intersection of the Meadow Mountain Trail and the White Chuck Trail, hike the 4.5 miles along the upper section of Road 23 back to the junction with Road 27, and then hike Road 27 for 2 miles to the Meadow Mountain Trailhead.

Alternative B would allow stock users to access the White Chuck drainage via Road 23. The rerouted road would include approximately 600 feet with a 10 percent grade that would be more difficult to negotiate with a stock vehicle than the original road was prior to the October 2003 flood, but would provide a more accessible route than Road 27 (after the Boundary Bridge approach on Road 25 is repaired). Stock users would regain access to the Meadow Mountain Trailhead and trail system, but there would not be stock access on the White Chuck Trail to the PCT.

A walkable tread would be left under this alternative, providing an opportunity for low elevation hiking as long as it remains passable.

Alternative C

Alternative C is similar to Alternative B and consists of restoring vehicle access along Road 23 to the junction with Road 27. However, under this alternative, the upper section of Road 23 (from MP 5.8 to the road terminus) would be placed in storage, rather than decommissioned, and the White Chuck Trailhead structures and signs would be retained.

The impacts to hikers, climbers, and stock users are expected to be the same under this alternative as they would be under Alternative B, including access to low elevation trails. These impacts would change if the Forest Service exercised the option to re-construct the upper section of the road at some point in the future. If that were to occur, the impacts would be similar to those described below for Alternative D.

Alternative D

Alternative D would restore vehicle access along the entire length of Road 23, all the way to the White Chuck Trailhead. This would provide direct vehicular access to the White Chuck Bench/Crystal Creek, Meadow Mountain, and White Chuck trailheads and associated trails (Tables 6 and 7). Use of the trails, including low elevation trails, accessed from these trailheads by hikers could return to pre-flood levels after trail repairs.

Use levels on the trails that are accessed via the White Chuck Trail (Table 7) would, however, depend on repairs to the White Chuck Trail being funded and made. Repairs to the White Chuck Trail would be less difficult and costly under this alternative than under the other alternatives because vehicles and construction equipment would be able to access the White Chuck Trailhead. Use levels in the Kennedy Hot Springs area are unlikely to return to pre-flood levels because the flood buried the springs and cabin under a thick layer of mud and debris. The numbers of hikers using this route to access the PCT could, however, be expected to return to pre-flood levels, if funding to repair the White Chuck Trail is secured, and repairs are made.

The popular Boulder Basin climbing route would once again be accessible (assuming that the White Chuck Trail is repaired), and use would likely increase over current levels, and reduce diverted use on the North Fork Sauk Trail and Disappointment Peak route. Experienced climbers would regain quicker access to the more technically challenging Frostbite Ridge route.

Alternative D would allow stock users to access the White Chuck drainage via Road 23. The rerouted road would include approximately 600 feet with a 25 percent grade that would be more difficult to negotiate with a stock vehicle than the original road was prior to the October 2003 flood, but would provide a more accessible route than Road 27 (after the approach to Boundary Bridge on Road 25 is repaired). Stock users would have access to the White Chuck Bench/Crystal Creek, and Meadow Mountain trailheads. There would be no stock access on the White Chuck Trail until funding to repair the trail is secured and repairs are made.

Outfitter/Guide Use

Alternative A

Five outfitter/guide companies are permitted to use Glacier Peak Wilderness and the PCT, providing backpacking and climbing trips for youth and adults. These outfitter/guides have been operating on the east side of Glacier Peak Wilderness since the October 2003 flood. If Road 23 were not repaired, these outfitter/guides would likely continue to enter the wilderness from other trailheads and extend their itineraries to account for the longer distance, or request use elsewhere.

Alternative B

Alternative B would restore vehicular access along Road 23 to the junction with Road 27. Repairs to White Chuck Trail #643 would be difficult and costly under this alternative because vehicles and construction equipment would be unable to access the White Chuck Trailhead. Outfitter/guides would likely continue to enter the wilderness from other trailheads under this alternative and extend their itineraries to account for the longer distance on other usable trails or request use elsewhere.

Alternative C

Impacts to outfitter/guides under this alternative would be similar to those discussed above for Alternative B. These impacts would change if the Forest Service exercised the option to re-construct the upper section of the road at some point in the future. If that were to occur, the impacts would be similar to those described below for Alternative D.

Alternative D

Alternative D would restore vehicular access along the entire length of Road 23 all the way to the White Chuck Trailhead. Repairs to the White Chuck Trail would be less difficult and costly under this alternative than under the other alternatives because vehicles and construction equipment would be able to access the trailhead. If repaired, the White Chuck Trail would restore access to the wilderness for outfitter/guides and provide access to the Boulder Basin/Sitkum climbing route, as well as the more technically challenging Frostbite Ridge route.

Wilderness

Alternative A

If Road 23 were not repaired, visitation to the part of the Glacier Peak Wilderness typically accessed from this road and associated trailheads would remain low. Opportunities for solitude would remain exceptional in this part of the wilderness and existing campsites would have a substantial chance to rehabilitate. This may result in some shift in use to campsites in areas closer to the current road access, and a possible shift in some day use areas to overnight use. Although access would continue to not be available via Road 23, other trail and bridge repair efforts (that are not part of this project), as well as repairs to Road 26 (Suiattle Road), could increase wilderness use.

Alternative B

Alternative B would restore vehicular access along Road 23 to the junction with Road 27. This would provide direct vehicular access to the Meadow Mountain Trailhead. Use along the Meadow Mountain Trail #657, which provides access to the Glacier Peak Wilderness, could potentially return to pre-flood use levels under this alternative. Use of the Meadow Mountain trail may increase under this alternative as wilderness users displaced from the low elevation White Chuck Bench Trail switch to this higher elevation trail as it would be the only remaining maintained trail providing access into the White Chuck drainage from the west.

This alternative would not restore vehicular access to the White Chuck Trailhead and repairs to White Chuck Trail #643 would be costly under this alternative because vehicles and construction equipment would be unable to access the White Chuck Trailhead. The number of hikers using this route (Road 23 and the White Chuck Trail) to access wilderness would not be expected to increase substantially over current levels. Similarly, the number of climbers using this route to access the summit of Glacier Peak would also not be expected to increase.

Alternative C

Impacts to wilderness under this alternative would be similar to those discussed above for Alternative B. These impacts would change if the Forest Service exercised the option to re-construct the upper section of the road at some point in the future. If that were to occur, the impacts would be similar to those described below for Alternative D.

Alternative D

Alternative D would restore vehicle access along the entire length of Road 23 all the way to the White Chuck Trailhead. Restoring motorized access to the White Chuck and the Meadow Mountain trailheads and the trails they access could return use levels to pre-flood numbers in the part of the Glacier Peak Wilderness accessed from these trails. Use levels on the trails that are accessed via the White Chuck Trail (Table 6) would, however, depend on repairs to the White Chuck Trail being funded and made. Repairs to the White Chuck Trail would be less difficult and costly under this alternative than under the other alternatives because vehicles and construction equipment would be able to access the White Chuck Trailhead.

Once all trail repairs are made (including those noted above that are not part of this project), the expectation is that trail use would increase back to pre-flood levels, or possibly be even greater in the short-term due to curiosity and stored up demand among visitors to see this part of the wilderness. The section of the PCT that passes through the White Chuck drainage is described by some as one of the more spectacular sections of the entire trail, which extends from Mexico to Canada.

Opportunities for solitude along the PCT and the White Chuck Trail would lessen as people began using these trails again and use at wilderness campsites in the area would increase. This increase in use may result in slight decreases in use at other wilderness areas as users temporarily displaced to those locations return to the White Chuck area and Glacier Peak Wilderness.

Dispersed Recreation

Alternative A

Alternative A, if implemented, would mean that no repairs would be made to Road 23 and vehicle access would not be restored to approximately 15 miles of road in the White Chuck drainage, including Roads 2311 and 2314. Access from the Suiattle River drainage over Rat Trap Pass (Road 27) is assumed with repairs of the Boundary Bridge across the Suiattle River (Road 25). Recreation opportunities, such as driving for pleasure, backcountry

mountain biking, snowmobiling, hiking, and cross-country skiing, would continue to be unavailable along Road 23. Other dispersed opportunities that historically involved motorized access to the area, such as berry picking, mushrooming, horseback riding, and camping, as well as access to traditional hunting and fishing areas, would continue to be limited under this alternative. Forest Service employees would not have motorized access to the area for maintenance and patrolling of facilities.

Road 23 is a key link in a 46-mile-long driving loop beginning in Darrington and extending along Suiattle Road over Rat Trap Pass, along Road 23 to the Mountain Loop Highway, and back to Darrington. This loop drive would not be possible under this alternative.

Alternative B

Alternative B would restore vehicular access along Road 23 to the junction with Road 27, and approximately 5 miles of road in the White Chuck drainage, including Roads 2311 and 2314. Recreation opportunities, such as driving for pleasure, backcountry mountain biking, snowmobiling, hiking, and cross-country skiing, would be available along this section of Road 23, as well as Roads 2311 and 2314. Other dispersed opportunities that historically involved motorized access to the area, such as berry picking, mushrooming, horseback riding, and camping, as well as access to traditional hunting and fishing areas, would be available, although vehicles would not be able to access the upper section of Road 23 (from MP 5.8 to the road terminus). A new turnaround would be constructed at the junction of Road 23 and Road 27. Due to lack of parking space at this junction, the dispersed camping area east of the upper White Chuck Bridge has been identified as a potential parking area. This would expand the current White Chuck Bench Trailhead parking east of the outhouse located north of Road 23. There is approximately 2 acres of area under consideration for additional parking

Septic pump trucks would be able to access and pump the existing toilets at the White Chuck Bench/Crystal Creek Trailhead. Forest Service personnel would be able to regularly patrol the area for vandalism and repairs.

The Darrington loop drive that includes portions of Road 25, Road 27, and Road 23 would be possible under this alternative (after the approach to Boundary Bridge is repaired).

Alternative C

Impacts to dispersed recreation under this alternative would be similar to those discussed above for Alternative B. These impacts would change if the Forest Service exercised the option to re-construct the upper section of the road at some point in the future. If that were to occur, the impacts would be similar to those described below for Alternative D.

Alternative D

Alternative D, if implemented, would restore vehicular access along the entire length of Road 23 all the way to the White Chuck Trailhead. Recreation opportunities, such as driving for pleasure, backcountry mountain biking, snowmobiling, hiking, and cross-country skiing, would be possible along the entire length of Road 23, as would access to traditional hunting and fishing areas. Other dispersed opportunities that historically involved motorized access to the area, such as berry picking, mushrooming, horseback riding, and camping, would also

be available. Septic pump trucks would be able to access and pump the existing toilets at the White Chuck Bench/Crystal Creek and White Chuck trailheads. Forest Service personnel would be able to regularly patrol the area for vandalism and repairs.

The Darrington loop drive that includes Road 25, Road 27, and Road 23 would be possible under this alternative (after the approach to Boundary Bridge is repaired).

Recreation Cumulative Effects

The analysis area for cumulative effects to recreation are the Suak, Suiattle, and White Chuck river drainages. The floods of 2003 and 2006/2007 damaged a number of roads and trails in the Sauk, Suiattle, and White Chuck river drainages. Damage occurred to six main roads, including Road 23, that provide recreational access to developed and dispersed recreation opportunities (Figure 17 Flood Damaged Road Repair Sites). The other five roads and their status as of January 2009 are identified in Table 8.

The proposed repair of White Chuck Road 23 would partially restore (under Alternatives B and C) and fully restore (Alternative D) vehicle access for recreation and administrative use to the White Chuck drainage and would cumulatively contribute toward management of the National Forest Road and Trail System consistent with the Forest Plan, as amended.

Trails

Approximately 188 miles of the 367 miles of trails on the Darrington Ranger District, including those accessed from Road 26, were estimated to be inaccessible after the October 2003 flood due to road and trail damage. This loss of access dramatically reduced recreation opportunities on the Darrington Ranger District. Repairs to three of the other five affected roads have already taken place, as indicated in Table 9. Repairs to the other two roads are currently proposed.

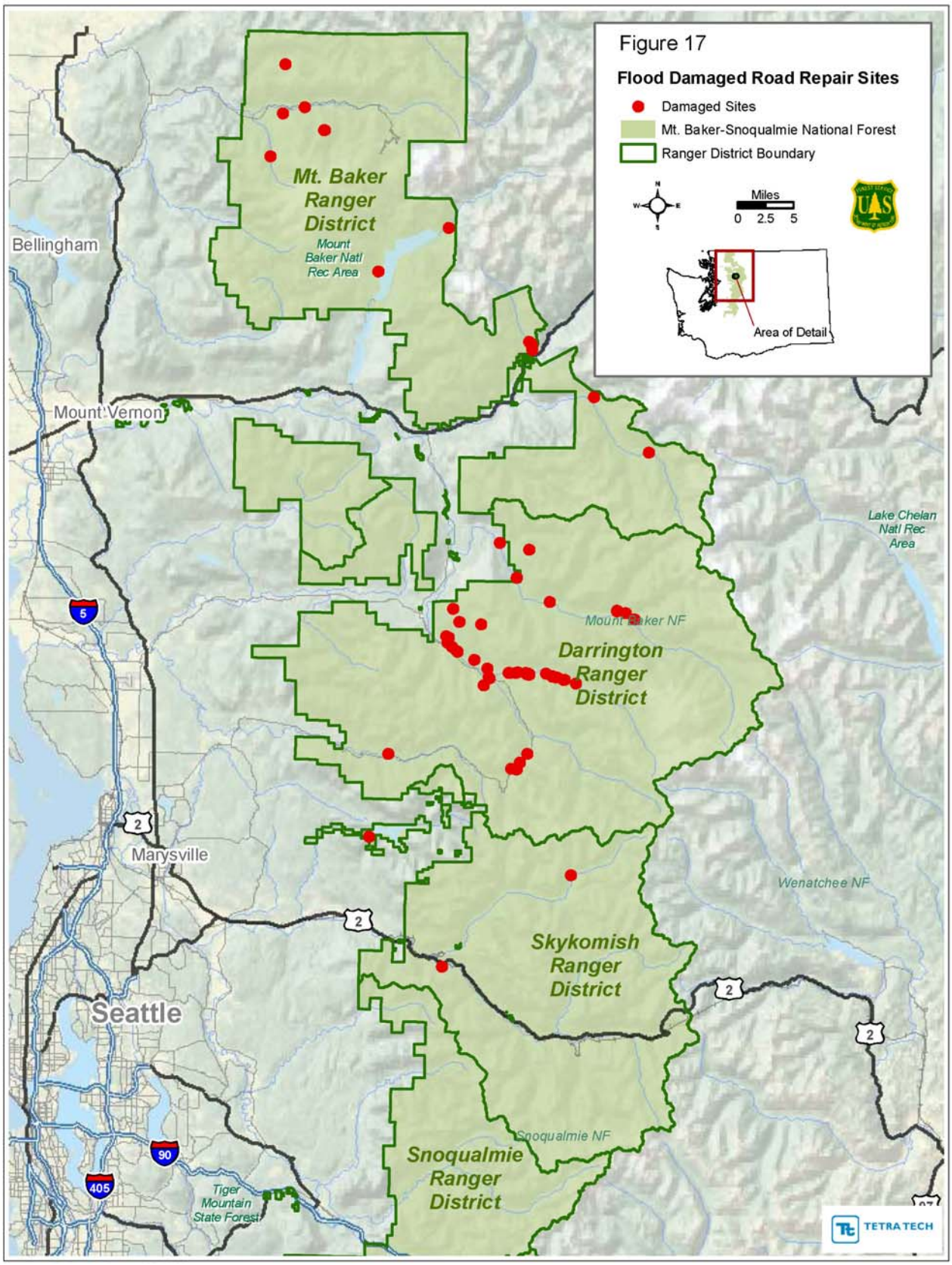


Figure 17
Flood Damaged Road Repair Sites
Damaged Sites
Mt. Baker-Snoqualmie National Forest
Ranger District Boundary
Miles
0 2.5 5
Area of Detail
Mt. Baker Ranger District
Mount Baker Natl Rec Area
Bellingham
Mount Vernon
Lake Chelan Natl Rec Area
Mount Baker NF
Darrington Ranger District
Marysville
Wenatchee NF
Skykomish Ranger District
Seattle
Snoqualmie NF
Snoqualmie Ranger District
Tiger Mountain State Forest
TETRA TECH

Table 9. Roads on the Darrington Ranger District Damaged in the 2003 and 2006 Flood Events

Road Number	Road Name	Affected Recreation Facilities	Current Status[1/]	Description[1/]
20	Mountain Loop Highway	4 trails, 1 developed campground	Open	Open from Verlot to Darrington
22	Gold Mountain Road	1 trail, 1 boat launch	Inaccessible from north end	Construction of a new White Chuck Bridge and removal of the old, damaged bridge completed Nov. 2008. From north end, inaccessible at MP 5.7 and 9.4 due to flood damage
25	South Suiattle Road	Access to Road 27	Inaccessible	Inaccessible at junction with Road 26 due to Boundary Bridge road approach flood damage.
26	Suiattle River Road	28 trails, 2 developed campgrounds, 1cabin rental	Closed	Washed out at MP 12.6, MP 13.0, MP 13.5, and MP 20.8.
49	Sloan Creek/North Fork Sauk Road	7 trails	Open	Repairs completed. in October 2008.

1/Current status as of January 2009
Source: USDA Forest Service 2009

Repairs to Road 23 under Alternatives B, C, and D would, in conjunction with the road repairs that have already been undertaken and others that are expected to take place over the next few years, substantially improve trail access on the Darrington Ranger District, restoring available recreation opportunities to close to pre-flood levels in most affected areas. Alternatives B and C would not, however, provide vehicular access to the White Chuck Trailhead. Repairs to White Chuck Trail #643 would be difficult and costly under these alternatives because vehicles and construction equipment would be unable to access the White Chuck Trailhead. Under Alternatives A through C, the number of hikers using this route (Road 23 and the White Chuck Trail) to access the PCT would not be expected to increase over current levels. Similarly, the number of climbers using this route to access the summit of Glacier Peak would also not be expected to increase.

Outfitter/Guide Use

Five outfitter guide companies are permitted to use the Glacier Peak Wilderness and the PCT, providing backpacking and climbing trips for youth and adults. These outfitter/guides have been operating on the east side of Glacier Peak Wilderness since the October 2003 flood. The return of outfitter/guide use to the west side of the wilderness would be more likely under Alternative D because vehicular access would be restored to the White Chuck Trailhead under this alternative.

Wilderness

The numbers of people who registered at three popular wilderness trailheads on the Darrington Ranger District from 2000 to 2007 are shown graphically in Figure 18. These

data provide a partial illustration of the effects that the 2003 flood had on wilderness trail use on the Darrington Ranger District. The cumulative effect of restoring vehicle access to trailheads and repairing the trails would be to restore traditional wilderness opportunities in this portion of the Glacier Peak Wilderness to levels similar to those prior to the flood. This would especially be the case under Alternative D, which would restore vehicular access to the White Chuck Trailhead. The number of hikers using Road 23 and the White Chuck Trail to access wilderness would not be expected to increase over current levels under Alternatives A through C because these alternatives would not restore vehicular access to the White Chuck Trailhead.

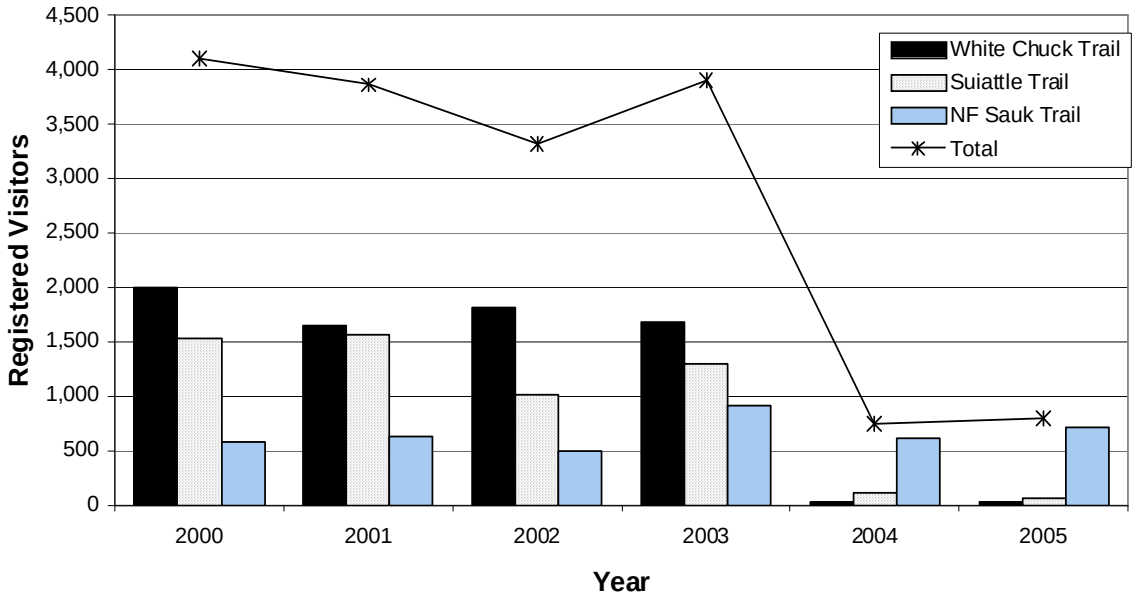


Figure 18. Number of People Registering at the White Chuck, Suiattle, and North Fork Sauk Trailheads, 2000 to 2007

Dispersed Recreation

The cumulative effect of restoring vehicle access to the roads damaged by the 2003 and 2006/2007 floods (Table 9) would be to restore opportunities that historically involved motorized access to the area, such as berry picking, mushrooming, fishing, horseback riding, and camping, as well as access to traditional hunting and fishing areas. Septic pump trucks would be able to access and pump the existing toilets at trailheads, and Forest Service personnel would be able to regularly patrol the area for vandalism and repairs. There would, however, be some differences in the available use based on the alternative selected for this project (see the Dispersed Recreation discussion above). The Darrington loop drive that includes Road 25, Road 27, and Road 23 would be possible under Alternatives B through D (after the approach to Boundary Bridge is repaired).

Consistency with the Forest Plan

All Alternatives would be consistent with the Forest Plan, as amended.

Recommended Wild and Scenic River Affected Environment

The White Chuck River is a tributary to the Sauk River, which is part of the congressionally designated Skagit Wild and Scenic River System. The Skagit Wild and Scenic River System is one of the least developed river basins in Puget Sound. Habitat in this system is relatively intact and its scenery is largely natural. Twelve miles of the White Chuck River, from the Glacier Peak Wilderness boundary to the confluence with the Sauk River, were found to be suitable for inclusion in the National Wild and Scenic River System (Forest Service 1990). The Forest Plan, as amended, identified the Outstandingly Remarkable Values for the White Chuck River to be Scenic, Recreation, Fisheries, and Wildlife (Forest Service 1990, Appendix E, p. E-5, Table E-2).

Forest Road 22 crosses the river near its confluence with the Sauk; Forest Road 23 runs parallel to the White Chuck River for its entire length (approximately 11 miles), crossing the river at MP 6.0. The White Chuck Bench Trail #731 roughly parallels the north side of the river for approximately 6.5 miles, from Road 22-013 at the west end of the trail to MP 6.0 of Road 23 at the east end of the trail.

Scenic

The scenic values of the river are considered outstanding. Mountain peaks, avalanche chutes, glaciers, and steep rugged forested slopes are visible in the background. The foreground views include tributary streams, side channels, large conifers, stands of cottonwood, alder, and rustic campsites. Landslides and slope failures are common throughout the White Chuck River valley. Forest management activities are occasionally visible from the White Chuck River, particularly below Crystal Creek where timber management has occurred since the 1940s. In the project vicinity, the valley is very narrow and the only developed access is from White Chuck Road.

Recreation

As discussed in the preceding sections, there is camping and hiking associated with area trails and roads. Fishing is generally poor, due to turbidity from glacial runoff. The river is dangerous and unsuitable for rafting and there are no commercial outfitters permitted on this river. The lower White Chuck River, below River Mile (RM) 6.0, can be paddled by experienced kayakers. The Forest Service White Chuck Boat Launch is located at the confluence of the Sauk and White Chuck Rivers. This boat launch is used by both private boaters and commercial outfitters as the starting point for trips on the middle Sauk River.

Fisheries

There are three fish species federally-listed as threatened in the White Chuck River basin: Chinook salmon, bull trout, and steelhead. Coho salmon, a Regional Sensitive Species and candidate for federal listing, is also found in the watershed, along with sockeye salmon, chum salmon, pink salmon, and coastal cutthroat trout. These species are listed throughout the Puget Sound. Fish are discussed in more detail in the Fisheries Specialist Report prepared for this project.

Wildlife

Wildlife species of interest that have been documented or may occur in the project area include four federally-listed threatened and endangered species including the grizzly bear, northern spotted owl, marbled murrelet, and, potentially, the gray wolf. Resident gray wolves are unlikely to occur west of the Cascade Crest due to an inadequate prey base but transient or dispersing wolves could occur in the project area. Other species of interest are Region 6 Forest Service Sensitive Species. Sensitive species that have been documented or may occur in the project area include the harlequin duck, Townsend's big-eared bat, Johnson's hairstreak, California wolverine, and bald eagle. Other Sensitive Species occur on the MBS National Forest, but they do not occur in the project area due to lack of suitable habitat (common loon, peregrine falcon, Larch Mountain salamander, and Van Dyke's salamander) or are not expected to occur in the project area despite the presence of suitable habitat based on absence during repeated survey efforts (Puget Oregonian, evening fieldslug, warty jumping slug, Oregon megomphix, and shiny tightcoil).

MBS National Forest Management Indicator Species (MIS) not mentioned above as federally listed or sensitive species that have been documented in the White Chuck drainage and may occur in the project area include the pine marten and pileated woodpecker (old-growth and mature forest associates); primary cavity excavators (woodpeckers associated with snags and downed logs); and black-tailed deer and mountain goat (representative of big game winter range and unique habitats). Roosevelt elk are also an MIS on the MBS National Forest, but this species does not use the White Chuck River drainage. Some land birds, including neotropical migratory birds, use the mixed conifer/deciduous forests found in the project area. Wildlife species are discussed in more detail in the Wildlife Specialist Report prepared for this Project.

Recommended Wild and Scenic River Environmental Consequences

Rivers found eligible or suitable for the National System through federal agency planning processes are not protected by the Wild and Scenic Rivers Act from proposed projects. However, the managing agency, in this case, the Forest Service, should, within its authorities, protect the values (scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values) that make the river eligible or suitable. The effects of the alternatives on the White Chuck River's Outstandingly Remarkable Values for fisheries and wildlife are discussed in the Fisheries and Wildlife Specialist Reports prepared for this project. Impacts to recreation are discussed in the preceding sections of this report.

Alternative A

Alternative A, if implemented, would leave the damaged sections along Road 23 as is, with no further repairs, construction, or reconstruction. In addition, the 8.1 miles in the Road 2311 and Road 2314 systems would no longer be accessible for maintenance. The roads would eventually grow in with vegetation and some areas would be vulnerable to future erosion problems. Further encroachment toward the roadbed by the river may result in continued sediment delivery from the eroding road fill. The river channel would continue to shift laterally across the width of the existing floodplain to the extent that the remaining road

segments would allow. Over time the risk of a catastrophic failure on Road 23, Road 2311, and Road 2314 would increase due to the lack of maintenance. If it were to occur, this type of failure would deliver additional sediment to the White Chuck River.

Alternative A would have no effect on the free-flowing characteristics of the Recommended Wild and Scenic River and would not be likely to adversely affect the scenic quality of the river. Landslides and slope failures are common throughout the White Chuck River valley.

Alternative B

None of the repairs proposed under Alternative B would threaten the free-flowing characteristics of the White Chuck River. Site #1 would involve work in the floodplain of the White Chuck River and Site #2 and Site #4 would involve in-water work (culvert removal, new culvert placement, and adjustment) in tributaries to the White Chuck River. This work would result in short-term increases in sediment, but these sediments would be indistinguishable from other sediments transported by the White Chuck River. Alternative B would not adversely affect the scenic quality of the river.

Alternative C

Potential effects to the Recommended Wild and Scenic River would be similar under this alternative to those discussed under Alternative B or, if the Forest Service exercised the option to reconstruct the upper portion of the road at some point in the future, Alternative D. Alternative C would have no effect on the free-flowing characteristics of the Recommended Wild and Scenic River under either future scenario and would not be likely to adversely affect the scenic quality of the river.

Alternative D

Potential effects to the Recommended Wild and Scenic River would be similar under this alternative to those discussed under Alternative B. Sites #5 to #8 are above the floodplain of the White Chuck River and none of the work at these sites is planned near the floodplain, active channel, or ordinary high water/bankfull level. Alternative D would have no effect on the free-flowing characteristics of the Recommended Wild and Scenic River and would not be likely to adversely affect the scenic quality of the river.

Recommended Wild and Scenic River Cumulative Effects

None of the proposed Road 23 alternatives would affect the free-flowing characteristics of the Recommended Wild and Scenic River (White Chuck River), nor would any of the alternatives be likely to adversely affect the scenic quality of the river. As a result, there would be no contribution from this project toward cumulative effects for the Recommended Wild and Scenic River.

Consistency with the Forest Plan

All Alternatives would be consistent with the Forest Plan, as amended.

Geology, Soils, Hydrology Affected Environment

White Chuck River

The analysis area for direct and indirect effects to geology, soils, and hydrology is the White Chuck watershed. The project area is located in the lower reach of the 54,509-acre White Chuck watershed. The White Chuck River originates on the slopes of Glacier Peak and terminates approximately 35 miles to the northwest, at the Sauk River MP 31.9. A history of volcanism and glaciation has created a dynamic landscape characterized by steep upper slopes and rock outcrops at higher elevations, through relatively flat benches created by mudflows at mid elevations, to narrow, incised channels within inner gorges at the lower elevations. Only the lower 2 to 3 miles of river are associated with a broad floodplain comprised of glacial outwash and lahar deposits reworked by the river.

Glacier Peak is surrounded by a number of glaciers. The high mountain terrain associated with Glacier Peak also supports a number of permanent snowfields and small glaciers. Meltwater from these glaciers during the warm summer months supply large amounts of water that maintain higher summer flows in streams that receive this meltwater, such as the White Chuck River. Glacier meltwater carries fine silts that keep the White Chuck River cloudy (turbid) much of the year, especially during the summer when melt rates are greatest.

Geology and Soils

The geology and geomorphology of the White Chuck River watershed is characteristic of the very complex North Cascades. Structural features such as faults and folded rock formations lead to rapid and variable weathering of the underlying bedrock. Recent retreat of glaciers and snowfields on Glacier Peak has exposed weathered bedrock and scree at the higher elevations. Repeated pyroclastic flows and lahars (mudflows) that originated from Glacier Peak deposited substantial depths of material along the lower (and in some cases mid) slope locations of the White Chuck River. Glacial outwash and mudflow deposits blanket much of the watershed below Glacier Peak. The eroded slopes at MPs 1.9, 2.4, and 3.4 exposed these very deep deposits (Figure 19), which are composed of a relatively fined-grained matrix material with assorted shapes and sizes of rock fragments distributed throughout. These materials will stand at steep angles when dry, but are subject to failure when wet.

Stream channels have incised deeply into the glacial and mudflow deposits producing steep inner gorges along most of the mainstem White Chuck River and the lower portions of the tributaries. These over-steepened slopes fail readily when water erodes the toe of the slope. The erosion that occurred during the October 2003 flood caused several inner gorge failures in the watershed.

Metamorphic bedrock material exists within the vicinity of the proposed project. Ocean bed sediments were extensively altered through geologic processes that produced the heat and pressure necessary to convert the sediments to banded gneiss, schist, and orthogneiss.

Numerous faults exist within the Lower White Chuck watershed, which have undoubtedly influenced slope stability characteristics and erosion processes in the area. These fault zones can create zones of weakness within bedrock material, which may result in higher hazard conditions. There was no evidence of faulting within the vicinity of the project area during field reviews, but the repair sites lie on either side of the Straight Creek fault.

No comprehensive landslide inventory has been completed within the White Chuck watershed. The MBS National Forest Slope Stability Model was used during the watershed analysis (Forest Service 2004) to assist in identifying areas of relative hazard potential or experiencing slope failures (mass wasting) under natural conditions. The MBS model integrates six interrelated physical characteristics, using Geographical Information System (ArcInfo), for evaluation and interpretation. The six characteristics used for the model include: bedrock geology, slope morphology, soil parent material, soil infiltration characteristics, precipitation zones, and previously identified highly unstable soils (mapped S-8 soils as defined in the Forest Plan, as amended). According to the MBS model, the lower White Chuck contains a relatively high concentration of high-risk acreage, approximately 31 percent of the watershed area.

Figure 19. Fine Textured River Terrace Typical of Sites #1 (MP 1.9), #2 (MP 2.4), and #3 (MP 3.4)

Soils are very deep, non-plastic and derived from alluvium and glacial drift. Surface soils are generally thin gravelly loamy sands. Subsoils are deep, gravelly, cobbly sand. Soils along Road 23 are naturally stable to moderately stable (Tables 10 and 11). Soil productivity within the White Chuck watershed is quite variable and corresponds with elevation, slope steepness, and parent material. Approximately 36 percent of the watershed consists of rock outcrop and talus slopes. These conditions are most prevalent within the steeper sloped, higher elevation areas.

Table 10. Soil Map Units by Site Number and MPs

Site #	Soil Map Unit
1	10, 74
2	10, 31, 71
3	10, 12
4	10, 12
5	12
6	12
7	10, 12
8	12, 36
Between Mile Posts	**Soil Map Unit**
1.9 – 3.5	10, 12, 31, 71, 74
3.5 – 5.8	10, 12, 31
5.8 – 10.3	10, 12, 13, 31, 36

Soil development and productivity is much higher within the valley bottoms and lower toe slopes where soils have developed from material that includes pumice and ash, glacial till and drift, residuum and colluviums, and alluvium. Deposits of glacial till and interbedded glacial lacustrine materials (existing primarily within the lower valley floor) develop unique soil structural and textural characteristics that frequently influence soil drainage characteristics that can have a substantial influence on slope stability potential.

S-8 soils are considered unsuitable for management of timber production, including road construction, because available technology cannot prevent irreversible damage to soil productivity or watershed condition. The S-8 areas are prone to landslide or mass wasting activity. While the slope locations within the vicinity of MP 1.9, MP 2.4, and MP 3.4 were not considered sufficiently unstable to map as S-8, these slopes are "potentially unstable." The MBS Slope Stability Model rated these slopes as having a high mass wasting potential, as was much of the hillslope on the south side of the White Chuck River. Field observations indicated that slope failures have occurred within the vicinity. Road construction should be avoided within these areas if possible. Road 23 from MP 5.8 to the road terminus, specifically between MP 6.45 and MP 7.2, and MP 8.5 to the road terminus, crosses areas with S-8 soils.

Where roads currently exist or are recently constructed erosion rates and landslides are many times greater than from undisturbed slopes (see Montgomery 1994 for a thorough review of studies on significant road-related geomorphic impacts). New road construction should include an extensive site survey and geotechnical investigations. Final road location and design criteria will be critical in order to improve the probability of maintaining a road location. Placing fill on, or loading unstable slopes with additional weight, should be avoided unless geotechnical investigations approve a stable disposal location. In some instances, fill on stable slope areas may be preferable to extensive cuts into the hillslope. Cutslopes through much of these new reroute areas will probably require some support or buttressing. Design and location also need to be carefully consider, specifically how water will be routed from the upper slope and where that water should be directed.

Table 11. Selected Soil Mapping Interpretations

Soil Map Unit	Acres Between MP 1.9 and 3.5	Landform	Surface Soil	Natural Stability	Surface Erosion	Cutbank Sloughing and Raveling	Regeneration	Road Construction
10	409.8	Flats adjacent to streams	Gravelly loamy sand	Very stable	Low	Moderate	Moderate	Issues with flooding.
12	100.3	Valley bottoms < 35% slope	Loam	Very stable to stable	Moderate	Moderate	High	Local wet areas require extra culverts and thicker base course.
31	196.8	Uneven, slightly to moderately dissected valley toeslopes > 35% slope	Loam or silt loam	Moderately stable	Moderate to high	Moderate	High	Wetness requires extra culverts, soils become muddy, other resources are damaged.
71	25.3	Steep smooth slopes > 35%	Gravelly sandy loam	Stable	High	Low to Moderate	Low to Moderate	Steep slopes, high damage from sidecast waste.
74	1122.5	Somewhat uneven and dissected slopes > 35%	Gravelly silt loam or loam	Stable to Moderately stable	High	Moderate	High	Steep slopes, damage to resources from sidecast waste.
10	459.5	Flats adjacent to streams	Gravelly loamy sand	Very stable	Low	Moderate	Moderate	Issues with flooding.
12	335.4	Valley bottoms < 35% slope	Loam	Very stable to stable	Moderate	Moderate	High	Local wet areas require extra culverts and thicker base course.
13	79.4	Valley bottoms > 35% slope	Loam	Stable	High	Moderate	High	Damage to resources from sidecast waste.
31	140.4	Uneven, slightly to moderately dissected valley toeslopes > 35% slope	Loam or silt loam	Moderately stable	Moderate to high	Moderate	High	Wetness requires extra culverts, soils become muddy, other resources are damaged.
36	436.2	Unstable dissected toe-slopes > 50% slope	Loam and sandy loam	Very stable to stable	Moderate	High	Moderate	Steep, dissected slopes; unstable, extensive raveling, poor alignment.

Hydrology

Annual precipitation averages about 85 inches near the mouth of the White Chuck watershed to as much as 131 inches on White Chuck Mountain. The project area lies within the transitional rain and snow zone. Snow is frequently found in the valley bottom, along the White Chuck River and on Road 23.

The United States Geological Survey (USGS) operates a stream gauge located on the Sauk River above the confluence with the White Chuck River. This gauge has operated since 1917, except for a period between 1923 through 1928. Table 12 lists the highest flows recorded by this gauging station. While the gauge does not measure the discharge of the White Chuck River, it is a good indicator of the relative magnitude of floods within the White Chuck watershed. Based on the channel responses to the 2003 flood in the Sauk and White Chuck Rivers, these watersheds responded similarly to that event.

The October 2003 flood event was large enough and of great enough intensity that the stream gage was damaged, as were numerous forest roads. The severity of this storm resulted from heavy rain at a much higher elevation than usual. Normally, high elevation snow (above 5,000 feet) is buffered and protected from melting by lower temperatures and the depth of snow. However, in October 2003, heavy rain fell on bare ground or shallow snow at elevations from 6,000 to 10,000 feet, and on permanent snowfields and glaciers that were "ripe" from the warmest September on record. The resulting rapid melt of ice and runoff caused the record flood.

Table 12. Peak Flows of the South Fork Sauk River

Date of Event	Flows (cfs)*	Return Intervals from R.W. Beck (1995)**	Simple Return Intervals*** (period of record through 2006)	Probability of Occurences in Any Year (%)	Comment
February 29, 1917	24,400		12-Year		--
December 12, 1921	29,100		17-Year	6.02	--
February 26, 1932	22,900		9-Year		--
November 27, 1949	30,200	25-Year	21-Year	4.82	--
February 10, 1951	20,800	20-Year	8-Year		--
December 18, 1979	19,000	<20-Year	7-Year		--
December 26, 1980	40,100	100-Year	42-Year	2.41	Prior to October 2003, largest event recorded on the Sauk River.
November 24, 1990	24,600	24-Year	14-Year	7.23	Largest flow between 1980 and 1990
November 8, 1995	24,100	24-Year	10-Year	9.64	--
October 17, 2003	44,000	100-Year	83-Year	1.20	Largest event ever recorded on the Sauk River
November 6, 2006	33,600		27-Year	3.61	--

** cfs = cubic feet per second; ** used Log Pearson III using record from 1918 to 1995; ***Based on simple probability: Number of years (n) of record plus one, divided by rank (m) of the particular flood; n+1/m, using record from 1918 to 2006.*

Based the "Log Pearson Type III[8]" method and the period of record from 1917 to 1995, runoff from the 2003 storm was larger than a 100-year event (R.W. Beck 1995). Using simple probability and the record through (and including) October 2003, the storm produced runoff with an 80-year return interval. Regardless of the methodology, the October 2003 flood was the highest of record (80 years of record). In all cases, the floods noted in Table 9 caused substantial watershed disturbance, including landslides, bank erosion, and loss of riparian vegetation, as well as damage to forest infrastructure (roads, trails, campgrounds, etc.).

Relating flood events to road damage on the Mountain Loop system, damage occurred during each event from 1949 with the first considerable damage occurring with the 1980 event. Between 1949 and 1980, a period of intense forest road system development, nothing approached a 25-year flood event. However, the expanded road system has been affected by the 1980 and subsequent storms.

Channel Dynamics

One of the main features of the White Chuck River is how much of the river channel, and tributary channels, is deeply incised in, and very confined by, the deep mudflow deposits that fill the valley floor. Steep inner gorge slopes are mostly unstable. Downstream of Crystal Creek, the valley begins to widen, the river gradient becomes less, and the channel meanders across the valley. In this reach, the river transitions from one that transports most of the bedload and large wood delivered to the channel, to one where large amounts of sediment and wood deposit on channel bars and margins where it is temporarily stored until another major event moves some of it farther downstream. Mostly because of the reduced gradient, the river does not have enough energy to move all the sediment and debris supplied to it.

Three of the eight primary road washouts (MPs 1.9, 2.4, and 3.4) were caused by meanders of the river contacting the outer boundary of the valley and eroding the deep mudflow deposits. This is the process by which rivers shape the valleys through which they flow and create river terraces and floodplains. Accumulations of debris effectively deflect flow energy across the channel at meanders. Failure of the inner gorge slopes is common in the White Chuck watershed because the riverbanks are composed of easily eroded material (mudflow and glacial outwash materials) and the valley bottom is generally narrow. In 1999, erosion of the inner gorge slope by the river closed Road 23 at MP 6.68 when a portion of the slope failed into the river. In that case, it was possible to relocate a portion of the road to avoid the encroaching river. Although failure of inner gorge slopes is a common natural occurrence in the White Chuck watershed, the presence of roads in any watershed increases the risk of slope failure (Beechie et al. 2005), and road segments on more erodible soils produce more sediment (Luce and Black 2001). The Geology, Hydrology, and Soils Specialist Report provides additional discussion of the mechanisms by which roads affect geomorphic processes.

Regarding mechanisms of failure in the White Chuck watershed, during major flood events, such as 2003, the river extends its meander amplitude in order to distribute and dissipate the extra energy of the water and debris coming down the channel. Through much of the river

[8] Log Pearson is a statistical method to determine the estimated size of an event by assessing the distribution of peak flows at a gauge site.

length, once the flood event is over, the river returns to the pre-flood geometry and occupies a lower amplitude meander. This occurred at the Site #1 (MP 1.9), where the channel downcut back into an alignment across the active floodplain from the road by the fall of 2006. It also occurred just upstream of the White Chuck Bridge, near the river mouth, where severe erosion of a tall left bank slope during the 2003 flood resulted when the meander swung wide. Since 2003, the river has returned to a lower amplitude alignment.

Figure 20, taken in the summer of 2006, illustrates where the channel moved to the right, away from the proposed road reconstruction alignment. The original road alignment is to the left in the shadows (where the vehicle is parked). The photograph was taken from the far end of the washout on the old alignment.

Figure 20. Site #1 (MP 1.9), Summer 2006

The November 6, 2006, flood again increased the amplitude of the meander at Site #1 (MP 1.9, Figure 21), although it is less pronounced than in 2003. The large wood jam forming downstream of the road washout was dramatically altered by the 2006 event, but still appears to be collecting wood.

Figure 21. White Chuck River Site #1 (MP 1.9), Flood Channel Margins for 2003 and 2006

At Site #2 (MP 2.4), the channel remains at the outer meander margins, against the slope that held the road prior to the October 2003 flood. Conditions at this site suggest that this meander amplitude and curvature is too great to be maintained long term. A debris jam and gravel bar formed in the channel between 2003 and 2006 that forced back more of the flow toward the pre-October 2003 alignment (Figure 22). The November 2006 flood deposited more material in the center of the channel and cut new channels through the wooded point bar on the inside of the meander (Figure 23). While flow remains against the high outside bank, there is potential for this to become an overflow channel if more material deposits on the river bend. Water will likely remain flowing along the outer bank for many years, or one flood could close it off and move the river to the right.

Figure 22. White Chuck River Site #2 May 2006

Note the small logjam forming on outside of meander

Figure 23. White Chuck River Site #2 (MP 2.4), 2 Days following the November 2006 Flood

Note the large amount of debris and sediment deposition in center of channel (picture left).

Similarly, at Site #3 (MP 3.4) during the November 2006 flood event, the river undermined the fill slope below the road bed washing out 180 feet of Road 23 and depositing large amounts of material along the left bank. Similar to Site #1 (MP 1.9), the river extended its meander amplitude at this location in order to distribute and dissipate the extra energy of the water and debris coming down the channel. In addition, large accumulations of woody debris and a logjam are located along the right bank (north side of the river) at this site. Following the November 2006 flooding event, the river has returned to the pre-flood geometry and occupies a lower amplitude meander. While flow remains against the deposited material and outside bank, there is potential for this material to encourage channel migration away from this bank, or additional floods could continue to recruit material from the steep slope.

Floodplains

As noted above, the White Chuck River near the MP 1.9, MP 2.4, and MP 3.4 washouts occupies a relatively broad floodplain. Field measurements taken in 2004 and 2008 resulted in a valley width of 500 to 600 feet at the MP 1.9 site, 200 to 300 feet just upstream of the MP 2.4 site, and 400 to 500 feet just downstream of the MP 3.4 site. Valley confinement by the hillsides is much less downstream of MP 1.9 but the mudflow deposits at the confluence of the White Chuck continue to confine the channel. Within this valley bottom, the White Chuck River maintains a floodplain about 300 feet in width, between river terraces. While the floodplain remains very active, many of the low terraces remain stable for long periods because large logjams protect them. Except for well-established side channels, there is very little evidence that the October 2003 flood over-topped the tree covered terraces. The 2006 flood cut through some of the jam at Site #2 (MP 2.4), but not at Site #1 (MP 1.9; Figure 24). During major storms, the logjams at the upstream end of point bars force the river to increase meander amplitude by limiting the amount of water that can pass straight down the valley over the terrace. This occurred at Site #3 (MP 3.4) during the 2006 storm event. The underlying slope of Road 23 at Site #8 (MP 8.5) is also directly connected to the floodplain, but as a high confining valley wall. During the November 2006 flood, the river most likely inundated the floodplain and had contact with this slope below the road.

Site #1 – no incursion into far terrace

Site #2 – 2006 flood broke through some of the debris jam and formed new channel through far terrace

Figure 24. 2006 Flood Channel Effects at Sites #1 and #2

Water Quality

The CWA and subsequent amendments make it unlawful for any person to discharge any pollutant into waters of the United States, unless a permit is obtained under provisions of the act. EPA delegated implementation of the CWA to the states and the State of Washington recognizes the Forest Service as the designated management agency for meeting CWA requirements on National Forest System lands.

Water quality monitoring has occurred in the Sauk River between the confluences of the White Chuck River and the Sauk River Forks. The various participants involved in water quality sampling in the Sauk River watershed over the years includes EPA, Sauk-Suiattle (Indian) Tribe, and the Forest Service. The Northwest Fisheries Science Center (NOAA) has also been monitoring stream temperatures, but has not reported on those data. The Skagit River System Cooperative, Skagit Stewards, and North Cascades National Park may also have stream water quality and biota data (macroinvertebrates), but those data were not obtained for this report.

Section 303(d) of the CWA requires Washington State to periodically prepare a list of all surface waters in the state impaired by pollutants. The Washington Department of Ecology 2000, 303(d) list of water quality impairments includes none of the waters in the upper Sauk River or its tributaries, including the White Chuck River. The 2002 to 2004 proposed listing (approved by the Department of Ecology but not yet by EPA) also shows no water quality impairments for this area.

There is little stream temperature data available for the White Chuck River. No long term monitoring has been conducted. Because the White Chuck is fed by glacier meltwater during the summer, it is assumed that the water temperature remains low. However, the active floodplain and relatively open channel, large gravel bars, and cloudy water, all create the potential for rapid warming of the water during the sunny hot summer.

The White Chuck River Watershed Analysis (Forest Service 2004) reviewed riparian conditions and concluded that there is abundant shade on all tributaries and much of the mainstem White Chuck River to maintain stream temperatures. The width of the river in the lower reaches is limiting the effectiveness of shade for temperature control; however, there is also more area of immature conifer and hardwood riparian vegetation that is less effective at providing shade.

The Forest installed a thermograph (Onset Stowaway) at the bridge on Road 23, across the White Chuck River (approximately RM 6.0) from June through September 2001 (Forest Service 2004). The Aquatic and Riparian Effectiveness Monitoring Program installed a thermograph (Onset Stowaway) near the mouth of the White Chuck River from June 26 to October 8, 2003 (Moyer et al. 2003). Maximum stream temperature in 2001 was 14.2˚ Celsius on 2 days; in 2003, the maximum temperature was 15.1˚ Celsius on 2 consecutive days (Table 13). The open, scoured channel, prevalence of gravel bars, and milky colored summer runoff contribute to the higher temperatures in the lower watershed.

Table 13. Stream Temperature Statistics for the Lower White Chuck River

Site	Year	Maximum Temperature (˚C)	Maximum 7-Day Mean of Maximum Daily Temp. (˚C)	Number of Exceedances of 7-Day Mean of Daily Max Standard for Bull trout (12˚C)
White Chuck Bridge (mid watershed)	2001	14.2	13.8	19
White Chuck mouth	2003	15.1	14.8	63

The predominant factor controlling stream temperature in the White Chuck River appears to be the width of the river. The width of the river is influenced by the amount of sediment that contributes to wide shallow channels where heating of the substrate contributes to warmer temperatures. The high turbidity also absorbs more of the thermal energy from the sun. As of January 2009, the White Chuck is not listed on the State 303(d) list for water temperature.

Sediment

Sediment plays a major role in the channel dynamics of the White Chuck River. The landscapes of these two subwatersheds of the Upper Sauk River watershed produce large quantities of sediment from active debris avalanche terrain and stream bank erosion; however, no sediment background data are known to exist. With the October 2003 storm event, an estimate of the total amount of sediment produced from the high riverbanks at Sites #1 (MP 1.9) and #2 (MP 2.4) is 101,000 cubic yards (130,000 tons). These are just two of many similar sites along the White Chuck River.

Swanson et al. (1981) estimated a range of sediment production from forested lands of 100 to 200 tons per square mile per year. Glaciers and glacial terrain on Mt. Rainier produce an estimated 19,000 tons of sediment per square mile per year (Metcalf 1979). There is no known sediment production estimate for the debris avalanche terrain in the upper White Chuck River; however, the glacial and snowfield terrain around Glacier Peak is similar to that of Mt. Rainier. If it is assumed that approximately 1 percent of the White Chuck watershed is glacial and avalanche terrain, an estimate of background sediment production in this river system would be approximately 33,000 tons of sediment per year[9]. Three additional eroding high stream banks are known within the White Chuck River; there are likely several more, given the entrenchment of the channel in the lahar deposits. Therefore, at least during a major flood year, such as 2003, these high, erosive banks contribute well over an order of magnitude greater amount of sediment (130,000 tons from Sites #1 [MP 1.9] and #2 [MP 2.4] in 2003 versus 33,000 tons estimated as normal annual yield for the watershed).

Although it is well documented that the geomorphic effects from roads is an increase in erosion rates and mass failure in watersheds with roads versus undisturbed watersheds (see the Geology, Hydrology, and Soils Specialist Report for additional discussion), the amount of sediment from Road 23 itself is inconsequential at these sites. That is, the combination of the annual glacial sediment supply, the presence of highly erodible banks, and the additional

[9] The watershed is 85.2 sq. mi.; 85.2 X 0.01 = 0.85 sq. mi; 0.85 X 19,000 tons/sq. mi. = 16,150 tons. The remaining watershed – 85.2 sq. mi. X 0.99 = 84.35 sq. mi.; 84.35 X 200 tons = 16,870 tons

sediment supplied during a major flood year largely mask any addition of sediment contributed via Road 23. Thus, at Sites #1 through #3 (MPs 1.9 through 3.4) and Sites #5 through #8 (MPs 5.8 through 8.5), the mechanism of failure was not directly influenced by the presence of the road. However, the damage at Site #4 (MP 3.5) did result from the presence of Road 23, and without repairs completed at this site, erosion will continue to occur.

Geology, Soils, Hydrology Environmental Consequences

Alternative A

Under the no action alternative, no soils would be disturbed, nor would a reduction in soil compaction occur (Tables 14 and 15). Because no road repairs would occur under this alternative, the road would remain in its current condition at the eight damaged sites. All other road drainage features between MP 1.9 and the road terminus would go without maintenance. The road surface is revegetating, and if left undisturbed, plants and trees would continue to colonize the road surface. Some of the drainage culverts that pass water under the road are failing due to lack of maintenance since 2003. Without proper road maintenance, road ditches and culverts will plug, and it is likely that there would be additional washouts at culvert crossings along Road 23. In addition, the steep slopes at MPs 1.9, 2.4, and 3.4 would remain open to erosion by the river resulting in large volumes of sediment delivered during the larger flood events.

Table 14. Acres of Disturbed during Construction

Site	Alternative A	Alternative B	Alternative C	Alternative D
1	0	0.5	0.51	0.51
2	0	1.4	1.4	1.4
3	0	1.4	1.4	1.4
4	0	0.1	0.1	0.1
5	0	0	0	0.2
6	0	0	0	0.09
7	0	0	0	0.05
8	0	0	0	0.12
Total	0	3.4	3.41	3.87

Table 15. Acres of Reduction in Compacted Road Soils

Sites	Alternative A	Alternative B	Alternative C	Alternative D
1 - 4	0	0	0	0
5 - 8	0	4.4	< 4.4	0

Over time, Stujack Creek would continue to erode a new channel around the blocked culvert at Site #3 (MP 3.4) until equilibrium is reached. There is a possibility that Stujack Creek could migrate farther down Road 23 (to the west), but the most likely location for the creek to cross was established in the 2003 flood. There would be no effect on soils or soil productivity beyond the impacts of the river to the streamside areas through channel migration and erosion of the inner gorge banks.

Sediment production would depend on the extent to which the river meanders erode the base of the raw slopes at MP 1.9, 2.4, and 3.4, and the amount of surface erosion or mass failure that would occur from these slopes and other slopes within the White Chuck River drainage. Large quantities of sediment would enter the river during flood events, which cause erosion at the base of these slopes. Eventually the slopes would erode back far enough that the river would abandon the outer meander for many years or decades. Stujack Creek would continue to scour and cause additional sediment to enter the White Chuck River until the Stujack Creek channel stabilized where it crosses Road 23. The amount of sediment would be minor, on the order of 100 to 200 cubic yards spread over several years. Segments of the road between Road MP 5.8 and road terminus would continue to slump, contributing small amounts of sediment to the tributaries draining the hillside and to the White Chuck River at locations where the road approaches the channel.

There are nearly no restriction on channel migration throughout the drainage upstream from MP 1.9, other than a few locations where Road 23 encroaches on the White Chuck River, and what the natural landscape imposes through steep inner gorge slopes all along the river. No anthropogenic addition or manipulation of large wood in the channel would occur.

There would be no machinery working in or near the river, therefore there would be no possibility of a hydraulic or fuel spill into the water from construction equipment working on repair of these sites. Since there would be no road maintenance on Road 23 (upstream from MP 1.9), Road 2311, and Road 2314, the risk of failure (culvert plugging, fill slope mass wasting, and /or surface gullying) would increase over time. Failure of the road drainage system could result in chronic and/or episodic erosion and delivery of sediment into the channel network.

Alternative B

The repairs would re-establish a roadway at Site #1 (MP 1.9), and reroute the road at Sites #2 (MP 2.4) and #3 (MP 3.4), such that the risk of road damage during future flood events would be reduced. Realignment of the box culvert on Stujack Creek would re-establish a roadway over Stujack Creek at Site #4 (MP 3.5) and eliminate the current conditions where the creek flows over the top of the culvert. Between Site #5 (MP 5.8) and the road terminus (MP 10.3), the road would be decommissioned, and while the risks of the slumping hillside would not be eliminated, there would not be further impacts to the road and associated structures, such as plugged culverts, compacted soils, surface runoff, or potential fill slope failure.

The proposed activities at Sites #1 through #4 (MPs 1.9 through 3.5) on soil productivity would result in the continued commitment of a segment of the White Chuck River drainage to a road for approximately 3.4 acres of surface (12-foot-wide compaction zone). Roads are hardened surfaces with compacted soils, which results in increased overland runoff, and can contribute to sediment delivery to stream systems. The potential effects of the proposed activities at Site #5 through the road terminus (MPs 5.8 through 10.3) include road decommissioning and removal of culverts. Overtime, the decommissioning of the last 5 miles of Road 23 would result in reduced soil compaction, sediment delivery, and overland runoff on 4.4 acres. The decommissioned road acres would have increased infiltration, and restored hydrologic connectivity and decreased risk of plugged culverts deferring flows.

Based on the information provided in Table 13, Alternative B would disturb 3.4 acres of forest soils at the repair sites. The degree or intensity of soil productivity losses is variable depending on the nature of the impacting mechanism. Soil biological processes are important to nutrient cycling and maintenance of soil structure. Organic matter and topsoil removal has a potential for reducing soil nitrogen and mycorrhizae. Loss of soil productivity associated with features such as the transportation system, including system roads, are often consider permanent commitments. Road decommissioning would result in plant colonization over time and even with active site preparation (including subsoiling, fertilization, and revegetation) recovery takes time. While soil productivity would improve over time, the soil is unlikely to return to its original condition and productivity.

Repair work that minimizes soil disturbance, maintains organic matter, and encourages rapid growth of native vegetation helps to conserve soil organisms, facilitate re-colonization, and maintain forest productivity. Based on the best information available, the Forest Plan Standards and Guidelines would minimize impacts to the soil resource under this alternative. In addition to having the smallest disturbance to soils next to the no action alternative, Alternative B will have the largest reduction of compacted soils due to road decommissioning and restoration (Table 14).

Sediment

Under Alternative B, there would be no appreciable soil erosion or sediment delivery to the river. The project would produce less than 13 cubic yards of sediment compared to the conservative estimate of 33,000 cubic yards of background annual sediment yield of the White Chuck River. Therefore, there would be very limited impacts to aquatic habitat or river processes due to project sediment.

At Site #1 (MP 1.9), reconstructing the road across the existing scoured area would create a buttress for the raw cut bank that formed during the 2003 flood. This repair design would promote slope stability at this site. The base of the road fill would be armored with large rock and wood. Construction would be designed to occur outside of the wetted channel to limit sediment delivery to the river. The construction site would be separated from the river by an erosion barrier; therefore, no sediment would be expected to enter the water unless a storm occurred during the construction period. The flat terrace above the low water channel provides a work site during low flow that would have a very low probability of any sediment moving across the terrace.

The only new ground disturbance would be at the two ends of the reconstruction where the roadway would be lowered to create the dip in the vertical alignment or where the road would be shifted into the slope. The newly exposed area would amount to about 0.25 acre created by new cut-slopes and the lower road prism. The new fill and roadway to cross the scoured area would add another 0.3 acre, for a total disturbed area of approximately 0.5 acre. The disturbed areas would be mulched and seeded to minimize erosion, but some erosion would still occur during the initial winter season.

At an erosion rate of 3,000 tons per square mile per year for the newly disturbed areas, the total erosion from bare areas would equal 3 tons (2 cubic yards) per year. Road surfacing with gravel and mulching and revegetation of bare soils would prevent most of this. In addition, the large wood incorporated into the base of the rock would likely retain sediment.

If erosion control is assumed 70 percent effective (Forest Service 1981[10]), 0.8 tons (0.6 cubic yard) of erosion may occur the first year or two and reduce to negligible amounts over the long term. Most of this erosion would enter the White Chuck River from the culvert at the low point of the dipped road grade. Most of the time, this sediment would be deposited on the low terrace and not enter the water directly. Accumulated sediment would be washed away during large floods when water would likely be near or against the base of the roadway. Over time, nearly all of the eroded material would be delivered to the White Chuck River as high water would wash it away from the base of the roadway and deposit it downstream. If the river meander moved to the middle or other side of the valley from the road, none of the sediment would be delivered to the river.

Site #1 (MP 1.9): No new sediment would be generated by machinery working on the gravel bars to place large wood complexes; however, the activity would disturb the gravel bars by running tracked equipment across the top, and some excavation would be required to secure the pieces in the substrate. There would be a small flush of finer silts and sands with the first high water, but only of materials already in the stream. The 0.6 cubic yard of eroded material from the road at Site #1 (MP 1.9) that would enter the river would be minor compared to the estimate of 15,778 cubic yards to have washed into the river here during the 2003 flood.

Site #2 (MP 2.4): The road would be relocated away from the White Chuck River using approximately 0.43 mile of Road 2311 and 0.2 mile of new construction. There would be no direct activity along the White Chuck River, but new construction on the reroute would include a large culvert crossing of an unnamed tributary stream (approximately 0.28 square mile). The new road construction would disturb approximately 1.4 acres of ground.

The rerouted road, including the new construction, would not cross any mapped S-8 soils, but the inner gorge slopes along the unnamed stream are very steep and unstable. Considerable concern for slope stability would result if the road were to cut across this slope. However, because the proposed road alignment would cross the drainage on a "through" fill perpendicular to the drainage, rather than a cut and fill across the slope, the fill would actually help stabilize the inner gorge slope.

At an erosion rate of 15,000 tons per square mile per year for new road construction and 3,000 tons per square mile for the work on Road 2311, the total annual erosion from the reroute would equal 42 tons (31 square yards) for the first year or two. Road surfacing with gravel and mulching and revegetation of bare soils would prevent most of this. If erosion control is assumed 70 percent effective (Forest Service 1981), 13 tons (9.6 square yards) of erosion may occur the first year or two and reduce to negligible amounts over the long term.

Much of this sediment would not enter the White Chuck River. Some sediment is projected to enter the unnamed tributary creek and other ephemeral channels that are crossed by Road 2311 and the new construction. This material would be transported to the White Chuck River over a period of years. Because most of the rerouted road would drain onto well-vegetated slopes only about a third (33 percent) of the eroded material would be expected to enter the White Chuck River. Eighty percent of the erosion that would occur along the

[10] Forest Service 1981. Guide for predicting sediment yields from forested watersheds. USDA Forest Service, Northern Region, Missoula, MT, and Intermountain Region, Ogden, UT. This guide describes erosion control techniques for forest roads and displays the relative sediment reduction of each, and combinations of techniques.

portion of the new construction that drains into the unnamed creek (about 300 feet of the road) is expected to be dispersed across the vegetated slopes. Using these assumptions, there would be approximately 4 tons (3 cubic yards) of material delivered to the White Chuck River from Site #2 (MP 2.4) the first year or two, then a negligible amount in subsequent years. The remainder disperses across the vegetated slopes.

There are 3 square yards of material from the road at Site #2 (MP 2.4) that would likely enter the river over time from the proposed repairs. This sediment delivery, likely during high flows, would be minor compared to the conservative estimate of 85,000 square yards that washed into the river here during the 2003 flood. If the river remains against the left bank at Site #2 (MP 2.4), future floods could generate tens of thousands of cubic yards of sediment.

Site #3 (MP 3.4): The road would be relocated 150 to 200 feet horizontally away from the White Chuck River using approximately 0.2 mile of new construction. There would be no direct activity along the White Chuck River, but new construction on the reroute would include installing one drainage culvert and four cross-drain culverts along the new section of road. The new road construction would disturb approximately 1.4 acres of ground.

The rerouted road would not cross any mapped S-8 soils, but the inner gorge slopes between the rerouted road and the White Chuck River are very steep and unstable. Considerable concern for slope stability would result if rebuilding of the road were attempted at the damaged site instead of 150 to 200 feet horizontally away from the river.

At an erosion rate of 15,000 tons per square mile per year for new road construction, the total annual erosion from the reroute would equal 33 tons (24.4 cubic yards) for the first year or two. Road surfacing with gravel and mulching and revegetation of bare soils would prevent most of this. If erosion control is assumed 70 percent effective (Forest Service 1981), 10 tons (7.4 cubic yards) of erosion may occur the first year or two and reduce to negligible amounts over the long term.

Much of this eroded material would not enter the White Chuck River and would take over a period of years to be transported to the river. Since most of the rerouted road would drain onto well vegetated slopes, only about a third (33 percent) of the eroded material would be expected to enter the White Chuck River. Using these assumptions there would be approximately 3 tons (2.2 cubic yards) of material delivered to the White Chuck River from Site #3 (MP 3.4) in the first year or two, then a negligible amount. The remainder would be dispersed across the vegetated slopes.

Site #4 (MP 3.5): A portion of the road washed out when flood debris plugged the box culvert at Stujack Creek. This site would be repaired by taking material from the culvert and reconstructing the roadway, surfacing with fresh gravel, mulching, and seeding the disturbed areas. Assuming erosion control effectiveness of 70 percent and less than 0.1 acre of disturbance, the sediment generation would be less than 0.1 ton (1.4 cubic feet). Once funding is secured, the box culvert would be replaced with a crossing that would accommodate fish passage. That replacement would generate a similar amount of sediment.

Site #5 through #8 (MP 5.8 through 8.5): Portions of the road either slumped or the fill material failed, and large trees toppled onto the road in many locations. Under this alternative, this site would not be repaired, but instead, from the junction with Road 27 to the White Chuck Trailhead (MP 5.8 to the road terminus, MP 10.3) would be decommissioned,

which would disturb and then reduce 4.4 acres of compacted ground. Road 23 from MP 5.8 through the road terminus (MP 10.3) crosses mapped unstable soils. Decommissioning this segment of road would permanently decrease the amount (2.2 acres[11]) of road on these unstable soils.

The erosion rate for decommissioning the road in the first year could be as high as the erosion rate for forest roads in the Pacific Northwest Cascade Mountains at 15,000 tons per square mile per year. Once decommissioning is complete, the erosion rate in the subsequent years is projected to decrease until the site is revegetated, with an erosion rate that is similar to the annual erosion rate for forests in the Pacific Northwest Cascade Mountains (380 tons per square mile per year). Using these assumptions, the erosion rate from decommissioning this section of road would be 103 tons (76.1 cubic yards) within the first years. If erosion control is assumed to be 70 percent effective (Forest Service 1981), a very conservative estimate of 31 tons (22.9 cubic yards) of erosion may occur while the slopes revegetate.

Much of this erosion would not enter the White Chuck River and would take over a period of years to be transported to the river. Since most of the decommissioned road would drain onto well vegetated slopes, only about a third (33 percent) of the eroded material would be expected to enter the White Chuck River. Using these assumptions, there would be approximately 10 tons (7.4 cubic yards) of material delivered to the White Chuck River in the first year after decommissioning activities. Assuming by the second or third year the erosion rate is similar to that of the forest, there would be approximately 1 ton (0.7 cubic yard) of material delivered to the White Chuck River on an annual basis from the decommissioned road segment. This amount would be similar to other forested areas in the White Chuck watershed. The remainder of erosion from the decommissioned area would be dispersed across the vegetated slopes. In addition to reducing sediment delivery, decommissioning the road would allow for plant colonization of the road way, increase water infiltration as the road becomes less compacted, reduce potential overland runoff, and reduce risk of road washouts. Hydrologic connectivity would not be dependent on culverts for drainage of the tributaries. Due to the instability of some of the slopes and the meandering of the river, there would still be sediment delivery from hillslopes that the decommissioned road crossed between MP 5.8 to MP 8.5.

The 7.4 cubic yards, decreasing to 0.7 cubic yard, of erosion that would enter the river under this alternative would be negligible compared to the estimate of 64,605 cubic yards that has entered from this segment of road due to the 2006 damage. Although the majority of this segment of road is greater than 0.08 mile north of the White Chuck River, if the river meander enlarges and extends against the north side of the river at Site #8 (MP 8.5), future floods would generate tens of thousands of cubic yards of sediment

Channel Dynamics

Some work at all three sites would influence channel dynamics, but very differently in all cases. Site #1 (MP 1.9) would place the roadway on a flood terrace of the White Chuck River; Site #2 (MP 2.4) would reroute the road and cross a small tributary to the White Chuck with a deep road fill and large culvert; Site #3 (MP 3.4) would reroute the road for approximately 800 feet around the slide; Site #4 (MP 3.5) would fix the existing crossing of a

[11] Total of 2.215 acres of unstable soils between Site #5 (MP 5.8) and the road terminus (MP 10.3).

fish-bearing tributary; and Site #5 (MP 5.8) through the road terminus (MP 10.3) would be decommissioned. None of these effects would compromise the overall processes of the river and watershed.

Site #1 (MP 1.9) would have the greatest effect on channel dynamics because material would be placed in a zone that was accessed by the river in October 2003 and partially again in November 2006. However, the project would have little effect on the overall channel migration, sediment and wood transport, or stability of the White Chuck River.

Prior to October 2003, the scoured area was occupied by a lahar deposit in the form of an inner gorge slope. This extreme hydrologic event tore into the hillside at the very edge of the river valley. The proposed fill would extend into the White Chuck floodplain approximately 50 feet for about 200 to 300 lineal feet. From cross-sections taken through this reach of river, the valley wall to valley wall distance is approximately 650 feet. The approximately 50 feet of fill would represent a reduction of about seven percent of the floodplain width; and only at this one wide meander bend. The toe of the hillside prior to the 2003 flood would have been an estimated 80 to 100 feet from the current base of the slope.

With the proposed road in place, there would be less than 0.5 foot increase in the 100-year flood level through this cross-section. Woody debris plays a large role in determining the channel width and floodplain inundation during floods. To minimize the effect of the large rock base for the road, large wood would be placed, in order to break up velocities and create aquatic habitat, should the river stay against the left bank (against the road). In addition, large logs from the relocation at Site #2 (MP 2.4) would be placed at the edge of the bankfull channel to create floodplain roughness and reduce the potential for the river to stay against the road. These logs would collect other wood moving down the channel and help establish a higher floodplain terrace next to the road. The tendency of the river following the last two floods has been to reestablish the channel away from the road at this location.

Site #2 (MP 2.4) would only affect channel dynamics through the trapping of large wood that might move down the unnamed channel, into the White Chuck River. Observations of this channel indicate that the flows in the channel are not large enough to move most of the wood that falls into the channel. Therefore, the amount of wood transport that would be affected by the culvert crossing would be very small. There is an undersized culvert in Road 23 where the road now crosses the unnamed creek. The proposed project would improve transport of small wood and debris to the White Chuck because the new culvert would be large enough to pass the 100-year flood and some debris.

Site #3 (MP 3.4) would have no effect on channel migration, sediment and wood transport, or stability of the White Chuck River because the road would be rerouted away from the river. Site #4 (MP 3.5) would continue to constrict flow and wood movement in Stujack Creek until a new structure is put in place that would pass 100-year floods and not be a barrier to fish passage. There would be no effect from repairing Site #4 because the culvert would merely be cleared and realigned to pass most flows. Sites #5 through #7 (MP 5.8 through 7.2) would have no effect on channel migration, wood transport, or stability of the White Chuck River because the road is located away from the river. Site #8 (MP 8.5) would have no effect on channel migration, but it would have a positive effect on sediment and wood transport and stability of the White Chuck River because the road would be decommissioned at this site.

Water Quality

Turbidity standards are expected to be met because of the small amount of introduced sediment during construction (about 2.8 cubic feet for the entire construction period[12]) and the dilution effect of the river. In addition, the project would occur at a time of year when the background turbidity is very high due to glacier melt water entering the river.

The expectation that the turbidity standards would be met is based on the small quantity of project-introduced sediment and the dilution by the White Chuck River. When the first runoff of fall entrains the remaining sediment on the channel margin, the background turbidity would be high and the suspended sediment from this project (42.1 cubic feet of sediment from the project minus sediment from construction times 35 percent) would be diffused into 1,000 cfs or more of turbid water. When the Stujack culvert is replaced with a structure to better pass fish, a minor amount of sediment would be generated at a time when the river is still turbid from glacier melt water.

No water quality impacts from oil, gas, or hydraulic fluid are anticipated because no machinery would be working in the water. At Sites #2 (MP 2.4), #4 (MP 3.4), and #5 (MP 3.5) to road terminus, equipment would briefly work over the water while installing or cleaning culverts. There would be a small risk of a spill on streamside materials. If this should occur, the area would be properly cleaned. Because there would be equipment working on the floodplain to excavate a hole for the riprap toe, and to place riprap and logs at Site #1 (MP 1.9), there would be the potential for a hydraulic leak. Should that occur, all contaminated material would immediately be removed and properly disposed of (see mitigation measures in Chapter 2).

As discussed above, because the White Chuck River is highly turbid, water temperature is higher than would be expected. Although there would be some trees removed at Sites #1, (MP 1.9) #2 (MP 2.4), and #3 (MP 3.4), none of those trees would have an effect on stream temperatures. At Site #1 (MP 1.9), the river is so wide that the trees associated with the project provide little if any effective shade. If the wood added to the site is effective at maintaining a narrower, deeper low flow channel and establishing an alder covered terrace, there would be better temperature control than currently exists.

At Site #2 (MP 2.4), the removal of some small alders where the road would cross the unnamed creek would have no measurable effect on the temperature of the creek. Shrubs dominate the area where the crossing would occur, and shrubs would return quickly after construction ceases.

The project would have no measurable effect on turbidity and sediment in the White Chuck River. Background turbidity in the White Chuck River is normally high; during winter storm events, the water is very turbid from erosion of the mudflow channel banks, and in the summer, glacier melt water contributes to high turbidity. In the fall and winter when there are no storm events, and the glaciers are frozen, the turbidity is low. There are no measurements of turbidity for the White Chuck River; however, it is expected to vary widely. Samples taken downstream on the Sauk River near Rockport in 2004 ranged from three NTU

[12] Based on the assumption that only Sites #2 (MP 2.4), #3 (MP 3.4), #4 (MP 3.5), and #8 (MP 8.5) would generate some sediment during construction and 35 percent of the construction-generated sediment is suspended size material and that about five percent of that will actually get into the water during construction. This amounts to about a 18-gallon bucket.

to 2,200 NTU (Washington Department of Ecology website). The White Chuck and Suiattle Rivers are likely the greatest contributors to that turbidity.

Alternative C

Under Alternative C, the repairs would be the same at Sites #1 through #4 (MPs 1.9 through 3.5) as under Alternative B, except two engineered logjams (ELJs) would be constructed approximately 500 feet upstream from the repair at Site #1 (MP 1.9). The ELJs would help shift the river away from the repair at Site #1 (MP 1.9). Between MP 5.8 and the road terminus (MP 10.3) the road would be placed in storage such that the risk of continued road slumping and failure would be reduced, unless the road is re-opened in the future.

Similar to Alternative B, this alternative would disturb 3.41 acres of forest soils (Table 13). However, based on the best information available, the Forest Plan Standards and Guidelines are believed to be adequate to minimize impacts to the soil resource under this alternative. Alternative C would be similar to Alternative B from MP 5.8 to the terminus (Tables 14 and 15) because the road treatment for storage is similar to decommissioning. The road in storage would provide similar benefits in hydrologic connectivity and sediment deliveries, with the expectation that there may be future use of the road with a corresponding return to the impacts expected from a road as described in Alternative D.

Sediment

As described under Alternative B, there would be no appreciable soil erosion or sediment delivery to the river due to repairs at Site #1 (MP 1.9). The project would produce nearly the same amount of sediment as under Alternative B; however, with the construction of the ELJs, activities under this alternative would produce a total of less than 14 cubic yards of sediment in the first year, and decrease to less than 7 cubic yards in the second year. Compared to the conservative estimate of 33,000 cubic yards of background annual sediment yield of the White Chuck River, the amount of sediment produced from the project would be negligible.

At Site #1 (MP 1.9) work within the active channel would temporarily compact and introduce sediments into the White Chuck River. From the construction of the logjams, approximately 20 tons (15 cubic yards) of sediment would potentially be compacted below, or reincorporated into the structure of the ELJs. Assuming effective design utilization of sediment, appropriate construction with sediment, and implementation of BMPs, less than 0.2 tons (0.3 cubic) would be introduced into the White Chuck River in the first year or two, then a negligible amount. With the implementation of BMPs, sediment introduction as a single pulse would be minimized, especially as any mixes with the glacially fed, sediment-rich White Chuck River. Any small flush of finer silts and sands with the first high water would only be of materials already in the stream and channel margins.

At Site #5 (MP 5.8) through the road terminus, Road 23 would be placed in storage under this alterative. Storage differs from decommissioning (as would be done under Alternative B) in that some of the small culverts may not be removed, but instead have most of the fill material removed over the pipe, dips placed on the uphill side, and additional dips installed every 100 to 200 feet. This would result in approximately 7.4 cubic yards, decreasing to 0.7 cubic yard, of erosion that would enter the river. This amount of erosion under Alternative C would be negligible compared to the estimate of 64,605 cubic yards that has entered, or will

enter the river from this segment of road due to the 2006 flood. If any culverts that are not removed fail, additional erosion would occur. In addition, if the road is removed from storage in the future, the amount of erosion would be similar as to that for Alternative D (see discussion below) at Sites #5 through #8 (MP 5.8 through 8.5).

Road 23 from MP 5.8 through the road terminus (MP 10.3) crosses segments of unstable soils. Placing this portion of road in storage would decrease the amount of road on unstable soils by approximately 2.2 acres. If the road were removed from storage, road reconstruction across the unstable soils would be of concern for sediment delivery and the need to meet road construction suggestions for the specific soils series the road crosses.

Channel Dynamics

Under Alternative C, effects to channel dynamics would be the same as those described under Alternative B, except at Site #1 (MP 1.9) (see discussion of effects to channel dynamics at Sites #2 through #8 [MP 2.4 through 8.5] under Alternative B). Under Alternative C, to further enhance aquatic habitat, mitigate for any affects to the floodplain, and encourage additional deposition of material onto the floodplain, two ELJs would be constructed within the active channel approximately 500 feet upstream from Site #1 (MP 1.9). With the addition of wood along the base of the riprap armored embankment, large logs placed on the bankfull channel, and two ELJs, the effect of the large rock base for the road would further be minimized. As previously noted, the tendency of the river following the last two floods has been to reestablish the channel away from the road at this location; these activities at Site #1 (MP 1.9) would further encourage channel migration away from the left bank (the road) and encourage deposition of material on the floodplain and slow water velocities around the wood complexes.

Water Quality

Under Alternative C, effects to water quality would be the same as those described under Alternative B, except that Alternative C would result in slightly more sediment input to the White Chuck River than Alternative B (about 10.9 cubic feet for the entire construction period and approximately 42.5 cubic feet following the first runoff of fall).

Because Alternative C would result in additional activity along the channel margins at Site #1 (MP 1.9) for the construction of the ELJs, as well as within the floodplain for other activities, there would be the potential for a hydraulic leak. Should that occur, all contaminated material would immediately be removed and properly disposed of.

Alternative D

Under Alternative D, repairs would be the same at Sites #1 through #4 as under Alternative C. Between MP 5.8 and the road terminus (MP 10.3) the road would be repaired to provide passenger vehicle access to popular recreation areas and access Matrix lands for timber management.

This alternative would disturb 3.87 acres of forest soils (Table 13) with the reconstruction of the last 5 miles of road. This would continue the commitment of 4.4 acres to forest road, compaction would not be reduced, and there would be a greater risk of plugged culverts, overland flows, and sediment delivery than under Alternative B or C. However, based on the best information available, the Forest Plan Standards and Guidelines are believed to be

adequate to minimize impacts to the soil resource under this alternative. Alternative D would have no reduction of compacted soils (Table 14).

In addition to previous evaluation on soil disruption and compaction, sediment production and the amount (miles/acres) of road reconstruction/construction on unstable soils are evaluated below.

Sediment

As under Alternatives B and C, there would be no appreciable soil erosion or sediment delivery to the river due to repairs under Alternative D. Under Alternative D, the project would produce less than 8 cubic yards. Compared to the conservative estimate of 33,000 cubic yards of background annual sediment yield of the White Chuck River, the amount of sediment produced from the project would be negligible. Work at Sites #1 through #4 (MP 1.9 through 3.5), and resulting erosion, would be the same as described under Alternative C.

At Site #5 (MP 5.8) the 0.1 mile of the road repair would occur approximately 0.1 mile away from the river, approximately 60 feet west of a live culvert. Based on the extent of damage and proposed repair, work at the site would disturb approximately 0.2 acre of ground.

At an erosion rate of 15,000 tons per square mile per year for re-constructing the road at the damaged site, the total annual erosion from the repair would equal around 5 tons (3.7 cubic yards) for the first year or two. Road surfacing with gravel and mulching and revegetation of bare soils would prevent most of this. If erosion control is assumed 70 percent effective (Forest Service 1981), 2 tons (1.5 cubic yards) of erosion may occur the first year or two and reduce to negligible amounts over the long term.

Much of this erosion would not enter the White Chuck River. Because most of the road repair work would drain onto well-vegetated slopes, only about a third (33 percent) of the eroded material would be expected to enter the White Chuck River. Using these assumptions there would be approximately 1 ton (0.7 cubic yard) of material delivered to the White Chuck River from Site #5 (MP 5.8) in the first year or two, then a negligible amount. The remainder would be dispersed across the vegetated slopes. This would be minor compared to the 565 cubic yards of erosion estimated to have been delivered into the river from the slump that occurred in 2006 at Site #5 (MP 5.8) (33 percent of 1,711 cubic yards of slumped sediment).

At Site #6 (MP 6.45), the 0.05 mile of road repair would occur approximately 0.08 mile away from the river. Based on the extent of damage and proposed repair, work at the site would disturb approximately 0.09 acre of ground. Using the same erosion rate and assumptions described for Site #5 (MP 5.8), work at Site #6 (MP 6.45) would result in total annual erosion of 2 tons (1.5 cubic yards) for the first year or two, which would be reduced to1 ton (0.7 cubic yard) per year after implementation of erosion control measures; this amount would be reduce to negligible amounts over the long term. Of this amount 0.3 tons (0.2 cubic yard or 33 percent) would be delivered to the White Chuck River during the first year or two. This would be a minor amount compared to the 1,147 tons (847 cubic yards) of material estimated to have been delivered to the White Chuck River from the slump that occurred in 2006 at Site #6 (MP 6.45) (33 percent of 2,567 cubic yards of slumped sediment).

At Site #7 (MP 7.2), the 0.04 mile of the road repair would occur approximately 0.1 mile away from the river. Based on the extent of damage and proposed repair, work at the site would disturb approximately 0.05 acre of ground. Using the same erosion rates and assumptions described for Site #5 (MP 5.8), this would result in 1 ton (0.7 cubic yard) of erosion for the first two years, which would be reduced to 0.3 tons (0.2 cubic yard) of erosion after implementation of proper erosion control techniques, then negligible amounts over the long term. Of this amount, approximately 0.1 ton (0.07 cubic yard) or sediment would be delivered to the White Chuck River during the first year or two. This would be a minor amount compared to the estimated 23 cubic yards of material estimated to have been delivered to the White Chuck River from the slump that occurred in 2006 at Site #7 (MP 7.2) (33 percent of 69 cubic yards of slumped sediment).

At Site #8 (MP 8.5), the 0.07 mile of the road repair would occur approximately 70 feet above the base of the river wall, and would disturb approximately 0.12 acre of ground. Due to this connectivity between the road and river wall, activities at this site to repair and construct new portions of the road would likely contribute sediment moving downslope to the White Chuck River. Using the same erosion rates and assumptions as described for Site #1 (MP 1.9), this would result in a total annual erosion of 3 tons (2.2 cubic yards) for the first year or two, which would be reduced to 1 ton (0.7 cubic yard) of erosion and negligible amounts over the long term after implementation of proper erosion control techniques. This amount would be minor in comparison to the 63,170 cubic yards of erosion estimated to have washed into the river here during the 2006 flood. The addition of riprap as the base of the road at Site #8 (MP 8.5) would assist in road stability, but due to the dynamic nature of this landscape the road will be susceptible to future failures at this site, potentially generating tens of thousands of cubic yards of sediment.

Road 23 from MP 5.8 through the road terminus (MP 10.3) occurs on 2.2 acres of mapped S-8 soils. There is considerable concern for road stability along this segment of Road 23 because of the past road failure in 2006. Repairing this segment of road maintains the amount of road on unstable soils.

Channel Dynamics

Alternative D would have the same effects on channel dynamics as described under Alternative C, for Sites #1 through #4 (MP 1.9 through 3.5). Sites #5 through #7 (MP 5.8 through 7.2) are greater than 0.08 mile (141 yards) away from the White Chuck River and none of the creeks that drain the hillslope along this segment of road occur within the extent of the damaged sites. Therefore, the work at these sites would not affect the channel dynamics of these creeks. Overall, none of these effects at any of the sites would compromise the overall processes of the river and watershed. Repair work at Site #8 (MP 8.5), due to its location above the river, would not directly affect channel migration, wood transport, or stability of the White Chuck River; however as discussed above, sediment transport would be affected.

Water Quality

Under Alternative D, Turbidity standards are expected to be met because of the small amount of introduced sediment during construction (about 11.4 cubic feet for the entire construction period) and the dilution effect of the river. This prediction is based on the small quantity of

project-introduced sediment and the dilution by the White Chuck River. When the first runoff of fall entrains the remaining sediment on the channel margins, the background turbidity would be high and the suspended sediment from this project (22.5 cubic feet) would be diffused into 1,000 cfs or more of turbid water. When the Stujack culvert is replaced with a structure to better pass fish, a minor amount of sediment will be generated at a time when the river is still turbid with glacier melt water.

Effects Summary

Overall, the effects of each of the action Alternatives on soil disturbance and compaction, and channel dynamics and sediment regime of the White Chuck River would be minor. Road construction would occur outside the normal high water channel or on the slopes away from the river. Very little sediment would be created during construction activities. Rock and large wood will protect the base of the road fill at Site #1 (MP 1.9) while leaving most of the floodway clear of road material. Under each alternative, there would be no measurable change in water quality. No alternative would result in the listing of the White Chuck River under Section 303(d) of the CWA.

Regarding soil quality, the short-term losses in soil quality would be relatively low to moderate in intensity (Table 16). The losses to soil quality would lessen with time. This could translate to similar effects on soil productivity; however, the prescribed design features and mitigation measures would ameliorate the damage and allow a relatively rapid recovery in the long term.

Table 16. Magnitude, Duration, and Intensity of Losses to Soil Quality

Duration	Intensity	Magnitude
Short term, *Alternative B*	Low	Small, 3.4 acres
Short term, *Alternative C*	Low to Moderate	Small, 3.41 acres
Short term, *Alternative D*	Low to High	Small, 3.87 acres
Long term (more than 50 years), all action alternatives	Low	Small

Table 17 provides a summary of sediment erosion for each alternative by site. Selection of Alternative B, C, or D would produce less sediment than the amount from damages that occurred in the 2003 and 2006. Although sediment erosion by site is initially lower under Alternative D than either B or C, by the second year both B and C are lower than D. Construction related fine sediment is lower under B than compared to C or D.

As previously noted, first year sediment erosion by site is lower under Alternative D than B or C; this is because the repairs only occur at individual sites under the D, and over 4.4 acres of road to be decommissioned or placed in storage under B or C, respectively. However, Alternative D would continue to have a risk of potential road slumps and failure where the river is adjacent to the road (MP 8.5). MP 5.8 to MP 8.5 crosses stretches of hillslope that are mapped as unstable soils (2.2 acres). If a failure were to occur, it would potentially damage the road and contribute tens of thousands of cubic yards of sediment to the White Chuck River.

Table 17. Effects Summary of Sediment Erosion

Alternative	Site	Sediment into White Chuck River from 2003 or 2006 Events (cubic yards)	Total Sediment into White Chuck River at Each Site (cubic yards)	Fine Sediment Erosion from Construction Only (cubic feet)
B				2.8
	1	15,778	0.6	
	2	85,000	3	
	3	22,222	2.2	
	4	6,000[13]	0.05	
	5-road terminus	64,605	7.4 going to 0.7	
C				10.9
	1	15,778	0.9	
	2	85,000	3	
	3	22,222	2.2	
	4	6,000	0.05	
	5- road terminus	64,605	7.4 going to 0.7	
D				11.4
	1	15,778	0.9	
	2	85,000	3	
	3	22,222	2.2	
	4	6,000	0.05	
	5	565	0.7	
	6	847	0.2	
	7	23	0.07	
	8	63,170	0.7	

Repairing the road under Alternative D would continue to commit 4.4 acres of forest land to harden road surface, with compacted soils that provide increased in surface runoff. The reconstructed road would continue to have a higher risk to hydrologic connectivity from plugged culverts and sediment erosion at hillslopes compared to Alternatives B and C. This stretch of Road 23 is across a dynamic landscape that naturally contains slumps, mass failures, and large movements of sediment and woody material

Table 18 provides a summary of effects relative to the no action alternative (Alternative A) as well as among each of the action Alternatives. Under Alternative A, no action would occur; however, potential negative effects include road ditches becoming plugged and washing out additional parts of Road 23 without proper maintenance.

In general, the benefits of road decommissioning (Alternative B) include reducing sediment delivery by improving infiltration through decompaction, reducing overland runoff in ditches by filling in ditches and outsloping road surfaces, and reducing potential road washouts by restoring hydrologic connectivity at road-stream crossings. Road use increases sediment delivery, and closing or decommissioning roads is expected to reduce sediment delivery to streams by reducing road use. Closing and stabilizing roads is expected to reduce the potential for sediment delivery to streams by reducing erosion potential of the road prism. Culvert removal would also allow for the natural distribution of large wood and larger sediments. Overall, under Alternative B or C, the amount of sediment delivered to streams is

[13] Approximation of culvert shift in Stujack Creek and amount of sediment generated (70 yd x 17 yd x 5yd).

Table 18. Effects Summary Relative to No Action (Alternative A) and Among the Action Alternatives

	Alternative B	Alternative C	Alternative D
Sediment Delivery	Decrease; much less than Alternatives C or D	Decrease; greater than Alternative B, but much less than Alternative D	Increase over current conditions
LWD Delivery	Increase; greater than Alternatives C or D	Increase; less than Alternative B, but greater than Alternative D	Similar to current conditions
Soil Compaction	Decrease; much less than Alternatives C or D	Decrease; greater than Alternative B, but much less than Alternative D	Increase over current conditions
Soil Productivity	Increase; much greater than Alternatives C or D	Increase; less than Alternative B, but greater than Alternative D	Decrease over current conditions
Impacts to Tributaries	Decrease; much less than Alternatives C or D	Decrease; greater than Alternative B, but much less than Alternative D	Increase over current conditions
Overland Runoff	Decrease; much less than Alternatives C or D	Decrease; greater than Alternative B, but much less than Alternative D	Increase over current conditions
Channel Dynamics	Large Improvement; more effective than Alternative C, but less than Alternative D	Improvement; less effective than Alternative B, but more than Alternative D	Improvement; less effective than Alternatives B or C
Water Quality	Very short-term, low-level sediment contribution	Short-term, low-level sediment contribution	Continued sediment contribution
Number of Stream Crossings	Decrease; much less than Alternatives C or D	Decrease; greater than Alternative B, but much less than Alternative D	Increase over current conditions
Road Washouts	Decrease; risk much less than Alternatives C or D	Decrease; risk much greater than Alternative B, but much less than Alternative D	Decreased risk over current conditions
Road Impact	Increase, but less than Alternatives C or D	Increase and similar to Alternative B; but less than Alternative D	Increase over current conditions
Overall Comparison	Improvement; more effective than Alternatives C or D	Improvement; less effective than Alternative B, but more than Alternative D	Improvement over current conditions, but less than Alternatives B or D

expected to be less than would occur if Road 23 were left under its current condition or repaired to a drivable state.

Alternative C is similar to Alternative B; however, placing the road in storage instead of decommissioning the road would only remove most of the culverts and have a higher risk for potential sediment erosion and culvert failure. Overall, Alternative C is similar to Alternative B in the amount of sediment delivered to streams. Alternative C has a slightly higher risk of sediment delivery than under Alternative B, but it would be less than what would occur if the roads were left under their current condition (Alternative A) or repaired to a drivable state (Alternative D).

Alternative D would repair the road to a drivable state and would continue to commit 4.4 acres of forest land to compacted road surface (the largest amount of compacted soils under the action Alternatives). As previously discussed, because the upper stretch of Road 23 crosses unstable soils (2.2 acres), there is a high potential for a hillslope failure to occur. If a failure were to occur, it would potentially damage the road and contribute tens of thousands of cubic yards of sediment to the White Chuck River. Overall, under Alternative D, there is the highest risk of sediment delivered to streams. The risk is expected to be more than either Alternative B or C, but it would be less than what would occur if the roads were left under their current condition.

Long-term effects are related to maintaining between 4.5 and 10.3 miles of road (depending on the Alternative) within the river corridor. Channel migration and erosion of the slopes that support the road also threaten other portions of the road. Repeated impacts to the road have occurred in the past because the large floods funnel through the inner gorge and undermine the slope below the road. The long-term future of the road will require other decisions on relocating or rebuilding the road to maintain the access. However, the repair and relocation proposed in this assessment are expected to reduce the risk of road loss at these sites. Over the long term, Alternatives B and C would restore road-stream crossings on the lower portion of the road, lowering risk of sediment delivery to streams. Alternatives B and C would also reduced the miles of road used by vehicles, which is expected to produce less sediment to streams over the long term in comparison to Alternatives A or D.

Geology, Soils, and Hydrology Cumulative Effects

Assumptions:

- Sediment effects from site erosion are short term–1 to 2 years;
- Long-term sediment has two main sources: a) floods and future road washouts, b) longevity of sediment in system; and
- Project-generated sediment is 35 percent by volume suspended sediment and 65 percent sand and gravel.

Travel distance (per year) in White Chuck River (Bunte and MacDonald 1998):

- Suspended sediment, particularly lacustrine clays–(20 kilometers, 12.4 miles);
- Bedload (sand and gravel)–(3 kilometers, 1.9 miles); and
- Bedload (cobbles, boulders)–(0.2 kilometer, 0.1 mile, 650 feet).

Washington State water quality standards include a narrative standard for sediment and numeric criteria for turbidity. The narrative standard prohibits sediment levels that would impair conditions for beneficial uses (in the case of the Sauk River, salmonid spawning and rearing). The turbidity standard[14] addresses the amount of suspended and/or dissolved material within the water column, measured in Nephelometric Turbidity Units (NTUs). An NTU is a measure of the reduction of light intensity when a light passes through a sample of the water. The water quality criteria differ depending on the background turbidity (whether it is less than or greater than 50 NTUs). There are no turbidity measurements in the vicinity of the White Chuck ERFO repairs, but the only flow conditions that would be expected to be less than 50 NTUs would be late fall and winter when no rainstorms were occurring. At other times of the year and during storms, flows would be expected to exceed 50 NTUs. Samples taken on the Sauk River near Rockport in 2004 ranged from 3 NTUs to 2,200 NTUs (Washington Department of Ecology 2006).

Cumulative Effects Analysis

The analysis area for the cumulative effects to geology, soils, and hydrology are the White Chuck and Sauk River watersheds. The effects of the proposed project would not be measurable (see previous discussion), but because the project does generate some sediment and alter the erodability of the valley wall at Site #1 (MP 1.9), an analysis of the cumulative effects of the proposed project and other projects in the area that would affect sediment and/or channel migration, is completed below.

The minor amount of suspended sediment expected from the White Chuck ERFO repair project would travel into the Sauk River and probably carry as far as Clear Creek. Considerable dilution occurs at the confluence with the Sauk River, but the White Chuck River dominates the turbidity of the Sauk below the confluence.

Not all of the project-related sediment would enter the water at the same time. During construction, with low streamflow conditions, any fines that entered the water would not likely travel as far and, if the timing coincided with turbid glacier melt water, it would not be detectable downstream. If a storm occurred during construction, the river would also be turbid and the construction related sediment would not be detectable downstream. A storm water pollution prevention plan would be in place to protect the river from storm-induced sediment. During the first high water, the remainder of the sediment on the stream margin will be mobilized and combined with the background turbidity of the river. The suspended sediment would not be detectable in the turbid White Chuck River flow and therefore would not be detectable downstream. The Fisheries section discusses effects of suspended sediment on aquatic organisms.

Sand and gravel from the repair sites would likely travel as far as the Sauk River the first year, but not much farther. The quantity of sand and gravel material that would enter the river in the first year (estimated to be 3.9, 4.1, and 4.1 cubic yards under Alternative B, C, and D, respectively) would be small and dispersed among the project sites as described under each alternative. Erosion control measures from a storm water pollution prevention plan

14 Washington State Department of Ecology Class AA Water Quality Standard for turbidity: shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

would capture most of the storm-induced sand and gravel before it enters the river. The sand and gravel that would enter the river would not be distinguishable, during transport, from the high background sediment of the river. Effects of this size sediment would again be on aquatic organisms and to some extent on channel morphology. Sands and gravels fill in pools and simplify the streambed and habitat features. A more uniform bed means more stream energy for bed and bank erosion. Because of the minor contribution to the overall bedload of the White Chuck River, there would be little effect of this small amount of sand and gravel added to the mix. No movement of cobbles or boulders would be expected from project activities, with the exception of use during project activities, and therefore are not considered in the cumulative effects analysis.

Table 19 shows the potential cumulative effects. Cumulative effects are discussed below. As has been stated, effects from the White Chuck Road repairs would not be detectable below the confluence with the Sauk River; thus, any effects from this project would not be measurable cumulatively with other projects downstream of the White Chuck River mouth.

No measurable contribution to cumulative effects to geology, soils, and hydrology are anticipated among the action alternatives and the actions listed in Table 19. Those items in Table 19 that have the potential for cumulative effects are discussed below.

Gold Mountain Road Repair, including White Chuck Bridge

Only minor amounts of sediment from the Gold Mountain road repairs are anticipated to reach the Sauk River, where a contribution to cumulative effects could occur with the proposed action. This sediment would be transported to the Sauk River through various small tributary streams that drain the Gold Hill area. Since this sediment could not be measured distinctly from background sediment in the Sauk River, and sediment from the proposed action would not be distinguishable in the White Chuck River, there would be no measurable cumulative effect.

White Chuck Trail Flood Repair

Most of the trail work involves relocating the trail away from the river where it washed out in 2003. Trail construction would generate small amounts of sediment that would mostly deposit on the forested slopes or within small tributary channels. The minor amount of sediment that would get to the White Chuck River would not be measurable; therefore, there would be no cumulative effect. At this time, there is no funding for this project.

Ongoing, Annual Road Maintenance (Road 23 and 27 systems)

Access over Road 27 would not occur until the Boundary Bridge is repaired, which is probable in 2009. Therefore, maintenance would not occur until after the proposed project is completed. Maintenance increases the surface erosion on roads for a storm or two until traffic re-compacts the road surface. The actual amount and timing of the erosion cannot be predicted, so an assumption is that there could be a small flush of sediment from fresh road maintenance while there is still some sediment production from the proposed project (within the first couple years).

Table 19. Cumulative Effects Determination for Projects in the White Chuck and Sauk Rivers; Pertinent to the White Chuck ERFO Road Repairs

Project Type and Activity or Source	Sediment Effect	Overlap in Time	Overlap in Space	CE?[15]	Extent/Detectable?
Gold Mountain Road Repair, including White Chuck Bridge	Suspended	Yes	Yes	Yes	Minor suspended sediment from the bridge project may occur when suspended sediment is generated by the Road 23 repairs, but the combined effect would not be detectable in the Sauk River.
	Bedload	Yes	No		
White Chuck Trail Flood Repair	Suspended	Yes	Yes	Yes	The combined effect of any suspended sediment generated from the trail work would not be detectable.
	Bedload	Yes	No		
Upper White Chuck Pacific Crest Trail Flood Repair	Suspended	Yes	No	No	This project is too far away for a detectable contribution to cumulative effects.
	Bedload	Yes	No		
Design analysis work for White Chuck Road Repair in spring 2009	Suspended	No	Yes	No	No overlap in time and therefore there would be no contribution to cumulative effects from this analysis work.
	Bedload	No	Yes		
On-going, Annual Road Maintenance (Rd 23 and 27 systems)	Suspended	Yes	Yes	Yes	Short overlap in time and space with the first maintenance period after repairs are complete.
	Bedload	Yes	Yes		
White Chuck Bench Trail Flood Repair	Suspended	No	Yes	No	This project would occur when there is no longer detectable sediment from the Road 23 repairs.
	Bedload	No	Yes		
Forgotten Thin Plus, Commercial Thinning Sale	Suspended	Yes	Yes	Yes	Suspended sediment mixed with Sauk River background and upstream sediment would not be detectable in the Sauk River.
	Bedload	Yes	Yes		
Gold Mountain Radio Tower	Suspended	No	No	No	There are no remaining sediment effects from this action.
	Bedload	No	No		
Reconstruction/Repair of Roads 24, 2424, 2420, 2097, and 2097010	Suspended	Yes	Yes	Yes	These projects would be long-term improvement – sediment reduction; minor increase first season.
	Bedload	Yes	No		
County Road Repairs (Darrington to NF boundary)	Suspended	No	No	No	This completed project is 11 or more miles down river and has no lingering effects.
	Bedload	No	No		
Gold Hill Fire Salvage Timber Sale	Suspended	No	No	No	There are no remaining sediment effects from this action.
	Bedload	No	No		
Suiattle Road 26 Repair	Suspended	No	No	No	This project is too far away for cumulative effects to overlap.
	Bedload	No	No		
Bedal Creek culvert removal (Road 4096)	Suspended	No	No	No	There are no remaining sediment effects from these completed actions that have reduced long-term watershed sediment.
	Bedload	No	No		
Rd 4096 Decommission, convert to trail.	Suspended	No	No	No	
	Bedload	No	No		

[15] The "CE?" column only suggests that there could be CEs because of overlap in time and space. If the individual effects are small, there may not be a measureable combined effect and therefore no cumulative effect. See narrative after table for cumulative effects call.

Table 19. Cumulative Effects Determination for Projects in the White Chuck and Sauk Rivers; Pertinent to the White Chuck ERFO Road Repairs (continued)

Project Type and Activity or Source	Sediment Effect	Overlap in Time	Overlap in Space	CE?[16]	Extent/Detectable?
Decommissioning portions of Roads 2080, 2083, 2084, 2086, 2087	Suspended	No	Yes	No	Completed watershed restoration with long-term sediment reduction.
	Bedload	No	Yes		
Lyle Commercial Thinning Sale	Suspended	No	Yes	No	There are no remaining sediment effects from this sale.
	Bedload	No	No		
Mountain Loop ERFO Repairs	Suspended	Yes	Yes	Yes	Brief time overlap with very minor amount of suspended sediment that would be indistinguishable from background at White Chuck confluence.
	Bedload	Yes	No		
Funnybone portion of Skull/Funny-bone Commercial Thinning	Suspended	No	No	No	This project is too far away for cumulative effects, and would not likely overlap in time.
	Bedload	No	No		
Skull portion of Skull/Funnybone Commercial Thinning	Suspended	No	Yes	No	There are no remaining sediment effects from this portion of the sale.
	Bedload	No	No		
White Chuck Bench Trail Maintenance	Suspended	No	Yes	No	Effects are limited and not expected until after ERFO 2009 repairs are complete.
	Bedload	No	No		
Too/Rib Timber Sale	Suspended	No	Yes	No	There are no remaining sediment effects from these sales.
	Bedload	No	No		
Dubor and Dontbor Thin	Suspended	No	Yes	No	There are no remaining sediment effects from these sales.
	Bedload	No	No		
Decline Timber Sale	Suspended	Yes	No	No	This project is too far away for cumulative effects; drains into Dan Creek.
	Bedload	Yes	No		
Instream Treatments and fish passage projects	Suspended	No	Yes	No	There are no residual effects that could combine cumulatively with effects from this project.
	Bedload	No	No		
Wishbone Thin Timber Sale	Suspended	No	No	No	This project is within the Dan Creek watershed that flows into the Sauk River downstream of Darrington.
	Bedload	No	No		
Past ERFO treatments on Road 23	Suspended	No	Yes	No	There are no remaining sediment effects from these actions.
	Bedload	No	Yes		
White Chuck Boat Launch	Suspended	Yes	Yes	Yes	This activity does not generate sediment in any measurable amount.
	Bedload	No	No		

If a storm occurs within a week or two of the maintenance and completion of the ERFO repairs, a possible cumulative effect could occur; however it is difficult to quantify the effect. Much of the material that washes from the road surface deposits alongside the roadway. The remainder may enter ephemeral or perennial channels where additional deposition occurs. A

[16] The "CE?" column only suggests that there could be CEs because of overlap in time and space. If the individual effects are small, there may not be a measureable combined effect and therefore no cumulative effect. See narrative after table for cumulative effects call.

small amount of suspended material may enter the White Chuck River where the flush of sediment is occurring from the ERFO repair work. The combined small amount of sediment would be masked by the background storm-generated sediment in the White Chuck River.

Forgotten Thin Plus Commercial Thinning Sale

A minor amount of sediment is projected to enter the Sauk River from the Forgotten Thin Plus Thinning Sale, but would not be detectable within the background turbidity or bedload. A similarly small amount of sediment is projected to enter the White Chuck River from the proposed action. Once the Sauk and White Chuck Rivers combine, there would be no measurable cumulative effect of these two projects.

Reconstruction/Repair of Roads 24, 2424, 2420, 2097, and 2097010

Roads 24 and 2420 have been repaired for thinning activities. A minor amount of sediment is projected to enter the Sauk River, but would not be detectable within the background turbidity or bedload. The timing of the road work for 2424, 2097, and 2097010 is uncertain compared to the proposed action, but the worst case scenario is that this road work would occur close to the same time as the proposed action. Should that occur, there would be small amounts of sediment generated by both projects. The reconstruction/repair of Roads 2424, 2097, and 2097010 would result in some sediment entering small tributaries of the Sauk River. Some of this sediment will flush out of the tributaries during storm events, but would not be measurable in the Sauk River. Because the proposed project-related sediment is not expected to be measurable at the mouth of the White Chuck River, there is no cumulative effect of these two projects.

Mountain Loop ERFO Repairs

The Mountain Look Scenic Byway ERO repair was completed in the spring of 2007, and will have mostly stabilized by the time the work starts on the proposed project. A small amount of suspended sediment from the Mountain Loop work is projected to reach the White Chuck River confluence, but the amount would be very small and not measurable at that distance. No measurable cumulative effect would occur at the confluence of the Sauk and White Chuck Rivers.

White Chuck Boat Launch

This activity does not generate sediment. Wading into the water to launch a boat re-suspends sediment already present in the river bed. The resulting turbidity dissipates quickly and would occur during the boating season only. Because launching a boat does not generate sediment, there would be no cumulative effect with the proposed project, even though the turbidity created by this activity could overlap in time and space with turbidity generated by the proposed project.

Climate Change

Throughout time and continuing into the future, global climate change has and will continue to occur. The action alternatives included in this assessment have incorporated the concept that not only will the global climate continue to change, but also the affects will likely be felt

at the scale of the Mt. Baker-Snoqualmie National Forest. To address these changes, a number of options have been promoted, developed, and incorporated into the design options for each of the action alternatives. Appendix E provides a description related to Climate Change and Adaptation Options.

Consistency with the Forest Plan

Alternative A would be consistent with the Mt. Baker-Snoqualmie National Forest Land and Resource Management Plan (LRMP) as amended because it would meet the Aquatic Conservation Strategy Objectives, Standards and Guidelines for Road Management. No new roads would be built, no soils disturbed, no S-8 soils crossed, and no disturbance to channel dynamics would occur because no activities are associated with this alternative.

Alternative B would be consistent with the Mt. Baker-Snoqualmie National Forest LRMP, as amended, because it would meet the Aquatic Conservation Strategy Objectives and Standards and Guidelines for Road Management. Although new sections of Road 23 would be built, and a total of 3.4 acres of soil would be disturbed, these sections would be primarily outside of the channel migration zone of the river. In addition, 4.5 miles of Road 23 would be decommissioned, totaling a 4.4-acre reduction in compacted soils, and therefore, there would be no net increase for roads in the watershed. The 4.5 miles of Road 23 that would be decommissioned crosses portions (2.2 acres) of S-8 soils and would therefore be consistent with the Forest Plan as amended.

Alternative C is the primarily the same as Alternative B and would therefore be consistent with the Forest Plan as amended.

Alternative D would *in*consistent with the Forest Plan, as amended, because there would be a net increase for roads in the watershed and sections of the road that cross S-8 soils would be reconstructed (2.2 acres). Under this alternative 3.87 acres of soil would be disturbed and compacted.

Fisheries Affected Environment

The proposed road repairs are located within the White Chuck subwatershed in the Sauk River sub-basin, which is a Tier 1 Key Watershed. Tier 1 Key Watersheds serve as refugia for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species (Forest Service and BLM 1994).

Fish Species of Interest

The White Chuck River provides habitat for a diversity of fish species including species listed as federally “Threatened” under the ESA, those listed as “Sensitive” by the Pacific Northwest Region of the Forest Service, as well as other anadromous and resident fish species (see Table 20, Fish Species with Management Emphasis in the White Chuck River).

Table 20. Fish Species of Management Emphasis, White Chuck River Watershed

Species (Stock)	Source and Status	Utilization Associated with Project Analysis Area
Chinook salmon (upper Sauk)	NMFS—Listed Threatened (3/99); reaffirmed Threatened (6/05); Designated critical habitat (9/05) Forest Service—MIS SaSI 2002–-Depressed	White Chuck mainstem to RM 12 (known); large tributaries: Camp, Owl, Pugh.
Bull trout	USFWS—Listed Threatened (11/99); reaffirmed Threatened (4/08); Designated critical habitat (9/05) Forest Service—MIS SaSI 2004—Unknown for Upper Skagit stocks; Healthy for Lower Skagit stocks	White Chuck up to about RM 19, near Baekos Creek. Upstream of Baekos Creek, habitat is present but spawning has not been confirmed.
Steelhead (Sauk winter)	NMFS—Listed Threatened (5/07); critical habitat not yet designated Forest Service—MIS (anadromous and resident) SASSI 1998–-Healthy SaSI 2002 Unknown (due to combined data with Skagit surveys)	Mainstem spawning up past Camp Creek, to about RM 11; presumed use up to about RM 18. Tribsutaries: Owl, Pugh, Stujack, Black Oak Creeks.
Coho salmon (Skagit)	NMFS–-Candidate; Species of Concern (4/04) Forest Service—Sensitive; MIS SaSI 2002—Healthy	White Chuck mainstem to Owl Ck. (RM 9.8), with habitat to Fire Ck. (RM 12.8); lower reaches of Camp, Owl, Pugh, Crystal, Dead Duck, Stujack, Black Oak, and some unnamed tributaries.
Sockeye salmon (riverine, not Baker River stock)	NMFS—Not Warranted (Baker River stock in Skagit; 3/99) Forest Service—Sensitive	Mainstem up to and including lower Camp Creek.
Coastal cutthroat trout (Skagit)	NMFS—Not Warranted (4/99) Forest Service—Sensitive, MIS (anadromous and resident) SaSI 2000—Unknown	White Chuck mainstem up to and including lower Crystal Creek.
Chum Salmon (Sauk fall)	NMFS—Not Warranted (3/98) Forest Service—MIS SaSI 2002—Healthy	Not known to utilize the White Chuck River, but in the Sauk mainstem up to Falls Creek.
Pink salmon (Skagit)	NMFS—Not Warranted (10/95) Forest Service—MIS SaSI 2002—Healthy	Considered strays and not a contributing part of the Skagit stock. Five individuals and two redds seen at various locations during 1981 habitat surveys; two individuals seen at RM 1.6 in 1989.
Salish sucker	Forest Service—Removed from the R6 Sensitive Species list in 2007.	Unknown; low-gradient habitat lacking in the White Chuck; known in off-channel ponds in the Sauk and Suiattle.

NMFS—National Marine Fisheries Service; (Forest Service 1990 and Forest Service 2004); USFWS—United States Fish and Wildlife Service; SASSI—Washington State Salmon & Steelhead Stock Inventory (WDF et al. 1993; WDFW and WWTT 1994); SaSI—Washington Salmonid Stock Inventory (WDFW 1998, 2000, 2004); MIS—Management Indicator Species (from Forest Service 1990).

Federally Listed Species

Chinook salmon

The National Marine Fisheries Service (NMFS) listed the Puget Sound Chinook salmon Evolutionarily Significant Unit (ESU) as Threatened under the ESA in March 1999 and reaffirmed the Threatened status in June 2005.

While three Chinook salmon (*Oncorhynchus tshawytscha*) stocks utilize the Sauk River sub-basin, the Chinook salmon in the White Chuck River are managed as part of the Upper Sauk (spring) stock. Chinook salmon are mainstem and large tributary spawners. In the White Chuck, Chinook salmon spawn primarily in the mainstem from RM 9.9-12, but are also known to spawn in Camp, Owl, and Pugh Creeks. Rearing occurs in the mainstem along gravel bars and in/around tributary confluences. Some Chinook salmon will only rear in freshwater during their first summer then move downstream to rear in the Skagit River estuary, while others will rear a full year in fresh water.

Bull Trout

The USFWS listed the Coastal-Puget Sound bull trout Distinct Population Segment as Threatened in November 1999 and reaffirmed the Threatened status in April 2008.

Bull trout (*Salvelinus confluentus*) in the Sauk basin are a native char considered part of the Lower Skagit bull trout core population, with two local populations in the White Chuck system (Lower White Chuck and Upper White Chuck). These bull trout populations exhibit anadromous, fluvial, and resident life history forms, migrating between freshwater and saltwater, or within freshwater habitats. Requiring cold water temperatures for spawning and incubation like other char, bull trout are known to utilize the White Chuck up to about RM 19, within the Glacier Peak Wilderness near Baekos Creek. Upstream of Baekos Creek, habitat is present but spawning has not been confirmed. Early rearing occurs in close proximity to spawning habitat, but juveniles will disperse downstream throughout the system to rear.

Steelhead

The Puget Sound Distinct Population Segment of steelhead was federal listed by NMFS in May 2007.

Two steelhead (*Oncorhynchus mykiss*) stocks utilize the Sauk Basin: the Sauk winter steelhead, and the Sauk summer steelhead. Winter steelhead comprise up to 95 percent of the steelhead in the basin and utilize most of the Sauk basin into the headwaters. Steelhead in the White Chuck are part of the Sauk winter stock, and spawn up to about Fire Creek (RM 12.8). Rearing occurs in all accessible areas downstream. Resident rainbow likely have scattered use throughout the watershed.

Sensitive and Other Fish with Management Emphasis

The MBS National Forest has habitat for three fish species included on the Region 6 Regional Forester's Sensitive Animal Species List (Forest Service 2008a). These fish are the Puget Sound/Strait of Georgia coho salmon (*Oncorhynchus kisutch*), Baker River (Skagit) sockeye salmon (*Oncorhynchus nerka*), and Puget Sound coastal cutthroat trout (*Oncorhynchus clarki*).

Coho salmon in the White Chuck are part of the Skagit basin stock. They generally utilize smaller tributaries and off-channel habitats, and have been found in the White Chuck as far as Owl Creek (RM 9.8). Habitat is available up to about Fire Creek (RM 12.8), where natural stream gradients make access more difficult and habitat less attractive. Coho salmon rear for about a year in freshwater, distributing downstream throughout the river system.

Riverine sockeye salmon are found in the White Chuck mainstem up to and including lower Camp Creek. These fish are considered strays and are not recognized as a distinct stock; they are not managed as part of the Baker River stock.

The anadromous and resident forms of coastal cutthroat trout are found in the mainstem White Chuck up to and including lower Crystal Creek. High stream gradients limit this species.

Pink salmon in the White Chuck are considered strays and not a contributing part of the Skagit stock. Chum salmon do not appear to use habitat in the White Chuck.

Fish Habitat Watershed-Scale Assessment

The White Chuck River Watershed Analysis (Forest Service 2004) characterized the watershed processes and aquatic conditions for fish and fish habitat at the watershed scale. This entire river drainage is located within a Tier 1 Key Watershed. This key watershed, like other Forest key watersheds, contributes directly to the conservation of at-risk anadromous salmonids, bull trout and resident fish species (Forest Service and BLM 1994).

Doyle (2000) assessed the White Chuck River watershed to determine baseline conditions of fish and fish habitat indicators for upper Sauk spring Chinook salmon and bull trout using criteria established in the USFWS Matrix of Diagnostics/Pathways and Indicators (USFWS 1998). The objective of the assessment was to integrate the habitat conditions at the project site, reach, and watershed scales to arrive at an overall determination of the potential effect of land management activities on a proposed or listed species. Of the 19 habitat condition indicators (18 habitat indicators plus an overall integrated fish and habitat indicator), 18 were rated as *functioning appropriately*, and one indicator, "Road Density and Location" was identified as *functioning at risk*.

This 2000 assessment was revisited in 2004, and again in 2008, to reflect site, channel reach and watershed-scale changes to fish habitat as the result of the October 2003 and fall/winter 2006/2007 flood events. The 2004 assessment compared low elevation aerial photography from before the October 2003 flood with both 2004 aerial photographs and 2004 on-the-ground field surveys. The post-flood results (Doyle 2005) showed substantial volumes of large wood had entered stream channels and positively influenced six habitat indicators (large woody debris, pool frequency/quality, large pools, off-channel habitat, fish refugia, and floodplain connectivity). The 2008 assessment also compared aerial photography from before the October 2003 flood with both 2004 aerial photographs and 2008 on-the-ground field surveys. Again, substantial volumes of large wood had entered stream channels and positively influenced six habitat indicators (large woody debris, pool frequency/quality, large pools, off-channel habitat, fish refugia, and floodplain connectivity).

This additional large wood should keep these habitat indicators functioning appropriately over the next decade in the White Chuck, and improve conditions downstream as the wood migrates down into the Sauk. Native fish populations in the Sauk River sub-basin have

adapted to these dynamic flood conditions and over time have come to rely on the habitats created as a result of these natural processes. As small and large logjam complexes form and grow throughout the mainstem and side channel network, large rearing and holding pools are created, and spawning gravels are collected and retained.

Fish Habitat Project Area

The "action area" is the area of interest for consultation with the USFWS and NMFS. An "action area" is determined based on the proposed project area and the area that could receive direct or indirect impacts associated with the project. Four damage sites are located in the lowest reach of the White Chuck River, downstream of the junction of Roads 23 and 27 and four damage sites are located upstream of the junction of Roads 23 and 27. The action area for this project is from RM 0-11.7 of the mainstem White Chuck, tributaries draining into the White Chuck River where Road 23 stream crossings occur and are proposed, and the Sauk River.

Downstream of the junction of roads 23 and 27 the action area includes the mainstem White Chuck and the named and unnamed left-bank tributaries downslope of Road 23 from RM 0-4.0. An additional 300 feet of an unnamed tributary recognized by Williams et al. (1975) as stream number 1121 (hereafter referred to as Unnamed Tributary; see Figure 2 for its location) flows under Road 23 and 2311, and is also included in the action area. Upstream of the junction of roads 23 and 27, the action area includes the mainstem White Chuck and the named and unnamed right-bank tributaries downslope of Road 23 from RM 6.5-11.7.

Most of the known salmon, trout, and char spawning occurs at the confluences of the tributaries with the White Chuck River and in the White Chuck mainstem upstream of the confluence with Owl Creek (RM 9.8). Rearing for these species occurs in the action area, particularly in the mainstem White Chuck and tributaries. Stujack Creek, a tributary of the White Chuck, provides habitat for steelhead, bull trout, and coho salmon up to a natural barrier located about 700 feet upstream of the Road 23 crossing. Within the Unnamed Tributary, a natural barrier is just downstream of the Road 23 crossing, and there is no documentation that this stream provides useable fish habitat.

Surveys from 1982, within the action area, found the dominant fish habitat type to be riffles in the mainstem White Chuck River. The channel widths vary from 40 to 125 feet (summer low-flow to bankfull width), with a channel gradient between 1 to 3 percent, and a dominant substrate size ranging between coarse gravel (1 to 2 inches diameter) to small rubble (3 to 5 inches diameter). Channel gradient for spawning areas range between 2 to 10 percent.

Overall, use of the mainstem by salmon, trout, and char is most likely limited due to the high turbidity of the glacially derived runoff, especially during the summer (Forest Service 2004). Off-channel habitat and low gradient areas of tributaries draining into the White Chuck River are the primary areas used during these summer periods. This emphasizes the importance of these clear water habitats, such as Stujack Creek, its confluence with the White Chuck River, and off-channel areas, as they are the primary spawning and rearing areas for salmon, trout, and char in the White Chuck watershed.

The October 2003 and fall/winter 2006/2007 floods recruited, transported, and deposited abundant volumes of LWD within and adjacent to the lower reach of the river. Based on post-October 2003 low elevation aerial photography and limited field stream surveys, this

LWD has initiated additional pool formation. Both primary pools (length > 1.5 channel widths, and > 2 feet depths) and secondary pocket pools are in the process of forming. With continued transport and deposition in the active river channel, this LWD has the potential to develop larger primary pools and more secondary pools. These pool types are critical for salmon, trout and char migration, spawning, and rearing. With time, the pool quantity and quality in this river reach should increase.

Between 2003 and 2006, a debris jam and gravel bar formed at Site #2 in the channel that forced more of the White Chuck flow back toward the pre-October 2003 river alignment and away from the location where Road 23 washed out. The November 2006 flood deposited more material in the center of the channel and cut new channels through the wooded point bar on the inside of the meander (Figure 25). Water will likely continue to flow along the outer bank for many years, providing off-channel habitat, or one flood could close it off and move the river to the right. This debris jam, gravel bar, and connected off-channel habitat reflects the type of conditions resulting from the accumulation of recruited and transported LWD available in the White Chuck River.

Figure 25. White Chuck River Site #2 (MP 2.4) 2 Days after the November 2006 Flood
Note the large amount of debris and sediment deposition in center of channel (picture left).

These types of large debris jams assist in creating and maintaining off-channel habitat that provide rearing areas for juvenile salmonids during the summer (Figure 26). During the 2008 field survey, juvenile salmonids were observed in many of these off-channel areas, including this one at Site #2. These off-channel areas in the mainstem and low gradient areas of tributaries draining into the White Chuck River, are the primary segments in the action area with any potential environmental consequences from the proposed project alternatives.

Figure 26. White Chuck River Site #2 (MP 2.4) during the 2008 Summer

Note the large debris jams assisting in creating and maintaining off-channel habitat for juvenile salmonids.

Special Habitat Designations—Critical Habitat

Critical habitat is a term within the ESA. It is defined as those areas designated by the Secretary of the Interior or Commerce, for the survival and recovery of listed species. These can be areas either occupied, or not currently occupied, that contain physical or geographical features essential to the conservation of the species. As defined in the ESA, "conservation" means all methods and procedures, and the use of those, needed to bring a species to recovery, i.e., the point at which the protections of the ESA are no longer needed.

Chinook salmon: In September 2, 2005, the National Marine Fisheries Service issued a final rule designating critical habitat for 12 ESUs, including the Puget Sound Chinook salmon ESU (70 FR 52630). This rule became effective January 2, 2006. The White Chuck Road 23 Repair Project is associated with the following segment designated as critical habitat for Chinook salmon: the White Chuck River from its confluence with the Sauk River, upstream to approximately RM 12. This area provides spawning, rearing, or migration habitat and was rated by NMFS as having high conservation value to the ESU. This segment supports the independent population of the upper Sauk River (spring) Chinook salmon.

Bull Trout: USFWS issued a final rule September 26, 2005 (70 FR 56212), designating critical habitat for Coastal-Puget Sound bull trout. While a stream segment in the White Chuck River drainage was initially proposed for listing, National Forest System lands covered under the Northwest Forest Plan (including all lands within the MBS National Forest) were excluded from final listing designation. Critical habitat is designated in the Sauk River downstream of the Forest boundary (about RM 24.5); which is 9.5 miles downstream from the White Chuck Road 23 Road Repair Project.

Special Habitat Designations—Essential Fish Habitat

The Sustainable Fisheries Act of 1996 amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) to establish requirements for EFH descriptions in Federal fishery management plans and to require Federal agencies to consult with NMFS on activities that may adversely affect EFH. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Chinook salmon, coho salmon, and Puget Sound pink salmon are the predominant species

caught and managed under the Pacific Fisheries Management Council's salmon management plan (Pacific Fishery Management Council 1999). Chinook salmon and coho salmon EFH are present in the White Chuck, but pink salmon EFH is not considered to be present.

Watershed and Fish Habitat Restoration

Formal watershed restoration on the Mt. Baker-Snoqualmie National Forest began in fiscal year 1995 as part of an ACS described in the Forest Plan, as amended. Addressing resource needs and management impacts; however, began in the prior decade. The goals and objectives of watershed restoration are integral to recovery of fish habitat, riparian habitat, and water quality. Restoration strategies are comprehensive, addressing both the protection of physical and biological processes and functions of the best habitats that remain (refugia) and restoration of those processes and functions in degraded habitat. Restoration activities are integrated into a program designed to protect and restore upslope, riparian, and channel components of watersheds, including physical, chemical, and biological characteristics. Restoration activities also are designed and carried out in ways that advance the goal of increasing the capacity of the Western Washington Province's communities and workers to improve their economic and social well-being. Recognition of this goal as a key part of watershed restoration in and around the Forest ensures that short- and long-term economic benefits are compatible with environmental goals. Table 21 displays restoration treatments implemented in the White Chuck River watershed since the mid-1980s. The list is not exhaustive and shows a variety of treatments and locations.

Table 21. Watershed Restoration History in the White Chuck River Watershed

Type of Treatment/Location	Date	Description
Instream Habitat White Chuck Tributaries and side channels (Black Oak Creek, RM 1.0, RM 1.7, Two Pink salmon Channel [RM 5.1])	1985, 1988, 1990-92	Log deflectors and pool creation for rearing complexity and stability; instream logs for spawning gravels
Fish Passage Owl Creek, Crystal Camp Road	1999	Culvert removal at Crystal Camp, culvert-to-bridge at Owl Creek
Slope stabilization, road treatments, closures and decommissioning Dead Duck, Rd. 2314, 2311 and spur, 2440 and spurs, 2710, 2720, temporary logging roads	1990s	Streamside slope stabilization at various sites using on-site wood, Replace/upgrade failing culverts, remove culverts, construct waterbars and rolling dips, remove temporary railcar bridge over Dead Duck Creek, remove stringer bridge over Black Oak Creek, block vehicle access
Nutrient enhancement	2000s	Limited planting of salmon carcasses by WDFW or authorized groups to increase availability of marine-derived nutrients

Restoration activities in the White Chuck River system have the objective of reducing human-influenced sedimentation above the already high natural loading, and increasing or enhancing off-channel aquatic habitat quantity or quality. Emphasis on upslope restoration of watershed processes, and riparian and instream habitat restoration, is expected to continue over the next several years. Upslope restoration will focus on decreasing both the quantity

and magnitude of resource responses to natural processes, while instream habitat improvements will help provide benefits as upslope conditions improve.

Activities might include treatment of upslope drainage problems associated with roads through either closure or obliteration, or through reconstruction of roads to improve local hydrology. Where roads are needed for administrative use, drainage improvements and opportunities to relocate them out of riparian areas and away from fish-bearing waters will be considered. Retaining adequate forest canopy will help reduce effects to the timing and quantities of flows. Removing fish passage barriers provides an immediate and long-lasting benefit to multiple fish species. Impacts to riparian and aquatic habitats from recreational use can be assessed and treatments considered addressing problem areas. Cooperative restoration efforts with local Tribes, County/State/Federal agencies, non-profit groups, and private landowners are expected to increase over time.

Recreation and Fisheries

Damage from the 2003 and 2006/2007 flood events severely restricted motorized use of the White Chuck drainage. Road access was cut off by the combination of damage to Road 23, Road 26, and Road 25 across the Suiattle River at Boundary Bridge. Access for hiking and climbing groups shifted to other areas such as the North Fork Sauk River. However, hikers and climbers are utilizing areas already disturbed, and are not staying for extended periods; they are proceeding to staging areas for climbing in the Glacier Peak Wilderness (Forest Service employee Adrienne Hall, personal communication [Hall 2006]).

Users of OHVs are driving the White Chuck road systems through unauthorized access across non-federal lands, and have created a path across Stujack Creek. Effects of this crossing are not likely measurable to fish or fish habitats, as the channel substrate is coarse and the crossing is perpendicular to the flow (versus users driving up the channel). The effects of the OHV use in the watershed are unknown, because there is no effective administrative or law enforcement access.

Fisheries Environmental Consequences

Section 7(a)(2) of the ESA, as amended, requires federal agencies to review actions authorized, funded, or carried out by them, to ensure such actions do not jeopardize the continued existence of federally listed species, or result in the destruction or adverse modification of designated critical habitats. The Forest Service consults with the USFWS and NMFS if projects potentially could affect listed species or special habitats.

The Forest Service consults with the USFWS and NMFS Fisheries if projects potentially could affect listed species or special habitats.

ESA Consultation

In December 2003, NOAA's NMFS issued a Letter of Concurrence to the Forest Service that agreed with the Forest Service determination that a portion of the proposed actions (at MP 2.4 and 3.5) for the White Chuck River may affect, but are not likely to adversely affect the ESA-threatened Puget Sound Chinook salmon. Early in 2004, informal consultation with NMFS on the effects of the proposed White Chuck ERFO Road Repairs on threatened and endangered fish species occurred (NOAA Fisheries 2005).

In April 2005, NMFS received a Project Consistency Evaluation Form and a brief project description from the Forest Service for four projects on the White Chuck River; two of which (at MP 2.4 and 3.5) NMFS and the Forest Service had already completed informal consultation for with the finding *may affect, but are not likely to adversely affect*. Also included in the Project Consistency Evaluation Form, the Forest Service determined that the proposed project at MP 1.9 is likely to adversely affect Chinook salmon, their designated critical habitat, and EFH; and requested to initiate formal ESA Section 7 consultation and Magnuson-Stevens Act EFH consultation. Early in July 2005, the Forest Service requested a conference on effects to critical habitat within the project area; and on July 20, 2005, the Forest Service and NMFS met to discuss the alternatives of the project, clarify the details of the project, and initiate formal consultation.

NMFS concluded in its Opinion, dated October 26, 2005, that "the proposed action is not likely to jeopardize the continued existence of Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*), or result in the destruction or adverse modification of critical habitat" (NOAA Fisheries 2005). In addition, "[T]the Opinion also includes an incidental take statement with terms and conditions necessary to minimize the impact of taking that is reasonably likely to be caused by this action" (NOAA Fisheries 2005).

Early consultation with the USFWS for bull trout began in April 2004, and representatives from the USFWS, the Forest Service, and the FHWA made a visit to the White Chuck River in February 2005 (USFWS 2005). In April 2005, the final Biological Assessment for the White Chuck Road Repair at MP 1.9 was sent by the Forest Service electronically and received by USFWS (USFWS 2005).

In February 2008, NMFS and the Forest Service met again regarding additional repairs for 2006 flood damaged sites at MP 3.4, MP 5.8, MP 6.45, MP 7.2, and MP 8.5, and discussed supplemental information on effects determination for work at MP 1.9. Under the additional supplemental information, the effects determination for Sites #2 to #8 for Chinook salmon would be *may affect, but not likely to adversely affect* (Forest Service 2008b).

Alternative A

If implemented, this alternative would result in no repairs. Damaged road segments would not be repaired, reconstructed, or relocated. Vehicular access on Road 23 would be possible from MP 0.0 up to the road closure at MP 1.6 and seasonally between damage Site #4 (MP 3.5) and damage Site #5 (MP 5.8 if the route over Rat Trap Pass is reopened). The 8.1 miles in the Road 2311 and 2314 systems would also not be accessible for maintenance.

The remaining road prism would exist as it does today with no obliteration efforts, no culvert removal, no ditch removal, no eroded road segments pulled back, and no erosion control measures taken. The road would eventually grow in with vegetation and some areas would be vulnerable to future erosion problems.

Fish Species of Interest

There would be no direct effects to fish species of interest at the watershed or project-level scales under this Alternative.

At Site #4, Stujack Creek is flowing around and over the blocked culvert, and would remain a partial or total fish passage barrier to the 700 feet of habitat upstream of the culvert. All

other culverts would remain without maintenance to control road surface and ditch water, and leave the area vulnerable to debris plugging these culverts and diversion of stream flow out of the channel and down the road in the event of crossing failure. Culverts along Road 23 that have been identified as a concern to fisheries are reported in the Fisheries Specialist Report. In addition, there would be no access for the Forest Service to provide and maintain fish passage at all road crossings of existing and potential fish-bearing streams.

Effects to Federally Listed Species

Alternative A, if implemented, would result in no direct effects to federally listed or proposed fish. Stujack Creek at Road 23 (Site #4) would continue to be a barrier to Chinook salmon, bull trout, and steelhead. Some sediment would be generated at Site #4 as the channel regrades and erodes material around the blocked culvert. Channels draining the Road 2311/2314 system would continue to add minor amounts of sediment to existing loads in the watershed, but this would not be distinguishable from the normally high background load of suspended glacial sediments in the watershed. Over time, the risk of a catastrophic failure on the Road 2311 and Road 2314 systems would increase due to lack of maintenance. A failure would deliver additional sediment to the White Chuck.

Fine sediments and gravels that deposit on redds could suffocate eggs and reduce egg-to-fry survival, or in sufficient quantities, gravels could bury redds and prevent emergence of fry. Indirect impacts could affect Chinook salmon, bull trout, or steelhead in the lower White Chuck and Sauk, but would not be traceable to lack of project action.

Impacts to Sensitive and Other Fish with Management Emphasis

With Alternative A, there would be no direct effects to regionally sensitive or other fish species with management emphasis. Stujack Creek would continue to be a barrier to coho salmon and resident trout. Some sediment would be generated at Site #4 as the channel regrades and erodes material around the blocked culvert. Channels draining the Road 2311 and 2314 systems would continue to add minor amounts of sediment to existing loads in the watershed, but would not be distinguishable from the normally high background load of suspended glacial sediments in the watershed. Over time, the risk of a catastrophic failure on the Road 2311 and Road 2314 systems would increase due to lack of maintenance. A failure would deliver additional sediment to the White Chuck.

Fine sediments and gravels that deposit on redds could suffocate eggs and reduce egg-to-fry survival, or in sufficient quantities, gravels could bury redds and prevent emergence of fry. Indirect impacts could affect coho salmon, sockeye salmon, coastal cutthroat trout, resident trout, pink salmon, and chum salmon in the lower White Chuck and/or Sauk, but would not likely cause them to trend toward federal listing, and would not be traceable to lack of project action.

Key Watersheds

Implementing Alternative A would result by default in a net decrease of 14.1 miles of open permanent road system in the White Chuck River watershed (the estimated amount that washed away and segments no longer accessible; MP 1.9 to 3.5, MP 5.8 to 10.3, and the 8.1 miles in the Road 2311/2314 systems). Road 23 between Site #1 and Site #4, and between

Site #5 and Owl Creek, and the 8.1 miles in the Road 2311 and 2314 system, would be left in an unstable and/or unmaintained condition with no cost-efficient means to treat them.

Fish Habitats

This alternative would have no direct effects to designated critical habitats for Chinook salmon or bull trout, to essential fish habitats for Chinook salmon, coho salmon, or Puget Sound pink salmon, or to habitats for the sensitive and other species with management emphasis at either the watershed scale or action area. Fine sediments and gravels from road fills can degrade spawning and rearing habitats by filling in or covering spawning gravels and by filling pools and hiding spaces between larger rocks. Some sediment would be generated at Site #4 as the channel regrades and erodes material around the blocked culvert. Channels draining Road 23 between Site #1 and Site #4 and between Site #5 to the road terminus and the Road 2311 and 2314 systems would continue to add minor amounts of sediment to existing loads in the watershed, but would not be distinguishable from the normally high background load of suspended glacial sediments in the watershed. Over time, the risk of a catastrophic failure on the Road 2311 and Road 2314 systems would increase due to lack of maintenance. A failure would deliver additional sediment to the White Chuck.

Recreation and Fisheries

This alternative would not restore general access for all recreationists, and off-highway vehicles would continue to cross Stujack Creek with effects that are not likely measurable to fish or fish habitats. The likelihood of a fish being crushed at this crossing by OHVs is discountable, and the coarse channel substrate helps prevent ruts from forming. The quantity of sediment transported downstream would be negligible.

Alternative B

With this alternative, Road 23 would be repaired in-place at Site #1, incorporating a dip in the road plus log in the floodplain and logs interspersed in the large rock to be placed at the base of the repair. At Site #2, Road 23 would be relocated around the washout using 2,300 feet (0.44 mile) of Road 2311, constructing 1,200 feet (0.23 mile) of new road approximately 250 feet upslope from the washout, installing a new culvert to cross the Unnamed Tributary in the new location while removing the existing culvert under Road 23. The 1800 feet (0.34 mile) of Road 23 that would be decommissioned on both ends of the washout at Site #2 would be treated for drainage and erosion concerns, and then ripped and seeded. Road 23 would be rerouted at Site #3 around the washout before Stujack Creek. Approximately 600 feet (0.11 mile) of road would be constructed approximately 400 feet from the White Chuck River across a 25 percent sideslope above the washout. Road 23 would be repaired in-place at Site #4 (at Stujack Creek). The gravel and bedload material plugging the culvert would be removed and used as fill material to rebuild the approximate 50 feet of road that washed away in the 2003 flood. When funding allows, the box culvert at Stujack Creek would be replaced with an open-bottomed arch capable of passing 100-year floodwaters.

Under this alternative, Road 23, from the junction with Road 27 to the White Chuck Trailhead (MP 5.8 to MP 10.3), would be decommissioned. At damage Sites #5 through #8, culverts would be removed, unstable fill slopes pulled back and placed in stable areas, and dips installed. The concrete bridge at Owl Creek would not be removed, and a walkable

tread would be left in the decommissioned road prism. Refer to Chapter 2 (Alternatives) for a full description of proposed road repairs.

Fish Species of Interest

Effects to Federally Listed Species

Implementation of Alternative B would maintain existing populations of federally listed and proposed fish at the scale of the Sauk sub-basin and White Chuck River watershed. Project activities would not measurably influence fish populations at this broad scale.

For federally listed fish, the Forest consulted on an effect determination of *likely to adversely affect* for this action alternative for Chinook salmon, steelhead, and bull trout due to expected use of riprap associated with repairing Road 23 in-place at Site #1. The work would be in the floodplain on the margins of the river instead of in the active channel and ordinary high water/bankfull. Proposed repairs at Sites #2 and #4 *may affect, but are not likely to adversely affect* Chinook salmon, steelhead, and bull trout. In-water work for culvert removals, new culvert placement, and adjustment at Sites #2 and #4 would occur during low-flow non-spawning periods. Similarly, repairs at Site #3 and activities involved with decommissioning Road 23 from MP 5.8 to the road terminus were determined *not likely to adversely affect* Chinook salmon, steelhead, and bull trout.

Work in the floodplain at Site #1 to place and partially bury large wood would disturb sediment already on the floodplain. The smaller sediment size classes would flush downstream the first time flow reached the floodplain. Project activities at Site #1 would likely impact juvenile Chinook salmon, steelhead, and bull trout using this bank (south side of the river where the road would be repaired); however, large wood would be incorporated into the base of the rock to dissipate velocities from high flows and create slow water habitat.

Work instream at the Unnamed Tributary (Site #2) and Stujack Creek (Site #4) would introduce sediments to those waters. This work, however, would be done during low flow periods when fish are not spawning. A few individuals might be displaced by a plume of sediments associated with project activities, but with implementation of conservation and mitigation measures (such as diverting water away from the work area), such short-term effects would be minimized, and fish are not expected to be measurably affected.

Work at Site #3 would be on the hillslope and no work is planned near the floodplain, active channel, or ordinary high water/bankfull.

Culverts that would be removed from MP 5.8 to the road terminus (MP 10.3), prior to decommissioning Road 23, are primarily drainage structures with water running through them for parts of the year. For culverts with water running through them most of the year, removal would occur during low-flow non-spawning periods. At all sites, slopes adjacent to or within riparian areas would be protected with erosion and/or sediment control. Vegetation or slope protection would be completed prior to the first rainy season. Final stabilization measures, vegetative and structural, would occur prior to the end of the normal operating season. Additional management requirements and conservation and mitigation measures outlined in other sections of this document would be employed accordingly at each of the sites.

Because Road 23 would be decommissioned from MP 5.8 to MP 10.3, it should pose no further threat to the White Chuck River or to fish along that section of the White Chuck River.

The project related sediments would be indistinguishable from other sediments transported in the White Chuck. The White Chuck transports a high natural load of fine glacial sediments, and also continues to erode and transport materials from exposed banks upstream of the project sites. In addition, not all of the project-related sediment would enter the water at the same time. During construction, with low streamflow conditions, any fines that entered the water would not likely travel as far and, if the timing coincided with turbid glacier melt water, it would not be detectable downstream. Other indirect effects would be beneficial to these species due to long-term habitat improvements (see the habitat discussion below).

Other than potentially regaining access for Chinook salmon, steelhead, and bull trout in Stujack Creek upstream of Road 23 over existing post-flood conditions, direct effects to federally listed and proposed fish species are not likely due to timing of proposed activities and due to conservation and mitigation measures that would be employed.

Impacts to Sensitive and Other Fish with Management Emphasis

Proposed project activities would not impact chum salmon due to lack of presence, but the action area, which includes the White Chuck River and Stujack Creek, contains habitat utilized by the other sensitive and management indicator species. Project activities at Site #1 are likely to impact coho salmon and sockeye salmon, coastal cutthroat trout, resident trout species, and possibly pink salmon (if present), but not likely to cause them to trend towards federal listing. It was determined that activities at Sites #2 and #4 would not impact coho salmon and sockeye salmon, coastal cutthroat trout, resident trout species, and possibly pink salmon (if present). Proposed repair activities at Site #3 and activities involved with decommissioning Road 23 from MP 5.8 to the road terminus would not impact coho salmon and sockeye salmon, coastal cutthroat trout, resident trout species, and possibly pink salmon (if present) due to implementation of timing and conservation measures. Overall project activities are not likely to cause these species to trend toward federal listing.

Implementation of Alternative B would maintain existing populations of sensitive and other fish with management emphasis at the scale of the Sauk sub-basin and White Chuck River watershed. Project activities would not measurably influence fish populations at this broad scale. Direct and indirect effect to sensitive species and other fish with management emphasis would be the same as those described under Effects to Federally Listed and Proposed Species.

Key Watersheds

Implementing Alternative B would result in a net decrease of approximately 4.5 miles of permanent road system in the White Chuck River watershed, and restore access to maintain the road network between MP 0 and MP 5.8. Water quality would be maintained, and repair at Site #1 would create a barrier to further erosion and mass failure of the slope.

Fish Habitats

At the scale of the Sauk River sub-basin and White Chuck subwatersheds, activities associated with the Alternative B would be expected to maintain all watershed conditions at

their existing levels of function. At the action area, sedimentation and impacts on channel morphology and floodplain conditions in the lower White Chuck would negatively affect spawning and rearing habitats during project activities and within the next few years after project completion, but over the longer term (approximately 5 to 10 years), habitat features would be improved.

Construction at Site #1 would occur in the floodplain and riprap with incorporated pieces of large wood would be placed as the base of the road. Project effects; however, would occur only during times when high flows reach the floodplain or inundation from precipitation and runoff is great enough for sediment in the floodplain to become mobile and enter the White Chuck River.

Sedimentation of fish habitat downstream would potentially occur at Site #2 and Site #4, and at locations where culverts would be removed from MP 5.8 to the road terminus. This sedimentation; however, would occur within the next year after the project (during high flows) until the disturbed soils are revegetated. In addition, the project related sediments would be indistinguishable from other sediments transported in the White Chuck.

Sedimentation to spawning and rearing habitats generated by project activities at all sites would be short-term in duration and minor. The amount of sediment would have no measurable effect on spawning gravels and filling pools used for holding and rearing, and would be masked by other sediments in the White Chuck. In the Unnamed Tributary (Site #2), Stujack Creek (Site #4), and all locations (MP 5.8 to terminus) where culverts would be removed, sediments would potentially be transported to the White Chuck River during the construction period. However, work would be done during low flow periods when fish are not spawning.

A few individual fish might be displaced by a plume of sediments associated with project activities, especially as tributaries, tributary mouths, and off-channel habitats provide the areas primarily utilized by salmon, trout, and char for spawning and rearing. However, with implementation of timing and mitigation measures (e.g., low flow non-spawning times and diverting water away from the work area), such short-term effects would be minimized, and fish are not expected to be measurably affected. Effects to fish rearing in Stujack Creek, and in and near the mouth of the Unnamed Tributary and all streams containing flow where culverts would be removed are expected to be minimal and not measurable with implementation of conservation measures. Management, conservation, and mitigation measures would minimize sedimentation (e.g., removing culverts with erosion control measures and ripping/seeding/mulching decommissioned segments), and natural revegetation with alders is expected to occur very quickly where road segments are ripped.

Large woody debris function in creating pool habitats would potentially be improved, and off-channel habitats would potentially be created and maintained under this Alternative. At Site #1, placed and partially buried large wood would likely assist in creating or enhancing existing jams and would allow high flows to scour large pools valuable for juvenile fish rearing and adult holding. These complexes of wood would also encourage the formation of off-channel habitats in the floodplain during high flows.

Under Alternative B, the road would be routed away from the White Chuck River at Sites #2 and #3, thus scour of the left bank and migration of the river would not be impeded. This reroute would improve connectivity between the White Chuck River and left floodplain,

potentially resulting in recruitment of woody debris. The addition of large wood from the left bank would likely assist in creating additional habitat and maintaining the presence of available off-channel habitat.

Realignment, versus replacement, of the culvert at Site #4 would continue to constrict flow and wood movement in Stujack Creek until a new structure is put in place that would pass 100-year floods, not be a barrier to fish passage, and facilitate in the transport of wood, debris, and sediment through an open-bottomed arch culvert with a natural streambed material.

No activities would occur that would affect LWD function in creating pool or off-channel habitat at Sites #5 to #8, or at any of the culverts removed between MP 5.8 and Road 23 terminus.

Streambanks would be temporarily disturbed during project activities at Sites #2, #3, #4 and streams containing flow where culverts would be removed between MP 5.8 and the road terminus. These sites; however, would be seeded and mulched to control erosion. Cleaning of the culvert at Stujack Creek (Site #4) would allow the stream to flow in its channel instead of continuing to erode around the culvert in a new path. With relocation of Road 23 away from the White Chuck River at Sites #2 and #3, the river would be allowed to freely migrate into the bank.

At Site #1, the road would be reconstructed at the edge of the floodplain, and only during very high flows would the river reach the base of the road. The wood jams at this site would help dissipate flood energy and deflect high flows away from this rock. Wood interspersed into the rock would further minimize effects of the rock to fish using the site.

The banks of streams with road crossings (i.e., Unnamed Tributary (Site #2) and other creeks with flow), and drainage features where culverts would be removed, would be sloped back to a natural gradient, seeded, and mulched. Overall, there would be temporary disturbance to these streambanks during project activities, but in a few years the streambank conditions would likely improve.

Floodplain connectivity would be affected at Site #1, because work would occur and material would be placed at the margins of the floodplain. Under this alternative, project activities at Site #1 would minimize the effect of the road on the river. The rock at the base of the repairs would only influence flows during over bank flow events; repairs at Site #1 would minimally influence river flows due to the location of the rock and because wood would be interspersed among the largest rocks. The wood jams enhanced at the edge of the channel may help create off-channel habitats in the 100-year floodplain.

Repairs at Sites #2, #3 and #4 are outside of the floodplain. Under Alternative B floodplain connectivity at these sites would not be affected. No activities would occur that would affect floodplain connectivity for the White Chuck River at Sites #5 to #8, or any of the culverts removed between MP 5.8 and Road 23 terminus.

Road density and location would be slightly improved with the relocation at Site #2 and #3 farther away from the river and outside of the floodplain and Riparian Reserves. In addition, the decommissioning of Road 23 from MP 5.8 to terminus would also improve road density and location. The overall location of Road 23 along the valley bottom and within Riparian Reserves from MP 0.0 to the reroute at MP 2.4, between the reroute at MP 2.4 and 3.4, and

from MP 3.5 to MP 5.8 would not change. There would; however, be a net decrease of 4.02 miles (21,200 feet) of permanent system road in the White Chuck watershed.

Recreation and Fisheries

This alternative would not restore all general access for all recreationists, as Road 23 from MP 5.8 to terminus would be decommissioned. However, Alternative B would provide vehicle access for all recreationists between MP 0 and MP 5.8. The project activities at Site #4 would eliminate OHVs from continuing to ford Stujack Creek, as the stream crossing would be restored. The project activities would improve conditions for recreationists and reduce any potential impacts to fish species from use of Road 23.

Special Habitat Designations—Critical Habitat

The Forest consulted on the proposed road repair activities. Negative effects would be expected with instream activities associated with repairs at Site #1 and critical habitat would be temporarily affected by construction activities, but would be would be short-term in duration, would occur at a localized level, and would be indistinguishable from other sediments transported naturally in the river. However, because of the potential affects from the riprap used as the foundation of the road, the proposed action *is likely to adversely affect* the critical habitat of Chinook salmon and bull trout in the White Chuck River watershed.

Special Habitat Designations—Essential Fish Habitat

The EFH species for the White Chuck River Road Repair have been identified as Chinook salmon and coho salmon. Pink salmon EFH is not considered to be present in the White Chuck watershed (Forest Service 2004). The proposed project may temporarily increase sedimentation and pollutants in, and downstream of, the project area during project construction; however, these effects would be temporary and would be minimized by implementing appropriate BMPs and mitigation measures. The proposed project would have long-term beneficial impacts on EFH by reducing the risk of catastrophic failure to the road systems and stream crossings, rerouting and decommissioning portions of the road network from the Riparian Reserve, and placing and partially burying large wood in the floodplain at Site #1. It is expected that use of the project area by Chinook salmon and coho salmon during the projected activity period will be limited to migration and rearing. However, timing restrictions for all ground-disturbing activities would be implemented to minimize effects to Chinook salmon or coho salmon. Although the proposed project activities would be beneficial at some sites, because of the potential affects from the riprap used as the foundation of the road, the proposed project may *adversely affect* EFH.

Alternative C

Alternative C is similar to Alternative B. This alternative would restore vehicle access in the White Chuck River drainage to the junction with Road 27, with repairs at four sites of Road 23 (MP 1.9, MP 2.4, MP 3.4 and MP 3.5). However, the upper portion of Road 23, from the junction with Road 27 to the White Chuck Trailhead (MP 5.8 to MP 10.3), would be placed in storage and closed to vehicle traffic (ML 1) by removing culverts and fill at Sites #5 through #8 (MPs 5.8, 6.45, 7.2, and 8.5) rather than decommissioning the upper road, as under Alternative B. A walkable tread (a path 4 to 5 feet wide) would be left. Storage at

these sites would include removal of culverts and unstable fill slope and natural hillslope drainage patterns would be restored. A segment of road east of the junction of Roads 23 and Road 27 would be retained as a turnaround. Due to lack of parking space at this junction, the dispersed camping area east of the upper White Chuck Bridge has been identified as a potential parking area. This would expand the current White Chuck Bench Trailhead parking east of the outhouse located north of Road 23. There is approximately 2 acres of area under consideration for additional parking.

In addition to repairs described under Alternative B, repairs at Site #1 would include the construction of two ELJs between 500 and 650 feet upstream of Site #1. The construction of the logjams would assist in trapping sediment and debris and shifting the river away from the base of the repaired road at Site #1.

Fish Species of Interest

Effects to Federally Listed Species

Implementation of Alternative C would maintain existing populations of federally listed and proposed fish at the scale of the Sauk sub-basin and White Chuck River watershed. Project activities would not measurably influence fish populations at this broad scale.

At Site #1, the majority of work would be in the floodplain on the margins of the river instead of in the active channel and ordinary high water/bankfull. Work in the floodplain would disturb sediment already present. Smaller sediment size classes of the same material along the banks would flush downstream the first time high flows reach the floodplain. Although the majority of work would be in the floodplain, construction of the two ELJs at Site #1 would require work inside the ordinary high water/bankfull. Direct effect to Chinook salmon, bull trout, and steelhead could occur due to construction of ELJs. To minimize take from heavy equipment and construction within the river channel, conservation and mitigation measures (such as diverting water away from the project site) would be implemented. Potential positive indirect effects at Site #1 include pool formation and creation of off-channel habitat. The ELJs would assist in enhancing habitat in this reach of the White Chuck River. Potential negative indirect effects at Site #1 include temporary compaction and introduction of sediments to the White Chuck River. However, these sediments would be the same sediment material from the banks. In addition, any affects would be minimized due to timing and mitigation measures that would be employed.

At Site #1, although the wood incorporated into the riprap would dissipate velocities, and construction of the two ELJs would assist in pool formation, off-channel habitat creation, and floodplain development, for federally listed fish, the Forest consulted on an effect determination of *likely to adversely affect* for this action alternative for Chinook salmon, steelhead, and bull trout.

Repairs at Sites #2 through # 5 and their effects to Federally Listed and Proposed Species would be the same as described under Alternative B. Effects from placing Road 23 in storage from MP 5.8 to MP 10.3 would be the same as decommissioning this segment of road as described under Alternative B (as long as the road segment remains in storage).

Impacts to Sensitive and Other Fish with Management Emphasis

Proposed project activities would not impact chum salmon due to lack of presence, but the action area, which includes the White Chuck River and Stujack Creek, contains habitat utilized by the other sensitive and management indicator species. Project activities would impact coho salmon, sockeye salmon, coastal cutthroat trout, resident trout species, and possibly pink salmon (if present), but are not likely to cause them to trend toward federal listing. Direct and indirect effects to Sensitive and other fish with management emphasis would be the same as those described in the Effects to Federally Listed and Proposed Species described above (for Alternative C).

Implementation of Alternative C would maintain existing populations of sensitive and management emphasis fish species at the scale of the Sauk sub-basin and White Chuck River watershed. Project activities would not measurably influence fish populations at this broad scale.

Key Watersheds

Implementing Alternative C would result in a net decrease of approximately 4.5 miles of permanent road system in the White Chuck River watershed (Sites #1-#4 construction minus the amount placed in storage), and restore access to maintain the road network between MP 0 and MP 5.8. Water quality would be maintained, and repair at Site #1 would create a barrier to further erosion and mass failure of the slope.

Fish Habitats

Sedimentation of fish habitat due to project activities would be the same as described under Alternative B. This sedimentation would primarily occur within the first year following project construction (during high flows) until the disturbed soils are revegetated and loose sediment has been transported downstream.

Sedimentation to spawning and rearing habitats generated by project activities at all sites would be short-term in duration and occur at a localized level. At Site #1, #2, and Site #4, and all locations where culverts are removed from MP 5.8 to the road terminus, sediments would potentially be transported to the White Chuck River during the construction period. A few individual fish might be displaced by a plume of sediments associated with project activities. The amount of sediment ; however, would have no measurable effect on spawning gravels and filling pools used for holding and rearing, and would be masked by other sediments in the White Chuck River. Additionally, work would be done during low flow periods when fish are not spawning. For creeks such as Stujack Creek (Site #4) where flow is present year round, sand and gravel may enter the creek and could potentially be transported to the White Chuck River when spawning and incubation of fish occurs. However, with implementation of timing and mitigation measures (e.g., low flow non-spawning timing and diverting water away from the work area and implementing erosion control measures), such short-term effects would be minimized, and fish are not expected to be measurably affected.

Large woody debris function in creating pool habitats would potentially be improved and off-channel habitats would potentially be created and maintained. At Site #1, placed partially buried large wood and ELJs would assist in creating and enhancing existing jams and

scouring pools, which may be valuable for juvenile fish rearing and adult holding. Additionally, these complexes of wood would encourage additional formation and maintenance of off-channel habitats in the ordinary high water/bankfull active channel, and floodplain (during high flows).

At Sites #2 and #3, the road would be routed away from the White Chuck River, thus scour of the left bank and migration of the river would not be impeded. This reroute would improve connectivity between the White Chuck River and left floodplain, potentially resulting in recruitment of woody debris. The addition of large wood from the left bank would likely assist in creating additional habitat and maintaining the presence of available off-channel habitat.

Realignment, versus replacement, of the culvert at Site #4 would continue to constrict flow and wood movement in Stujack Creek until a new structure is put in place that would pass 100-year floods, not be a barrier to fish passage, and facilitate in the transport of wood, debris, and sediment through an open-bottomed arch culvert with a natural streambed material.

No activities would occur that would affect LWD function in creating pool or off-channel habitat at Sites #5 through #8, or at any of the culverts removed between MP 5.8 and Road 23 terminus.

Streambanks would be temporarily disturbed during project activities at Sites #2, #3, and #4. These sites, however, would be seeded and mulched to control erosion. Cleaning of the culvert at Stujack Creek (Site #4) would allow the stream to flow in its channel instead of continuing to erode around the culvert in a new path, which would eventually result in an improvement over existing conditions. With relocation of Road 23 away from the White Chuck River at Sites #2 and #3, the river would be allowed to freely migrate into the bank.

At Site #1, the road would be reconstructed at the edge of the floodplain, and only during very high flows would the river reach the base of the road. The wood jams at this site would help dissipate flood energy and deflect high flows away from this rock, and wood interspersed into the rock would further minimize effects of the rock to fish using the site.

The banks of streams with road crossings (i.e., Unnamed Tributary (Site #2) and other creeks with flow), and drainage features where culverts would be removed during road storage, would be sloped back to a natural gradient, seeded, and mulched. Overall, there would only be temporary disturbance to these streambanks during project activities, but in a few years the streambank conditions would likely improve.

Floodplain connectivity would be affected at Site #1, because work would occur and material would be placed at the margins of the floodplain. Under this alternative, project activities at Site #1 would be done to minimize the effect of the road on the river. The rock at the base of the repairs would only influence flows during over bank flow events; repairs at Site #1 would minimally influence river flows due to the location of the rock and because wood will be interspersed among the largest rocks. The wood jams enhanced at the edge of the channel may help create off-channel habitats in the 100-year floodplain. The two ELJs immediately upstream from Site #1 would encourage deposition of material along the left floodplain (south side of the river). Deposition of material along this bank has been occurring since the 2006 floods. If additional material continues to be deposited, the channel

would likely migrate away from this bank. This has been the tendency of the river in this reach sine 2006.

Repairs at Sites #2, #3 and #4 are outside of the floodplain, and because of this, floodplain connectivity at these sites would not be affected. No activities would occur that would affect floodplain connectivity for the White Chuck River at Sites #5-8, or any of the culverts removed between MP 5.8 and Road 23 terminus.

Road density and location would be improved with the relocation at Site #2 and #3 farther away from the river and outside of the floodplain and Riparian Reserves. In addition, the decommissioning of Road 23 from MP 5.8 to terminus would also improve road density and location as there would be a net decrease of 4.5 miles of permanent system road in the White Chuck watershed.

Recreation and Fisheries

Impacts to recreation and fisheries under Alternative C would be the same as those described under Alternative B above.

Alternative D

Alternative D would repair the entire length of Road 23; which would restore vehicular access to the White Chuck drainage and the White Chuck Trailhead. Repair to damage Sites #2, #3, and #4, would be as described under Alternative B. Repairs at Site #1 would be as described under Alternative C. Under this alternative, repairs to damage Sites # 5 through #8 are as described in Chapter 2.

Fish Species of Interest

Effects to Federally Listed Species

Implementation of Alternative D would maintain existing populations of federally listed and proposed fish at the scale of the Sauk sub-basin and White Chuck River watershed. Project activities would not measurably influence fish populations at this broad scale.

Repairs at Site #1 to #4, and the effects of these repairs to Federally Listed Species, are as described under Alternative C.

Road repairs at Sites #5 through #8 would occur above the floodplain of the White Chuck River and no work would be planned near the floodplain, active channel, or ordinary high water/bankfull. Because damage at Sites #5 through #8 would be repaired, and Road 23 would again be open for travel, the road surface would return to a hard compacted surface that would increase surface runoff entering the river. Because increased surface runoff would increase sediment delivered to the stream, the effects to fish and fish habitat from Road 23 would be similar to conditions prior to the 2003 and 2006 events that damaged the road. There is a high potential for future road failure along the upper portion of Road 23 because the road crosses S-8 soils. Road failure would result in the addition of sediment into tributaries along this stretch of road that could travel to the White Chuck River. If a failure occurred at Site #8 that was similar to the 2006 failure, tens of thousands of cubic yards of sediment would be delivered to the White Chuck River.

At all sites, slopes adjacent to or within riparian areas would be protected with erosion and/or sediment control. In addition, before the first wet season, vegetation or slope protection would be completed and prior to the end of the normal operating season, final stabilization practices should include vegetation as well as structural at all sites. Other management requirements and timing and mitigation measures outlined in other specialist reports and this report would be employed accordingly at each of the sites.

Project related sediments would be indistinguishable from other sediments transported in the White Chuck River. The White Chuck transports a high natural load of fine glacial sediments, and continues to erode and transport materials from exposed banks upstream of the project site. In addition, not all of the project-related sediment would enter the water at the same time. During construction, with low streamflow conditions, any fines that entered the water would not likely travel as far and, if the timing coincided with turbid glacier melt water, it would not be detectable downstream. Other indirect effects would be beneficial to these species due to long-term habitat improvements (see the habitat discussion below). Due to the distance from the White Chuck River the repairs at Sites #5 through #8 occur at, implementation of timing and mitigation measures, and project related sediment being indistinguishable from other sediments transported in the river, project activities at these sites *may affect, but are not likely to adversely affect* Chinook salmon, steelhead, and bull trout.

Other than potentially regaining access for Chinook salmon, bull trout, and steelhead in Stujack Creek upstream of Road 23 over existing post-flood conditions, direct effects to federally listed and proposed fish species are not likely due to timing and to conservation and mitigation measures that would be employed.

Impacts to Sensitive and Other Fish with Management Emphasis

Proposed project activities would not impact chum salmon due to lack of presence, but the action area, which includes the White Chuck River and Stujack Creek, contains habitat utilized by the other sensitive and management indicator species. Project activities would impact coho salmon, sockeye salmon, coastal cutthroat trout, resident trout species, and possibly and pink salmon (if present), but are not likely to cause them to trend toward federal listing. Direct and indirect effects to Sensitive and other fish with management emphasis would be the same as those described in the previous section (Effects to Federally Listed and Proposed Species).

Implementation of Alternative D would maintain existing populations of sensitive and other fish with management emphasis at the scale of the Sauk sub-basin and White Chuck River watershed. Project activities would not measurably influence fish populations at this broad scale.

Key Watersheds

Implementing Alternative D would result in a net increase of approximately 0.19 miles of permanent road system in the White Chuck River watershed (due to new construction at Sites #2 and #3), and restore access to maintain the road network between MP 1.9 and the road terminus (MP 10.3). Water quality would be maintained, and repairs at Site #1 would create a barrier to further erosion and mass failure of the slope. Under this alternative; however, road miles and road density would not be reduced within the White Chuck River watershed.

Fish Habitats

At repair Sites #1 through #4, effects to fish habitat would the same as those described under Alternative C. From MP 5.8 to Road 23 terminus, at locations where reconstruction of Sites #5 through #8 occurs, sedimentation of any potential fish habitat below these sites would occur within the next year after the project (during rain events), until the disturbed soils are revegetated and lose sediment has been transported downstream.

Sedimentation to spawning and rearing habitats generated by project activities at all sites would be short-term in duration and occur at a localized level. The effects of sedimentation to spawning and rearing habitats from Sites #1 through #4 would be as described under Alternative C. For Sites #5 through #8, sediment would potentially be transported to the White Chuck River during the construction period. The amount of sediment would have no measurable effect on spawning gravels and filling pools used for holding and rearing, and would be masked by other sediments in the White Chuck River. Implementation of timing and mitigation measures (e.g., low flow non-spawning timing and diverting water away from the work area and implementing erosion control measures), would minimize these short-term effects and fish are not expected to be measurably affected.

Large woody debris function in creating pool habitats would potentially be improved, and off-channel habitats would potentially be created and maintained. Effects on LWD function in creating pool and off-channel habitats at Sites #1 to #4 under Alternative D would be the same as described for these sites under Alternative C.

Road repairs at Sites #5 through #8 would occur above the floodplain of the White Chuck River and project activities would not affect LWD function at these sites.

Streambanks would be temporarily disturbed during project activities at Sites #2, #3, and #4. These sites, however, would be seeded and mulched to control erosion. Effects under Alternative D at these sites would be the same as described under Alternative C. No activities would occur that would affect streambanks at Sites #5 to #8 under Alternative D.

Floodplain connectivity would be affected at Sites #1 to #4 under Alternative D. These effects are as described under Alternative C. As repairs would occur outside the floodplain, no activities would occur that would affect floodplain connectivity for the White Chuck River at Sites #5 to #8 under Alternative D.

Road density and location, under Alternative D, would be slightly improved with the relocation at Sites #2 and #3 farther away from the river and outside of the floodplain and Riparian Reserves. The overall location of Road 23 along the valley bottom and within Riparian Reserves from MP 0.0 to the reroute at MP 2.4, between the reroute at MP 2.4 and 3.4 and from MP 3.5 to MP 5.8 would not change. Overall; however, there would be a net increase of approximately 0.19 miles (1,020 feet) of permanent road system in the White Chuck River watershed (Sites #2 and #3 new construction).

Recreation and Fisheries

This alternative would restore access for all recreationists because all sites impacted by the October 2003 and fall/winter 2006/2007 flood events would be repaired. OHV use of Road 23 would potentially decrease as access for passenger cars and trailers, along with access for law enforcement, is restored. There may be heavier use of dispersed camping sites near

Road 23 where use dropped when the access changed. Education and law enforcement would be used to protect aquatic resources.

Effects of Mitigation

Standard Management Practices and Mitigation Measures are discussed in Chapter 2 of this EA. They include measures to help prevent spread of noxious weeds, to maintain water quality, and to minimize or avoid impacts to heritage resources or to botanical, wildlife, and fish species of concern from direct or indirect activities associated with the proposed action.

The botany mitigations would mostly have a neutral effect on fish, though seeding and mulching disturbed areas and decommissioned road segments would help prevent sedimentation; indirect benefits could be realized by requiring construction equipment and gravels free of weeds and weed seeds before entering the project site, particularly because certain species of invasive and noxious species are known to displace native vegetation in riparian areas and degrade riparian function.

Mitigations for heritage resources would be neutral to fish, as the effects from project activities would not be exceeded if heritage resources are found.

Wildlife mitigations include timing restrictions for daily activities (work starts 2 hours after sunrise and stops 2 hours before sunset) to minimize effects to murrelets. These restrictions would be neutral to fish, because while there is some variation in feeding patterns among species and life history stages at dawn and dusk, the effect on individual fish growth and population size would not be measurable or attributable to adherence to wildlife timing restrictions.

The mitigation measures to address hydrologic function, large woody debris, sedimentation, water quality, and riparian conditions would benefit fish and aquatic habitats through avoidance or minimization of impacts. Most of these mitigations are conservation measures that the MBS National Forest included in consultation documents with USFWS and NMFS to avoid or minimize incidental take of listed fish and to address effects to “critical” and to “essential” fish habitats. Timing windows for in-water work would avoid the most sensitive fish use periods (spawning and incubation). Conservation measures also duplicate some provisions of hydraulic project approval with the Washington Department of Fish and Wildlife. These are standard provisions refined over many years of permitting hydraulic projects in waters of the state and have been generally accepted by state and federal entities as effective ways to prevent or minimize effects from project activities in or near streams.

Fisheries Cumulative Effects

The affected area for cumulative effects to fish species is the White Chuck and Sauk Rivers.

The effects of implementing either one of the action alternatives could overlap with lingering effects from past projects, from incremental effects of concurrent projects, or from estimated additive effects of projects being planned for the near future. Table 22 displays activities that are being considered in this cumulative effects assessment for fisheries and aquatic habitats. There would not be any discernible contribution to cumulative effects to fish or their habitats expected by implementing any of the action alternatives.

Table 22. Activities for Fish Species Cumulative Effects Analysis

Project or Activity and Extent/Description	Potential Influence	Effect	Overlap Time	Overlap Space	Comments Resulting Cumulative Effect of Proposed Action with Project or Activity Listed
Gold Mountain Road Repair, including White Chuck Bridge Replace White Chuck Bridge, repair Rd. 22 system, construct connector	Woody debris and flow routing, suspended sediments and bedload to fish-bearing waters, concussive vibrations	Wood	Yes	No	Bridge work expected to occur in 2007. Roadwork includes a small segment in the Black Oak drainage, which was completed in 2006; effects from other Road 22 system work in 2007 would not overlap spatially. At White Chuck Bridge, influence on wood, flows and bedload are sufficiently spaced from proposed activities, and proposed action does not include concussive activities. Fine sediments would overlap (would be cumulative) but the effect from whatever sediments are added due to proposed activities combined with existing fine sediments from the White Chuck Bridge project would not be measurable or meaningful (the cumulative effect would be neutral to fisheries).
		Flows	Yes	No	
		Bedload	Yes	No	
		Vibration	Yes	No	
		Sediment	Yes	Yes	
Road Repairs from Past Flood Damage Multiple fixes from floods in 1974, 80, 89, 96, and 99. Replace fill and riprap, clear and replace culverts w/larger culverts or bridge, repair ford, fix ditches along Roads 23. Similar fixes to Rd. 27 and side roads from 82, 90, 96, and 99 floods.	Hydrologic routing, suspended sediments and bedload delivery to fish-bearing waters		No	Yes	The most recent repairs took place 7 years ago, and effects are no longer present. No potential cumulative effect due to lack of overlap in both time and space (no lingering effects).
Road Maintenance Routine road maintenance on Road 23 and 27: brush every 3 years and grade/blade 2 times yearly	Hydrologic routing, suspended sediments and bedload delivery to fish-bearing waters	Flows	No	No	Access has been lost past Rd. 23 MP 1.9. Maintenance being planned, but likely not on these roads until access is restored via Rd. 23 or Rd. 27; conservation measures would minimize sedimentation (short term). Potential cumulative effect due to overlap in both time and space. The effect from any sediments added due to proposed activities combined with existing fine sediments from road maintenance would not be measurable or meaningful.
		Bedload	No	No	
		Sediment	Yes	Yes	
Timber Harvest Clearcut harvest of 4940 acres from 1920s-1994, with 950 acres since 1980. Stream clean-out of woody material likely occurred.	Hydrologic routing, suspended sediment delivery to fish-bearing waters, riparian conditions and instream wood	Wood	Yes	Yes	Some potential lingering effects to flows and from instream and riparian wood removal. Generally, stands younger than 25 years are considered to add to a disturbed watershed condition. The 950 acres since 1980 comprise 6 percent of the non-Wilderness area, a level below suggested thresholds of concern (for sediments, flows). Wood was substantially recruited to channels from the 2003 and 2006 storms. Combined with any lingering effects of past harvests, the proposed project activities would not result in measurable effects to fish or to habitat conditions; the cumulative effects would be neutral to fisheries.
		Flows	Yes	Yes	
		Riparian Condition	Yes	Yes	
		Sediment	Yes	Yes	
Fish Passage Culvert removal at Crystal Camp road, and culvert-to-bridge at Owl Creek	Improved access to spawn or rear, increased fish pop'n, sediment/bedload to streams	Sediment	No	No	Completed late 1990s. These past projects may have lingering benefits to fish populations in the watershed; overall cumulative effect of proposed project would be incrementally beneficial to fish.
		Bedload	No	No	
		Access	Yes	No	
		Fish	Yes	Yes	

Table 22. Activities for Fish Species Cumulative Effects Analysis (continued)

Project or Activity and Extent/Description	Potential Influence	Effect	Overlap		Comments Resulting Cumulative Effect of Proposed Action with Project or Activity Listed
			Time	Space	
Instream Treatments Structures and off-channel projects for spawning and rearing habitats in White Chuck side channels (RM 1.0, RM 1.7, Two Pink salmon Channel [RM 5.1]) and Black Oak Creek	Instream habitat diversity resulting in increased fish population size; suspended sediments and bedload to fish-bearing streams	Sediment	No	No	Completed 1985-1992. Increased diversity; increased quantity and quality for rearing and spawning, though sites have experienced flood damage. No potential cumulative effect to habitats due to lack of lingering effects in project area, and suspended sediments and bedload have transported away or settled. While these past projects may have lingering benefits to local fish populations, cumulative effect of proposed project to fish populations would be incrementally beneficial.
		Bedload	No	No	
		Habitat	Yes	No	
		Fish	Yes	Yes	
White Chuck Trail Flood Repair Trail repair and relocation along 5 miles of White Chuck Trail #643	Suspended sediment delivery to fish-bearing waters, concussive vibrations	Sediment	No	No	No work expected in forseeable future. Lower end of trail project is about 8 miles upstream from Stujack Creek confluence (Site #3), with pathway for sedimentation 11.5 miles away. No potential cumulative effect due to lack of overlap in both time and space.
		Vibration	No	No	
Upper White Chuck Pacific Crest Trail Flood Repair Trail repair/relocation along 9 miles of the PCT #2000, incl. 10 bridges	Woody debris routing, suspended sediment delivery to fish-bearing waters, concussive vibrations	Wood	No	No	Trail and bridge work complete. Closest site is about 13 miles upstream from Stujack Creek (Site #3) confluence. No concussive activities are proposed by action alternative. Changes in wood routing wouldn't be distinguishable, and no lingering sediments. No potential cumulative effect due to lack of overlap in both time and space.
		Sediment	No	No	
		Vibration	No	No	
Design analysis work for White Chuck Road Repair in spring 2009	Analysis will include drilling 10 to 21 boring holes to identify subsurface conditions.	Sediment	No	Yes	All work will be completed within applicable work windows and all permits required will be obtained prior to drilling. Helicopter will be used to access drilling sites.
		Vibration	No	Yes	
Circle Peak Trail Reconstruction Trail reconstruction of 4 miles of Circle Peak (#638.1) and Crystal Lake (#638) Trails	Suspended sediment delivery to fish-bearing waters		No	No	Project completed. No potential cumulative effect due to lack of overlap in both time and space (no lingering sediment effects).
Trail Maintenance Routine trail maintenance of 62.5 miles	Suspended sediment delivery to fish-bearing waters	White Chuck Bench Trail #731	Yes	Yes	Active trail maintenance primarily associated with flood repairs (above). Those effects are not lingering, so no cumulative effect. If White Chuck Bench Trail is worked on, sediments would reach same area of effect as proposed project, but the cumulative effect would not be measurable or meaningful.
Noxious Weed Eradication District-wide control efforts	Contaminants to fish-bearing waters if herbicide is applied near streams or other drainage features.		No	No	Access has been denied past Rd. 23 MP 1.9. No potential cumulative effect; proposed project does not include use of herbicides, and also lack of overlap in both time and space.

The geology, soils, and hydrology affected environment cumulative effects section of this report provides a more detailed assessment of the potential influences from these projects. Sedimentation would be the predominant effect caused by management activities, with which this project could cumulatively overlap. Suspended sediments and bedload (coarse sediments such as sand and gravels) are of particular concern for fisheries due to negative effects on spawning and rearing habitats. These materials can smother redds and fill pool habitats, reducing fish survival and growth.

Effects from the proposed White Chuck Road Repair Project may overlap with suspended sediments and/or bedload from the Gold Mountain Road Repair, White Chuck Bridge, road repairs from past flood damage, road maintenance, past timber harvest, White Chuck Trail Flood Repair, Upper White Chuck PCT Flood Repair, Circle Peak Trail Reconstruction, White Chuck Bench Trail maintenance, and noxious weed eradication. Other cumulative effects (benefits to fisheries) result from fish passage and instream projects.

Consistency with the Forest Plan

Alternatives A, B, and C would be consistent with the Forest Plan, as amended, because there would no net increase for roads in the watershed, and water quality and fish habitats would generally be maintained. In addition, under Alternative B, the decommissioning would ensure that fish habitats in the White Chuck River and tributaries draining under Road 23 between MPs 5.8 and 10.3 are maintained over time. Alternative D would be consistent with the Forest Plan, as amended, because the proposed repairs would be to an existing mainline road and the difference in total feet of new road is minor. Additionally, there has been previous effort to store or close roads in the White Chuck watershed to reduce road mileage in a Tier 1 watershed.

The minor amount of suspended sediment expected from the White Chuck ERFO repair project would travel into the Sauk River and probably to about Clear Creek. Considerable dilution occurs at the confluence with the Sauk River, but the White Chuck River dominates the turbidity of the Sauk below the confluence.

The sediment effects from the proposed project activities would not be measurable due to dilution and masking by the high background sediments, and conservation and mitigation measures would further minimize effects. Overall benefits to fish populations would be incrementally cumulative, but not measurably attributable to the proposed project. Large wood placed at Site #1 under Alternatives B, C, and D would have localized effects to large wood accumulations, pool and off-channel habitat formation, streambank conditions, and floodplain connectivity, but would not result in measurable cumulative effects. There would be no resulting discernible cumulative effects to fish or their habitats by implementing any of the action alternatives.

Riparian Reserves Affected Environment

As a key element of the ACS, Riparian Reserves are a designated land allocation adjacent to all streams, water bodies, and unstable (and potentially unstable) areas. Riparian Reserves compose about 40 percent of the White Chuck watershed. Because the White Chuck and Stujack Creek are fish-bearing streams, the Riparian Reserves extend approximately 360 feet along either side of the river (two site-potential tree heights) (Forest Service and BLM 1994).

The small unnamed creek at Site #2 and other permanently flowing but non-fish-bearing streams in the area have Riparian Reserve widths of 180 feet (one site-potential tree height). Total Riparian Reserves area within the project area is approximately 448 acres (360 feet on one side of the river for 10.3 miles), not including unstable, potentially unstable, wet areas or side channels that could widen the Riparian Reserves boundary).

Forest vegetation types adjacent to most of the stream channels in the White Chuck drainage are mid- to late-seral stage classes. These Riparian Reserves are considered to be functioning appropriately as sources of woody debris and shade (Forest Service 2004). The 2003 and 2006 flooding events involved a natural process, and effects to Riparian Reserves in the watershed as a whole were appropriate results of these processes (Figure 27).

Figure 27. Large Wood Delivered to the White Chuck River Channel, Site #1, 2003 Flood Event

Note the prominence of hardwood trees in the Riparian Reserve.

Unlike the rest of the watershed, the Riparian Reserves in the lower three miles of the White Chuck River are dominated by hardwoods, mainly red alder and cottonwood. This portion of the watershed was logged in the 1930s and large wood was likely removed from the river channel in the 1970s. Flood events like 1990, 2003 and 2006 delivered large amounts of wood to the channel by eroding stream banks supporting trees, causing those trees to fall into the river. Many of the trees were swept downstream and deposited on the floodplain. Some low river terraces with standing trees were buried in several feet of sediment, causing the trees to die.

While much of the wood from the floods is still mobile and subject to rearrangement during normal high water, some large jams have formed. Old jams or older key pieces within jams at the head of point bars are beginning to decay and break down, allowing side channels to enlarge as they are re-activated. Tributaries are beginning to be choked with fallen trees, many of which are suspended over the channels.

Shade over the lower reaches of the White Chuck River is not optimal due to the lack of coniferous forest and the widening of the river channel from sediment deposition. Unstable landforms in the watershed contribute to the high sediment load.

Riparian Reserves Environmental Consequences

Alternative A

Within the action area, the floods of 2003 and 2006 drastically altered local streamside areas, including the erosion of the deep glacial deposits at Sites #1 and #2. Implementing Alternative A would have no direct effect on Riparian Reserves at the local or watershed-scale. However, Alternative A may have an indirect effect on Riparian Reserves at the local scale because no culverts would be removed and the risk of failure with no maintenance would be great. If a culvert were to fail, the streamflow would be diverted out of the channel and down the road. Stream erosion processes would continue to scour banks and remove riparian vegetation until the river energy moves away from these sites, which could be within a year or two, or take decades.

The inaccessible portions of the road system would eventually revegetate, but most of the road is not within the primary shade zone of the river and, therefore, would not affect stream temperatures. Trees that establish on the road would be stunted due to the compacted road materials and not be an important future source of large wood. By not reestablishing vehicle access along any of the road, Alternative A would result in a de facto net benefit to the Riparian Reserves along the River by decreasing the amount of open permanent road within them. This would, in time, reduce sediment delivery to the river and improve connectivity for low-mobility species.

Alternative B

Repair Sites #1, #3, #4, #5, and #8 and a portion of Sites #2, #6, and #7 are located within area designated as Riparian Reserve. Alternatives B would move the location of the road at Sites #2 (MP 2.4) and #3 (MP 3.4) away from the river's floodplain. Repairs at Site #2 would shift a portion of Road 23 outside of the Riparian Reserve. The alternative would also result in a net decrease in the permanent road system due to road decommissioning beyond MP 5.8. Therefore, Standards and Guidelines for roads management within Riparian Reserves would be met. New stream crossings would meet requirements to pass the 100-year flood and associated debris, while providing fish passage at fish-bearing streams.

Under Alternative B, there would be road construction or reconstruction work within 3 to 5 acres of Riparian Reserves and road decommissioning in an additional 1.0 acres of Riparian Reserves. Only the road reroute at Sites #2 and #3 would degrade Riparian Reserve conditions by removing trees and creating a vegetation-free strip affecting about 2 to 3 acres of Riparian Reserves. The other reconstruction work would mostly remain within the already affected road right-of-way. The road decommissioning would have a long-term benefit to the Riparian Reserves by enhancing conditions for revegetation. The acres of Riparian Reserves converted to a roadway represent less than 1 percent of the 448 acres of Riparian Reserves within the project area. If the decommissioning of 4.5 miles of road is considered a restoration of the habitat, then there would be a net benefit to the Riparian Reserve within the

project area by the proposed project. The Riparian Reserves on the opposite side of the White Chuck River would remain unchanged.

Under Alternative B, the Stujack stream crossing would be upgraded or maintained to prevent the creek from diverting out of the channel and down the road in the event of crossing failure (Forest Service and BLM ROD 1994b). The crossing would also be upgraded to better pass fish and flood-related debris when funds are available. Alternative B would provide treatment of the flood damaged sites to minimize disruption of natural hydrologic flow paths, including diversion of stream-flow and interception of surface and subsurface flow, or restricting sidecasting as necessary to prevent introduction of sediment to streams (Forest Service and BLM 1994). The effects on Riparian Reserves by implementing Alternative B would not diminish the functional values of the Reserves.

Alternative C

Alternative C would have the same effects to Riparian Reserves as Alterative B. The only difference is that by placing the portion of Road 23 from MP 5.8 to the terminus in storage, it leaves the option of having the road restored at some point in the future. If this were to happen, there would no longer be a net decrease in permanent roads in Riparian Reserves along the White Chuck River or net benefit to Riparian Reserves due to restoration over the long term.

Alternative D

Alternative D would have the same effects to Riparian Reserves as Alterative C for Sites #1 to #4. Under this alternative, all of Road 23 would be repaired, resulting in no change to the amount of permanent roads within Riparian Reserves along the White Chuck River or restoration of habitat.

Riparian Reserves Cumulative Effects

Several past, present, and future projects have been completed, are on going, or are proposed in the same vicinity as the White Chuck ERFO Road Repairs (see Appendix C). These projects are:

- Rib Thin, Too Thin, and Forgotten Thin Timber Sales (thinning);
- Road decommissioning (Road 2080, 2083, 2084, 2086, 2087);
- Ongoing flood repairs, Gold Mountain Road 23, and White Chuck Trail and PCT repairs);
- Annual road maintenance (Mountain Loop National Scenic Byway, Road 22 and Road 23 systems); and
- Noxious weed management (Mountain Loop and timber thinning sale treatments).

All of the timber sales identified no treatment zones within the Riparian Reserves and there would not be any removal of vegetation or ground disturbing activities, resulting in no adverse affect to the Riparian Reserves for the South Fork Sauk or White Chuck Rivers. All of the thinning sales have included treatments to maintain and restore species composition and structural diversity of plant communities in Riparian Reserves. The retention of the no

treatment zones and canopy cover of the riparian areas of sales within the "area of potential effect" results in no measurable amounts of effects from these projects to combine cumulatively.

There are no other roads within the White Chuck River Riparian Reserves proposed for decommissioning. The only road decommissioning in the area is within the Sauk River's Riparian Reserves with the decommissioning of Road 2080 and possibly the beginning of road 2081 (on the south side of the river). These projects are marginally within the "area of potential effect" for the White Chuck River ERFO project. However, the BMPs, seasonal mitigations, and other measures will reduce potential sediment delivery. With decommissioning, vegetation removal is anticipated to be short-term (one growing season) with vegetation expected to grow and fill-in areas where plants and trees are removed, thus improving Riparian Reserve conditions. Because the effects of the White Chuck Road repairs are small, and the road decommissioning effects are also small, any combined effects would not be measurable. Over time, riparian conditions would improve as the vegetation grows in and around Roads 2080 and 2081.

The flood repairs on the White Chuck and Mountain Loop National Scenic Byway are located within the Riparian Reserves. All projects are expected to utilize the BMPs, seasonal mitigations, and other measures to reduce potential sediment delivery, and are expected to contribute minimally or non-measurably to cumulative effects.

When considering road maintenance and noxious weed eradication, none of these projects would remove riparian vegetation. In fact, eradicating noxious weeds would be beneficial to Riparian Reserves because this would allow native species to re-inhabit the area. Because there would be very minor vegetation removal associated with the proposed project under any of the action alternatives, there would be a minimal contribution to cumulative effects on Riparian Reserves.

Consistency with the Forest Plan

Alternative A would be *in*consistent with the Forest Plan, as amended, because the crossings would no be maintained to prevent diversion of streamflow out of the channel and down the road. Alternative B would be consistent with the Forest Plan, as amended, due to a net decrease in the permanent road system in a key watershed, as well as in riparian reserves, and all road crossings would either be maintained or removed. Alternative C is similar to Alternative B and would likely be consistent with the Forest Plan, as amended; however, if the section of Road 23 from MP 5.8 to 10.3 is removed from storage, it would be the same as Alternative D. Alternative D would be consistent with the Forest Plan, as amended, because the proposed repairs would be to an existing mainline road, and the difference in total feet of new road is minor. Additionally, there has been previous efforts to store and/or close roads in the White Chuck watershed to reduce road mileage in this Tier 1 watershed.

Aquatic Conservation Strategy

The ACS was incorporated into the Northwest Forest Plan to restore and maintain the ecological health of watersheds and aquatic ecosystems at watershed and landscape scales. The specific goal is to maintain the natural disturbance regime using nine objectives:

1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of aquatic systems to which species, populations and communities are uniquely adapted.
2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.
3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.
4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.
5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.
6. Maintain and restore instream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.
7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.
8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.
9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.

Objectives 1 and 6 are not affected by the White Chuck Road Repair Project and will not be discussed further. Effects to Objectives 2, 3, 4, 5, 7, 8, and 9 will be evaluated in the following sections.

Effects of Implementation

Alternatives A, B, C, and D would not have measurable effects on the ACS objectives at the watershed and landscape scales. Under all alternatives, Glacier Peak and the White Chuck River will continue to be the major influences on the aquatic and riparian systems within the White Chuck drainage. The glacial flows and the river system will continue to maintain shorelines, banks, and bottom configuration (ACS Objective 2). The glaciers and the river have the greatest influence on water quality and will maintain the integrity of the system (ACS Objective 4). Glacial melting and the White Chuck River will particularly influence the sediment regime, including timing, volume, rate, and character of sediment input, storage, and flow (ACS Objective 5). Glacial melting and the White Chuck River will continue to influence floodplain inundation with no changes in timing, variability, or duration (ACS Objective 7) expected from any of the alternatives.

Some localized effects within the riparian reserve would result under the alternatives; however, the processes that affect the disturbance regime within the watershed would be maintained. The functions and processes described in the ACS objectives would be preserved and the natural disturbance regime of the White Chuck River would be maintained under these alternatives.

Under all alternatives, the presence of the Road 23 system (Roads 23, 2311, and 2314) has an effect on ACS Objectives 2, 4, 5, 7, 8, and 9 at the site-specific scale. Roads can represent potential obstructions to free migration for some limited mobility species. However, because these roads are low-use roads (compared to highways), with large gaps in time between vehicles and low travel speeds, especially during evening and nighttime hours, it is likely that they would not impede the movement of large, wider ranging species. Waller and Servheen (2005) found that grizzly bears strongly avoided areas within 500 meters of a major highway in Montana, as has been documented for other classes of open roads (e.g., forest roads) (Gaines et al. 2003). However, they would cross at night when traffic volumes were low (averaging 10 vehicles/hour). Waller and Servheen (2005) hypothesized that a traffic volume of 100 vehicles/hr is a threshold at which road traffic becomes a barrier to grizzly bear movement. Thus, the presence of the Road 23 system does not pose a major detriment to connectivity (ACS Objective 2). There are minor amounts of surface erosion on the roads during storm events; however, the resulting water quality (ACS Objective 4) and sediment (ACS Objective 5) is within the range of natural variation within this high sediment load watershed.

Since much of Road 23 is within the GIS-mapped Riparian Reserves, there would be a minor affect on the species composition and structural diversity of plant communities within the reserves (ACS Objective 8) and the habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species (ACS Objective 9). However, due to its location (generally on a high terrace away from the river's edge), the road does not effect the thermal regulation, bank erosion and channel migration (ACS Objective 8). Nutrient filtering is affected by the amount of sediment delivered to the river through road runoff, which delivers sediment more directly to the stream network. However, sediment resulting from road runoff is minor compared with the background sediment level in the watershed due to glacial melting and river channel migration. While Road 23 creates a barrier to the migration of coarse woody debris from tributaries into the main White Chuck River, the tributaries in the project area are too small to transport the large wood material

downstream. Therefore, the road does not have an effect on this process. Most of the coarse wood is supplied by bank erosion along the main White Chuck River channel (ACS Objective 8).

Alternative A

With no action, there would be no road repair activities to the eight damage sites and no road maintenance activities on Road 23 would occur above MP 1.9. Vehicular access and road maintenance on Roads 2311 and 2314 would also be precluded. Seasonal access for high clearance vehicles to the portion of Road 23 between Sites #4 and #5 would be possible via Rat Trap Pass (assuming repairs to Boundary Bridge, Road 26, and Road 27 are made).

Under this alternative, the risk of catastrophic failure of the road and road drainage features remains. The erosion that would result would not be consistent with ACS Objectives 4 and 5 locally, but at the watershed scale, there would be no measurable change in water quality or sediment regime in the White Chuck River.

Alternative A is neutral in terms of the ACS Objectives at Sites #5, #6, #7, and #8. Channels draining Road 23 between Site #5 and the road terminus would continue to add minor amounts of sediment locally, but this would not be distinguishable from the normally high load of suspended glacial sediments in the watershed.

Not repairing at Site #4 would be inconsistent with ACS objectives by leaving an obstruction (the plugged box culvert) in the channel and forcing Stujack Creek to establish a channel around the culvert, a process that is already occurring.

Alternative B

Implementation of Alternative B would have a localized effect on ACS Objectives 2, 3, 4, 5, 7, and 9. At Sites #1 through #4 project activities would cause a temporary addition of sediment (ACS Objectives 4 and 5) and would temporarily disturb streambanks (ACS Objective 3). The project related sediments from all activities would be short-term in duration, occur at the localized level, and would be indistinguishable from other sediments transported in the White Chuck River

Reconstruction of Road 23 at Site #1 (MP 1.9) would place the roadway up to approximately 50 feet into the floodplain for approximately 250 feet. This would have a localized effect on ACS Objectives 4, 5, and 7 at Site #1, as construction activities would occur in the floodplain, thus decreasing floodplain connectivity, and would disturb sediment already on the floodplain. The road would be constructed on an erosion resistant rock foundation. This would retard channel migration into the hillside at Site #1 and modify the floodplain that was created during the 2003 flood. As mitigation, the simplified floodplain created in 2003 would be enhanced with the addition of large wood. Correctly placing partially buried large wood at Site #1 would likely assist in catching and retaining mobile wood and would function in creating slow water habitats (ACS Objective 9). Even though this one site would be modified, the physical integrity of the aquatic system at the watershed scale would be maintained. The floodplain is wide at this location (500 to 600 feet) and no measurable change in the timing, variability, or duration of floodplain inundation would occur.

At Site #2, the roadway would be moved away from the river, reducing conflicts between the river and road. The intention is to return the hydrologic function to the landscape where the

road is located, so that the road does not intercept and re-direct water flow. The small amount of sediment generated from the new construction would not change the sediment regime of the river. The flood of 2003 demonstrated the high end of the range of sediment production of the river by exposing the large cut banks at Sites #1 and #2 and elsewhere on the river. These sites of exposed large cut banks will generate tons of sediment for many years to come.

At Site #3, Road 23 would be rerouted around the washout before Stujack Creek. Drainage and cross drain culverts would be installed. Because Alternative B would reroute the road away from the White Chuck River at Sites #2 and #3, connectivity between the White Chuck River and left floodplain would improve (ACS Objective 2) and habitat along the River would potentially be restored (ACS Objective 9).

Road 23 would be repaired in-place at Site #4. The gravel and bedload material that is plugging the upper end of the culvert would be removed and used as fill material to rebuild approximately 50 feet of road that washed away. When funds are available, this culvert would be replaced with crossing that would restore fish passage and 100- year flood passage. In the short term (5 years), this site would not restore conditions for ACS Objectives 2 and 3. However, culvert replacement would restore conditions at the mouth of Stujack Creek for unobstructed fish passage and passage of flood flows and bedload.

Sediment generated from decommissioning activities on Road 23 from MP 5.8 to the road terminus would be small, would occur within the first year after project completion (during high flows) until the disturbed soils are revegetated and loose sediment has been transported downstream, and would not change the sediment regime of the river. Decommissioning the upper road would have a positive long-term affect on the ACS objectives, because the road would no longer have an influence on the White Chuck River, its floodplain and riparian corridor.

At all damage sites, management and mitigation measures, including erosion and/or sediment control measures, would be implemented and minimize impacts to ACS objectives.

Alternative C

Implementation of Alternative C would have a localized effect on ACS Objectives 2, 3, 4, 5, 7, and 9; however, there would be no effect at the watershed level. These localized effects are similar to those discussed under Alternative B.

Construction of the two ELJs upstream from Site #1 would temporarily introduce sediments into the White Chuck River causing a short term and localized effect to ACS Objectives 4 and 5. Addition of two ELJs would have a minimal effect on fish habitat under low-flow conditions and would provide slow water habitat during high flow events (ACS Objective 9). The ELJs would facilitate trapping of material along the left bank at Site #1, potentially building this floodplain (ACS Objective 2 and 3), and initiating migration of the White Chuck River towards the right bank. The tendency of the river following the last two flood events has been to reestablish the channel away from the left bank at Site #1 and the addition of the two ELJs under this alternative would further facilitate this migration.

Under this alternative, not all culverts and drainage features would be removed, or all hillslopes restored from MP 5.8 to the road terminus; and because of this, there would be the

potential of crossing or hillside failure. A failure would deliver additional sediment to the White Chuck (inconsistent with ACS Objectives 3, 4, and 5).

At all damage sites, management and mitigation measures, including erosion and/or sediment control measures, would be implemented and minimize impacts to ACS objectives.

Alternative D

Alternative D would restore all of Road 23, and thus restore motorized vehicle access to the White Chuck drainage and to the White Chuck Trailhead. Project effects for repair of damage Sites #1 through #4 are as described under Alternatives C and would have only a localized effect on ACS Objectives 2, 3, 4, 5, 7, and 9; however, there would be no effect at the watershed level.

Damage Sites #5 to #8 are located above the floodplain of the White Chuck River and no work is planned near the floodplain, active channel or ordinary high water/bankfull. Further, the small amount of sediment generated from the new construction at Sites #5 to #8 would not change the sediment regime of the river (ACS Objectives 4 and 5). In addition, at all damage sites, management and mitigation measures, including erosion and/or sediment control measures, would be implemented and minimize impacts to ACS objectives.

Consistency with the Forest Plan

All Alternatives would be consistent with the Forest Plan, as amended.

Wildlife

This section describes the wildlife resources within the project area, located within the White Chuck drainage. Special status species addressed include species that are federally listed under the ESA, Forest Service sensitive listed species (Regional Forester's Special Status Species List 2008), MBS National Forest Management Indicator Species, Northwest Forest Plan Survey and Manage Species, and migratory landbirds.

The proposed road repair sites all occur within second growth mixed-conifer and hardwood stands dominated by alder, big-leaf maple and cottonwood. There are stands of mature coniferous forest along Road 23. Down wood is abundant at the repair sites. Riparian habitat is present at all of the repair sites with Sites 1, 3, 4, 5, and 8 and a portion of Sites 2, 6, and 7 located within Riparian Reserves designated by the Northwest Forest Plan (see the Riparian Reserves and ACS sections for additional discussion).

Federal Threatened and Endangered Species and Designated Critical Habitats

The USFWS has identified four terrestrial wildlife species that may occur on the MBS National Forest that are listed as endangered or threatened (T&E) under the federal ESA and two designated critical habitats. These include the northern spotted owl (*Strix occidentalis*), marbled murrelet (*Brachyramphus marmoratus*), grizzly bear (*Ursus arctos*) and gray wolf (*Canis lupus*). The project area occurs within designated critical habitat for the marbled murrelet, but is outside designated critical habitat for the northern spotted owl.

Grizzly Bear

Contiguous, relatively undisturbed mountainous habitat with a high level of topographic and vegetative diversity is characteristic of most areas where grizzly bears exist (USFWS 1993). Floodplains and avalanche chutes are considered important foraging habitat during spring, and berry fields are important spring through autumn. In some areas, elk and deer can be important prey items, and winter range and calving areas for these species provide grizzlies with important hunting areas.

The project area occurs within the North Cascades grizzly bear recovery zone designated by the USFWS in the 1993 recovery plan for the species (USFWS 1993) and subsequent 1997 supplement (USFWS 1997b). Threats to the species in this recovery zone include issues related to road access management, small population size, and population fragmentation resulting in genetic isolation (USFWS 1993). The project area falls within Bear Management Unit (BMU) 11 (Prairie; flood damage Sites #1 to #4) and BMU 9 (Suiattle; flood damage Sites #5 to #8), and is adjacent to BMU 8 (Boulder).

There are no recent, confirmed sightings of grizzly bears in any of these BMUs, though there are historical records of grizzly bears on Meadow Mountain in the Glacier Peak Wilderness from the 1940s (Holland 1980). There have been two recent probable sightings in these BMUs. One in 1986 in BMU 8 near the Perry Creek Trailhead over seven miles to the southwest of the project area, and one in 1983 in BMU 9 is near Twin Lakes over four miles to the east-northeast of the project area.

Due to human disturbance concerns, core grizzly bear habitat is modeled to consist of all habitat types greater than 1,640 feet (500 meters) from open roads, motorized trails, and high use non-motorized trails (Gaines et al. 2003). High use non-motorized trails are defined as trails with 20 parties or more per week during seasons when bears are active. The early season is defined as den emergence through early summer (March 15 through July 15) and the late season is defined as late summer to denning (July 16 through October 31).

In 1997 the North Cascades Grizzly Bear Management Committee, which consists of the Park Superintendent of the North Cascades National Park and the Forest Supervisors of the Wenatchee, Okanogan, and MBS National Forests, agreed to an interim standard of "No Net Loss" of grizzly bear core habitat until superseded by a Forest/Park Plan amendment or revision. The baseline for the no net loss policy was based on mapped status of road and trail systems occurring in BMUs as of July 31, 1997. Validation of road/trail status and use continues to be refined and updated with site-specific project review. The existing amount of core grizzly bear habitat within each BMU overlapping or adjacent to the project area is presented in Table 23. Table 23 also provides the amount of existing potential early and late season foraging habitat, defined as areas with 50 percent canopy cover or less, within these core habitat areas.

Table 23. Existing Core Habitat and Foraging Habitat with Grizzly Bear Management Units Overlapping or Adjacent to the Project Area

	BMU No. 8 (Boulder)	BMU No. 9 (Suiattle)	BMU No. 11 (Prairie)
Total Area (acres)	168,276	118,089	90,013
Area on National Forest lands (%)	81.2	100.0	72.3
Early core habitat (%)[1,2]	63.4	92.1	43.4
Late core habitat (%)[1,2]	59.2	74.5	39.3
Early season foraging habitat within core habitat (%)[1,3]	49.7	60.6	20.5
Late season foraging habitat within core habitat (%)[1,3]	63.7	69.0	32.8

[1]Includes only National Forest Service lands.
[2] Early season defined as March 15 to July 15; late season defined as July 16 to October 31.
[3] Foraging habitats defined as areas with 50 percent canopy cover or less.

Gray Wolf

The gray wolf is not likely to occur in the project area due to the lack of suitable habitat. On the MBS National Forest, wolves are largely dependent on big game species (deer and elk). Elk occurrence is only occasional in the watershed and deer populations are currently at low levels, resulting in prey populations insufficient to support resident wolf populations (Forest Service 2002).

Due to concerns that gray wolves are sensitive to human disturbance, particularly around denning and rendezvous sites, security habitat for this species is modeled as all habitat types containing less than 1.0 mile/square mile of open road. Security habitat is typically evaluated in terms of the relative level of human influence within a fifth-field watershed area (Gaines et al. 2003). There is suitable security habitat for gray wolves at the fifth-field watershed level because over 70 percent of the White Chuck drainage is classified as wilderness or semi-remote recreation. There are no known denning sites, but one rendezvous site was documented along the PCT on the MBS National Forest (Darrington District files). While the White Chuck drainage has an open-road density of only 0.35 mile of road/mile, Road 23 has historically been a relatively high-use road (although low when compared to highways). Although it is possible that transient or dispersing wolves may occur on the MBS National Forest, the high amount of historical road use (see Chapter 1 for a description of road use) and lack of a prey base would likely limit wolf presence in the project area work sites.

Northern Spotted Owl and Critical Habitat

The spotted owl continues to display a declining population trend across its range (as was predicted in the Northwest Forest Plan) in Oregon, Washington, and California (USFWS 2007). However, a 5-year status review of the northern spotted owl recently completed by the USFWS concluded that the species should remain listed as threatened under the ESA, rather than being reclassified to endangered status (USFWS 2004). The primary threat to spotted owls on the MBS National Forest is thought to be competition from barred owls (Courtney et al. 2004; K. Livezey, USFWS; personal communication, 2008). The residual

effects on habitat from past timber harvest is also thought to be a contributing factor to declining spotted owl populations (USFWS 2008).

Spotted owls are found in to low and mid-elevation mature and old-growth forests with dense canopies. They are sensitive to habitat fragmentation require large expanses of undisturbed mature forest and typically do not cross open habitats. Spotted owls nest in trees with broken-tops and other natural hollows and in old stick nests of other species. Pairs of owls show high nest fidelity, using the same nest site for years, but do not nest every year.

There are pockets of residual trees that provide suitable nesting habitat along the length of Road 23 adjacent to Site #3 (MP 3.4), Site #4 (MP 3.5), Site #5 (MP 5.8), Site #6 (MP 6.45), and Site #8 (MP 8.5). There is no suitable spotted owl nesting habitat in the immediate vicinity of the damaged road sections at Site #1 (MP 1.9), Site #2 (MP 2.4), and Site #7 (MP 7.2). The nearest historic spotted owl activity center (1990) to any of the project sites is approximately 1 mile to the east of Site #4, in the Dead Duck Creek area. Barred owls have been reported using habitat along most of Road 23, and were seen in the project area between Sites 1 and 2 (Reed 2004). The Sustainable Ecosystem Institute Report (Courtney et al. 2004) reaffirmed the value of retaining large blocks of suitable nesting habitat for spotted owl recovery, discussed the threats of habitat loss (fire and timber harvest), and stressed the concern with competition from barred owls. In some situations, habitat fragmentation is thought to both reduce the suitability of habitat for spotted owls and increase competition from barred owls, which are more adaptable (Courtney et al. 2004).

In Washington, the early nesting season for spotted owl occurs from March 1 to July 15; late nesting occurs from July 16 to September 30. Disturbance during the early nesting season, when owls initiate nesting and incubate eggs, could interrupt the nest selection process, potentially resulting in the selection of less optimal nest sites. If disturbance causes the temporary displacement of an adult owl from the nest during the incubation process this may increase the potential for nest failure. Most owl activities are nocturnal, and therefore noise during the daytime is less likely to disrupt owl feeding or nesting activities. Once young have fledged (typically after July 15) disturbance is not expected to adversely affect spotted owl nesting because young birds will be capable of flight and can move out of an area where noise affects them..

Marbled Murrelet and Critical Habitat

The marbled murrelet is a seabird that nests in coastal conifer forests along the Pacific Coast of North America. Activity associated with nesting has been observed as far as 50 miles inland in mature coniferous forests, usually 120 to 150 feet above ground. Nests are usually 120 to 150 feet above ground, are shallow depressions in lichens or moss on large limbs of trees with complex canopies that conceal their eggs. A primary threat to this species, identified in the federal listing process, is loss of nesting habitat, mainly from commercial timber harvest that occurred in the 1800s and 1900s. Other concerns include foraging habitat and loss of key prey items due to human impacts and climate shifts. Historically cut areas continue to be maintained as harvested, younger-age-class stands that are not suitable for marbled murrelet nesting. Harvested areas near salt water (less than 20 miles) are mostly in State and private management. Most of the remaining suitable habitat is on federal lands and is not subjected to ongoing timber harvest activities. As nesting sites typically are found on

large, lateral branches, the development time from a harvested stand to suitable nesting trees is 100 to 200 years, depending on site qualities (USFWS 1997a).

There are pockets of residual trees that provide suitable nesting habitat along the length of Road 23, including adjacent to Site #3 (MP 3.4), Site #4 (MP 3.5), Site #5 (MP 5.8), Site #6 (MP 6.45), and Site #8 (MP 8.5). There is no suitable murrelet nesting habitat in the immediate vicinity of the damaged road sections at Site #1 (MP 1.9), Site #2 (MP 2.4), and Site #7 (MP 7.2). The project area is between 37 and 47 miles from the salt water of Puget Sound and is therefore within the range of distance inland where birds could potentially nest. Flood damage Sites #5 (MP 5.8) and #6 (MP 6.45) are within Designated Critical Habitat Unit WA-09-e for the marbled murrelet (Figure WILD-1 map of critical habitat). The Critical Habitat Unit is approximately 48,824 acres.

Marbled murrelet detections (fly-overs and vocalizations) have been made in the White Chuck River drainage as far inland as lower Crystal Creek, which is approximately 41 miles from salt water (Forest Service 2004). Crystal Creek is a tributary that converges with the White Chuck River near the junction of Road 23 and 27 (Figure 28 showing overview of sites).

In Washington, the early marbled murrelet nesting season extends from approximately March 1 to August 5; the late nesting season extends from August 6 to September 15. After the chick has hatched, adult movements to feed the young are primarily in the early morning and evening hours, while the chick remains on the nest in a downy coat of cryptic camouflage. Fledging occurs approximately between June and September. Disturbance during the nesting season, when eggs are being incubated, could result in adult birds being flushed from the nest. Should this happen, it is possible that while the adult is absent, eggs could cool to the point that the embryo dies, or that predators could more easily detect the nest or have easier access to egg, resulting in nest failure.

Regional Forester's Sensitive Listed Species

There are 14 species on the Regional Forester's Sensitive Species List (updated January 2008) that are documented or suspected to occur on the MBS National Forest. However, only the harlequin duck (*Histrionicus histrionicus*), Townsend's big-eared bat (*Corynorhinus townsendii*), Johnson's hairstreak (*Callophrys johnsoni*), bald eagle (*Haliaeetus leucocephalus*), and California wolverine (*Gulo gul luteus*) are likely to occur in the project area. The bald eagle was recently taken off the federal T&E list; however, it is protected under the Bald and Golden Eagle Protection Act, and it is still being monitored by the USFWS for the first 5 years following delisting (discussed in this section).

Several sensitive species do not occur in the project area due to lack of suitable habitat, including the common loon (*Gavia immer*; large lakes). There is suitable habitat in the project area for the peregrine falcon (*Falco peregrinus*), a sensitive species that uses cliffs for nesting; however, there is no record of their use in the project area. Other species are not expected to occur in the project area based on their known range, and based on repeated survey efforts in suitable habitat including: Larch Mountain salamander (*Plethodon larselli*)

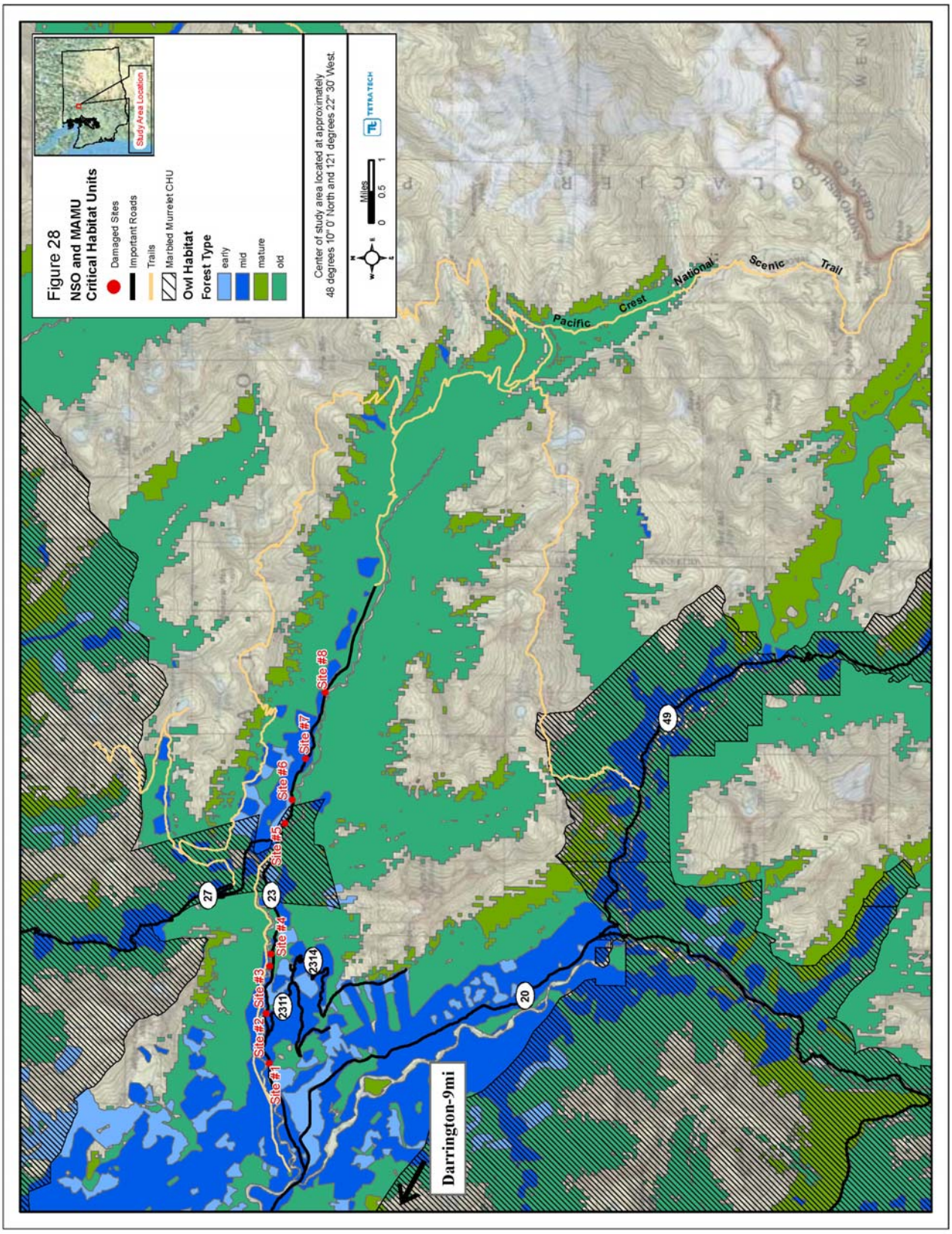


Figure 28
NSO and MAMU
Critical Habitat Units
Damaged Sites
Important Roads
Trails
Marbled Murrelet CHU
Owl Habitat
Forest Type
early
mid
mature
old
Study Area Location
Center of study area located at approximately
48 degrees 10' 0" North and 121 degrees 22' 30" West.
Miles
0 0.5 1
TETRA TECH
Site #1
Site #2
Site #3
Site #4
Site #5
Site #6
Site #7
Site #8
27
23
2311
2314
20
49
Darrington-9mi
Pacific Crest National Scenic Trail

and Van Dyke's salamander (*Plethodon vandykei*) (survey zone for both is south of Highway 2), Puget Oregonian (*Cryptomastix devia*), evening field-slug (*Deroceras hesperium*), warty jumping slug (*Hemphillia glandulosa*), Oregon megomphix (*Megomphix hemphilli*), and shiny tightcoil (*Pristiloma wascoense*). The latter groups of species will not be addressed further here.

Harlequin Duck

This species is suspected to use most of the White Chuck River drainage. Harlequin ducks have been observed in the lower reach of the river and near Kennedy Hot Springs (Forest Service 2004). Harlequin ducks build nests along stream edges in mature and large conifer forest or mixed forest stands within riparian zones of Class 1, 2, and 3 streams. Maintenance of water quality and down wood is important for supporting caddis flies, which are a major food source of harlequin ducks. Down wood also provides potential nesting and hiding sites within riparian areas.

Townsend's big-eared bats

The presence of suitable undisturbed roost, nursery, and hibernaculum (i.e., wintering hibernation) sites is the most important habitat component dictating the presence of this species (Perkins and Levesque 1987). Maternity and hibernation colonies typically occur in caves and mine tunnels, but may also occur in buildings and on the undersides of bridges (Washington Department of Wildlife [WDW] 1991). These sites are also used for night roosts. However, they also may occasionally use hollow trees for temporary roost sites. Townsend's big-eared bats feed primarily in the air along forest edges, roads, and open habitats, but can forage in almost any habitat (Johnson and Cassidy 1997). Primary threats to this species include changes in microclimate conditions due to human activities (e.g., removal of vegetation) that render roost, nursery, and hibernacula unsuitable to bats, and the direct disturbance of bats using these areas (Zeiner et al. 1990; WDW 1991).

Townsend's big-eared bats have been located in two sites on the Darrington District, roosting under a bridge on Road #26 on the Suiattle River and within a building at the Darrington compound (Forest Service 2004). No surveys were conducted within the project area, however the project area does not contain features suitable for roosting but could potentially provide foraging habitat for this species.

Johnson's Hairstreak

This butterfly occurs very locally ranging in the Cascade Mountains and been documented on the MBS National Forest. Habitat consists mostly of old-growth coniferous forests containing red fir, western hemlock, and gray pine. Caterpillars eat mistletoe (NatureServe 2008). The most recent account of this species occurs on the district in 2008, approximately 13 miles south of the project area. There are 42 Washington records for Johnson's hairstreak (Hinchliff 1996). Forty-one of the 42 Washington records are from ≤ 2,100 feet elevation, ranging from 0 to 2,100 feet, with an outlier record of 2,700 feet from southern Skamania County (Potter, personal Communication, 2005).

Bald Eagle

The bald eagle, a species formerly listed as threatened under the Federal ESA, was delisted in July 2007 (50 CFR Part 17). Protection to the species is still afforded by the Federal Golden and Bald Eagle Protection Act and the Migratory Bird Treaty Act, and the USFWS will monitor this species for the first 5 years following delisting. In addition, Washington State's bald eagle protection rules of 1986 (WAC 232-12-292) established a legal requirement for private, state, and municipal landowners to reach agreement with Washington Department of Fish and Wildlife (WDFW) on measures to protect breeding and roosting habitat.

Bald eagles occur year-round throughout Washington. Breeding bald eagles need large trees near open water that is not subject to intense human activity. In Washington, nearly all bald eagle nests (99 percent) are within 1 mile of a lake, river, or marine shoreline (Stinson et al. 2001). Assuming the presence of an adequate food supply, the single most critical habitat factor associated with eagle nest locations and success is the presence of large super-dominant trees (Watson and Pierce 1998).

During winter (November through March), bald eagles in the Pacific Northwest use a large foraging area that includes most rivers in the Puget Sound region, the Fraser River system in British Columbia, coastal areas in western Washington and British Columbia, and portions of interior British Columbia and Washington state (Watson and Pierce 1998). In the absence of disturbance, wintering bald eagles frequently move between major rivers in western Washington, in response to fish runs and shifts in fish distribution due to flood or high water. When disturbed, wintering eagles generally move only short distances (Stalmaster and Kaiser 1998). There is no historic indication that bald eagles have nested in the White Chuck River drainage, and minimal eagle use of this area by wintering eagles has been observed. It is unlikely that much winter use occurs due to the high-gradient reaches of the White Chuck River, which do not provide gravel bars for fish carcasses, thus limiting the foraging opportunities for bald eagles (Forest Service 2004).

Much greater foraging opportunities and eagle presence are recorded within the Sauk River to the west and the Skagit River to the north (Darrington District files, Forest Service). The Sauk River and its tributary rivers comprise a small segment of the area used by wintering eagles, but over 400 eagles have been tallied in counts on these river segments during winter fish runs (TNC reports for 2000 – 2001 and 2001 – 2002). Bald eagle use at the confluence of the White Chuck and Sauk Rivers has been observed, but very few detections have been made of eagles upriver in the White Chuck River from the confluence. The closest known staging area/night roost is near Beaver Lake and Lyle Creek on the Sauk River over a mile to the southwest of flood damaged Site #1.

Wolverine

In the Washington Cascades, wolverines occur in alpine areas down through forested zones to the lower edge of forests. Generally, they are most common in alpine and subalpine zones, but will sometimes descend into valleys, particularly in winter where large game may be available. Wolverines are opportunistic feeders. They forage on carrion but are capable of killing their own prey. In many areas, wolverines are believed to be dependent on ungulates as a major food source.

Wolverines naturally occur at low densities, with individuals ranging over large areas (Johnson and Cassidy 1997). They require large tracts of undisturbed land and are sensitive to human activity, particularly near den sites. The abundance of food and presence of human activity are though to be more influential on wolverine habitat selection than plant associations or topography (Ruggiero et al. 1994). Wolverines are likely present on the Darrington Ranger District because it contains large tracts of sparsely populated, undeveloped, and unroaded areas. Flood damage Sites #5 to #8 are less than a mile from the Glacier Peak Wilderness Area. However, wolverines are not expected to occur in the project area due the lack of abundant prey (deer and elk) and the high levels of human activity that occur along Road 23 (dispersed camping, hiking, and mountain biking). Given that approximately 70 percent of the White Chuck River drainage is wilderness, it is possible that transient or dispersing wolverines could occur in the project area.

Management Indicator Species

Management Indicator Species in the Forest Plan include threatened and endangered species (bald eagle and peregrine falcon [now delisted], grizzly bear, and gray wolf); old-growth and mature forest associates (northern spotted owl, pine marten [*Martes americana*], and pileated woodpecker [*Dryocopus pileatus*]); snag and downed log associates (primary cavity excavators (i.e., woodpeckers); and big game winter range (black-tailed deer [*Odocoileus hemionus*], Roosevelt elk [*Cervus elaphus roosevelti*], and mountain goat [*Oreamnos americanus*]). The bald eagle, peregrine falcon, grizzly bear and northern spotted owl are discussed above.

Pileated Woodpecker

The pileated woodpecker inhabits mature and old-growth and second-growth forests with large snags, decaying live trees, and fallen trees that it uses for nesting and roosting (Bull and Jackson 1995, Aubry and Raley 2002). Pileated woodpeckers are primary excavators and while excavating wood during foraging, they accelerate the wood decay process and expose prey that can be consumed by other species (Aubry and Raley 2002). This species is considered a “keystone habitat modifier” and serves as an indicator of mature forest conditions. Pileated woodpecker nests are typically found in hard snags of 25 inches diameter at breast height or larger.

Nesting habitat within the project area is of low quality for the pileated woodpecker because the forest is second growth with less than 20-inch diameter at breast height trees and few large snags. The project area also provides suitable foraging habitat. Higher quality habitat is found in older forests outside the influence zone of the flood damaged sites. The Forest Plan requires retention to support 40 percent of woodpecker population levels on lands managed for timber, and 100 percent population levels within riparian areas and lands not receiving a timber emphasis (Forest Service 1990). Over 60 percent of the White Chuck drainage consists of forests greater than 200 years of age and is expected to meet desired snag and down wood habitat through out most of the area (Forest Service 2004). Assessment of snags on a landscape scale for various projects in the project area vicinity (Forest Service 2004), found that there is a high percentage (85 percent) of the forest stands in the watershed that provide moderate to high-quality nesting/foraging habitat for primary excavators. Viability for primary excavators is maintained by this habitat at the 100 percent level (Forest Service 2006).

Black-tailed Deer and Elk

The black-tailed deer is an indicator of big game winter range conditions. Black-tailed deer are not abundant in the lower White Chuck River drainage, and they occur at low densities in the project area, in part due to limited forage availability (Forest Service 2004). The south-facing slopes of White Chuck Mountain (approximately 2 miles north of road repair Sites #1 and #2) and Meadow Mountain (located approximately 2.5 miles northeast of road repair Site #8) are considered important deer wintering areas due to the south facing slopes with less snow accumulation. The project area does not provide suitable winter range for this species given the cold air drainage of the White Chuck River and snow build-up in the river bottoms (Forest Service 2004). Deer forage habitat in the White Chuck drainage is expected to decrease as the forest canopies increase in timber harvested areas, and available forage is further reduced. During a site visit at flood damage Site #2, there was little sign of deer presence with no pellets, browse, or bedding sites observed. Elk are not currently known to use the White Chuck Drainage.

Mountain Goat

A population of mountain goats inhabits White Chuck Mountain, approximately 2 miles north of the project area. Goats use the southwest slopes of White Chuck Mountain during the winter months and are often observed on the rocky outcrops. No mountain goat habitat occurs at any of the flood damaged sites along the river; however, there is designated winter range on the north side of the White Chuck River. It is located across the river from flood damage Site #2 (MP 2.1), approximately 0.25 mile north of Road 23, and consists of cliff habitat. Nine goats were observed approximately 1 mile north of Site #2, during a site review in the spring of 2004. Goats have not been hunted in this area since 1995. Roads can increase vehicle access, which is associated with harassment, poaching, collisions with vehicles, and potential displacement of species such as mountain goats. Although variable and dependent on the situation, goats appear to become intolerant of human activities and disturbance at about 300 meters appears to be the distance at which mountain goats become disturbed and intolerant of human activities (WDFW 2003). However, guidance from the Washington Department of Fish and Wildlife is to discourage human use and vehicle traffic on and off roads and trails November 1 to June 30 within 1.6 kilometers (1 mile) of winter range (WDW 1991). All of the repair sites are outside of this distance from designated winter range and on the opposite side of the White Chuck River from other areas used by mountain goats.

Pine Marten

Pine marten are a Forest indicator species of old-growth and mature forests in the Pacific silver-fir forest association. Although marten may be found in all forested zones, higher densities of marten are found in the Pacific silver-fir and mountain hemlock forest zones. Marten may occur in and around the flood damage sites, and Jones and Raphael (1990) found that marten used riparian areas throughout the year in western Washington where they forage. However, habitat quality is low due to the forest zone and the young age of much of the forest within a mile of the repair sites.

Primary Cavity Excavators

Primary cavity excavators (i.e., woodpeckers) are Forest indicator species of snags and downed log habitats. Assessment of snags on a landscape scale for various projects in the project area vicinity found that a high percentage (85 percent) of the vegetated watershed consists of moderate to high quality nesting and foraging habitat for primary excavators (Forest Service 2004). This habitat provides viability for primary excavators at the 100 percent level (Forest Service 2006). The forest habitat at the reroute around Sites #2 (MP 2.4) and #3 (MP 3.4) provides suitable foraging and nesting habitat for woodpeckers. Habitat in the immediate area of the other project sites also may provide suitable woodpecker foraging and nesting habitat.

Other Rare and Uncommon Species (Formerly Survey and Manage Species)

A revised record of decision for Survey and Manage species was signed in January 2001 by the Regional Forester, and became effective February 11, 2001 (Forest Service and BLM 2001). The subsequent 2004 Record of Decision to Remove or Modify the Survey and Manage Mitigation Measures Standards and Guidelines removed the standards and guidelines, and moved some survey and manage species onto the Region's Special Status/Sensitive Species Program (Forest Service and BLM 2004). However, this ROD was repealed in 2006, and the 2001 ROD reinstated. Species that were covered under Survey and Manage as of March 21, 2004 (prior to the 2004 ROD) are once again included in the Survey and Manage program, and are now referred to as 'Other Rare and Uncommon Species' per regional direction. The inclusion of some of these species in the Region's Special Status/Sensitive Species Program remains in effect. All the 'Other Rare and Uncommon Species' on the Forest are addressed above as Sensitive Species. There is only one mollusk listed for pre-disturbance surveys on the north half of the MBS National Forest, the Puget Oregonian, which is addressed above.

Executive Order 13186 Migratory Landbirds

Executive Order 13186 outlines responsibilities of federal land management agencies relative to landbird conservation and the Memorandum of Understanding with the USFWS regarding interim direction on implementation of the Migratory Bird Treaty Act. There are 18 priority landbird (songbird) species identified by the USFWS as species of conservation concern for the Southern Pacific Rainforests physiographic area that occur on the MBS National Forest (USFWS 2002b). All of these species are associated with coniferous forest. Twelve of these species are neotropical migrants. Suitable nesting and foraging habitats for these species occurs adjacent to the road repair sites and along the length of Road 23. The wildlife specialist report for this project provides a listing of these species.

Protection Buffer Species and Bat Roost Sites

Protection Buffer species includes the white-headed woodpecker, black-backed woodpecker, pygmy nuthatch, and flammulated owl. These species are not known to occur on the MBS National Forest.

Forest Plan Standards and Guidelines calls for protection of caves, and abandoned mines, wooden bridges and buildings that may be used as roost sites by bats, specifically fringed myotis, silver-haired bat, long-eared myotis, long-legged myotis, pallid bat, and Townsend's big-eared bat. None of these roost site features is located at or near the project site. The project will not affect potential bat roost sites for these species.

Wildlife Environmental Consequences

ESA Consultation

Consultation with USFWS on the effects of the proposed White Chuck ERFO Road Repairs on threatened and endangered wildlife species occurred under the Five-Year Programmatic Biological Assessment for Forest Management: MBS National Forest (June 2002). In their Programmatic Biological Opinion for that project, the USFWS granted incidental take of spotted owl and marbled murrelet due to harassment from noise-generating projects (USFWS 2002b).

The original proposal made by the Darrington Ranger district in 2004 to repair three flood damaged site along Road 23 was reviewed by the Level 1 Team (consisting of Forest Service, USFWS, and NMFS [for Chinook salmon only]) for consistency with the Programmatic Biological Assessment. It was determined in April 2005 that the project met consistency requirements, thus meeting consultation requirements under the ESA. Effects determinations for the northern spotted owl and the marbled murrlet were Likely to Adversely Affect, for potential noise disturbance during the early breeding season, which is covered by the Biological Opinion. The effects determination for the northern spotted owl, marbled murrelet Critical Habitat, grizzly bear, gray wolf, and lynx was *no effect*.

In February 2009, the Level 1 Team met again regarding additional repairs for 2006 flood damaged sites at MP 3.4, MP 5.8, MP 6.45, MP 7.2, and MP 8.5. The Project Consistency Evaluation Form was signed, completing consultation (see project files). The effects determination for northern spotted owl and marbled murrelet is *likely to adversely affect*, for noise disturbance with no additional consultation is required, as the Programmatic Biological Opinion granted incidental take due to noise. The effects determination for spotted owl and marbled murrelet Critical Habitat is *no effect*. The effects determination for the grizzly bear and the gray wolf is *not likely to adversely affect with a potential beneficial effect* due to an increase in the amount of core/security habitat under Alternatives B and C and no change under Alternative D.

Effects Common to all Alternatives

The action alternatives would result in approximately 3 to 6 acres of habitat removal as a result of road repairs at Sites #2 (MP 2.4) and #3 (MP 3.4), and would include the potential of re-establishing vehicle use on approximately six (Alternatives B and C) to 10 miles (Alternative D) of road in the White Chuck River drainage. All habitat removed would consist of second-growth mixed coniferous/deciduous forest. Impacts to wildlife would be negligible, regardless of alternative implemented due to the large percentage of the White Chuck River drainage that is within wilderness or semi-primitive non-motorized designations (greater than 70 percent of the drainage), and because the majority of the proposed work is within the road prism or adjacent to the existing Road 23.

Implementing any of the four alternatives would have no effect or impact on the mountain goat, common loon, peregrine falcon, Larch Mountain salamander, VanDyke's salamander, Puget Oregonian, evening field slug, warty jumping slug, Oregon megomphix, shiny tightcoil, Roosevelt elk, or the Survey and Manage mollusk *Cryptomastix devia.* These species either are not suspected to occur in the project area, the project area does not support habitat for these species, or the habitat that is present near the White Chuck Road Repair Project would not be affected directly or indirectly, by implementation of any of the alternatives.

Reopening Road 23 has the potential to result in wildlife-vehicle collisions; however, there are no records of such incidents on Road 23. When passable, the maximum posted speed on the road was approximately 20 miles per hour, though the actual speed was probably less, given the condition of unpaved portions of road. Bertwistle (2004) examined rates of wildlife collisions for five wide-ranging ungulate species (elk, bighorn sheep, mule deer, moose, and white-tailed deer) and four wide-ranging carnivore species (coyotes, wolves, black bears, and grizzly bears) over 50 years in Jasper National Park. Results indicated that numerous variables influenced collision rates though collision rates were lowest at reduced vehicle speeds. Similar studies have shown that most of wildlife vehicle collisions occur at speeds of 45 to 55 miles per hour on low volume, two-lane roadways (Huijser et al. 2007). Even under alternatives that would restore vehicle access along a portion of the road (Alternatives B and C) or to the end of the road (Alternative D), the posted road speed and traffic volumes would remain low and, therefore, an increase in wildlife-vehicle collisions would not be anticipated. Other potential effects of increased human access, which may differ by alternative, are discussed below.

Alternative A

Under Alternative A, no repairs to Road 23 would be made, resulting in no loss of wildlife habitat. The exception would be minor amounts of forest habitat lost due to erosion if unstable areas along the road continue to erode. River meander over the long-term would also continue to shift portions of mature forest habitat within the riparian area to early seral habitat. Although the roadbed would revegetate over time trees would likely be stunted due to the compact soils in the road bed. At best tangible habitat benefits for species associated with mature forests (e.g., the spotted owl and marbled murrelets) are long-term, as it would take 80 or more years for the road system to grow in and mature forest structure to develop. Potential nesting structure for spotted owls and marbled murrelets would not be expected for 150 to 200 years.

Alternative A would also result in the continuation of limited human access to trail systems in the White Chuck drainage. Although hikers could still reach trail systems accessed via Road 23 (e.g., White Chuck Bench, Meadow Mountain, and White Chuck) over the short-term by hiking or biking, the road would not be maintained as a trail and would eventually become overgrown. This would result in a continuation of the current low level of human access to the White Chuck drainage and thus low levels of disturbance to wildlife resulting from human presence. Species such as the wolverine, wolf, and grizzly bear, which are sensitive to human activity, would benefit from areas with less human access and by not reestablishing vehicle access there would be a de facto increase in security/core habitat for these species.

Without repair, the road would be expected to continue to erode in places without repair, resulting in the contribution of sediment to the White Chuck River. This could occur to a larger extent during a high-water event (e.g., the major flooding in 2003 and 2006) or slowly over time. Materials such as suspended sediment, sand and gravel, and cobbles/boulders may have localized impacts to fish populations, but these impacts would not be expected to be of great enough magnitude to affect prey availability for bald eagles.

In addition, Alternative A would preclude access to Matrix lands along Roads 2311 and 2314. This could have varying effects on wildlife because timber management can have positive effects on some species while adversely affecting others. Harvest of mature forest results in habitat loss for species that are associated with large, mature trees for nesting, roosting, or denning (e.g., marbled murrelets, northern spotted owls, and marten). Timber harvest can also reduce habitat quality for species that require large tracts of contiguous habitat (e.g., grizzly bears and wolverines). However, forest management in second-growth forests can provide many benefits to wildlife by creating forest openings that increase understory growth and thus foraging habitat for some species (e.g., black-tailed deer and elk) and accelerating the development of mature forest successional stages.

Based on the above discussion, Alternative A would have *no effect* on northern spotted owls, marbled murrelets, and marbled murrelet critical habitat. Alternative A may affect but is *not likely to adversely affect* grizzly bears and gray wolves due to the de facto increase in core/security habitat.

Alternative B

Under Alternative B, other than the construction of two re-reroutes at Sites #2 (MP 2.4) and #3 (MP 3.4), there would be little change physically to the habitat conditions within the project area. Two large cedar snags (greater than 21 inches in diameter) would be removed at Site #2, and one large cedar snag would be removed at Site #3. Other trees to be removed would be less than 21 inches in diameter.

Alternative B would also result in the a reestablishment of vehicle access on Road 23 and the accompanying increase in human use up to MP 5.8. Human use would be expected to decrease from MP 5.8 to the White Chuck Trailhead because of the road decommissioning. Road repair activities would create noise above ambient levels, which can affect wildlife during critical seasons (i.e., breeding).

Federally Threatened and Endangered Species and Designated Critical Habitats

Grizzly Bear

Given the lack of recent detections and the low density of grizzly bears in the North Cascades, grizzly bears are unlikely to occur in the vicinity. However, under Alternative B, the decommissioning of Road 23 from MP 5.8 to the White Chuck Trailhead would result in an additional 1,670 acres of core habitat (both early season and late season) for the grizzly bear in BMU 9. This BMU already has 92 percent of the BMU in early core habitat and 75 percent in late season core habitat, which represents a high level of existing core habitat. The re-establishment of vehicle access up to MP 5.8 would not change the core habitat as per the mapped status of road and trail systems within BMUs 11 or 8.

Recreation activity on the flood-damaged road systems from hikers, backpackers, and other users would be replaced with vehicle transport of visitors to the established trailheads near the Road 23/27 junction. Because vehicle access would not be reestablished past MP 5.8, the amount of human use in the upper White Chuck River drainage would be less likely to return to pre-flood levels. Visitor use would be spread across multiple access points to Glacier Peak Wilderness, with all drainages retaining existing visitor use during the late summer period.

Vegetation removal under Alternative B would be minor at the scale of a grizzly bear home range and would not be expected to alter habitat connectivity for grizzly bears. Transient individuals passing through the project area could be exposed to temporary construction related noise and disturbance, as well as seasonal disturbance associated with the increase in summer recreation use associated with reestablishing vehicle access to the Road 23/27 junction. However, given that these sources of disturbance would occur in an area that has an existing level of human use, the large home ranges occupied by this species, and the availability of suitable habitat outside the project area, Alternative B *may affect, but is not likely to adversely affect* grizzly bears.

Gray Wolf

Gray wolves are sensitive to human activity and there is no core security habitat for wolves within the project area. However, under Alternative B, the decommissioning of Road 23 from MP 5.8 to the White Chuck Trailhead will result in an additional 1,670 acres of security habitat for the gray wolf in the White Chuck drainage.

It is unlikely that this species would occur near the proposed project other than in the form of transient individuals. These individuals could be exposed to temporary disturbance and noise associated with repair and construction. Given the minor amount of habitat removal relative to a gray wolf home range and the increase in security habitat Alternative B *may affect, but is not likely to adversely* affect gray wolves.

Spotted Owl

Vegetation removal associated with road construction at Sites #2 (MP 2.4) and #3 (MP 3.4) under Alternatives B would result in a reduction of approximately 3 to 6 acres of spotted owl dispersal habitat. However, the impacted stands would continue to provide dispersal habitat and therefore road construction activities would not be expected to affect dispersal of spotted owls. Vegetation removal would not affect suitable spotted owl nesting, roosting, or foraging habitat.

Alternatives B has the potential to result in adverse effects to nesting northern spotted owls due to noise disturbance at sites at MP 3.4, MP 3.5, MP 5.8, MP 6.45, and MP 8.5. Activities at these locations would involve heavy machinery, which would result in adverse noise impacts up to 35 yards from the sites. The area within 35 meters of these activities includes a maximum of 41 acres of suitable spotted owl nesting habitat. The scale and scope of this potential disturbance to spotted owls would be extremely small given home range size of spotted owl and suitable habitat for nesting owls within the White Chuck River drainage (13,750 acres; Forest Service 2004).

The Sustainable Ecosystem Institute Report (Courtney et al. 2004) identified major threats to spotted owl recovery as continued loss of suitable habitat, primarily from timber harvest and catastrophic wildfire, and competition from barred owls. Repairing and maintaining Road 23

is not expected to contribute to catastrophic wildfire or an increase in invasion of the barred owl, although the barred owl is known to be present within the project area. Repairs under Alternative B would provide access to some Matrix lands within the drainage for timber management activities. There are second-growth stands, particularly the western third of the drainage, which are a result of historic harvest activities. A number of studies, (Carey 2003, Carey and Wilson 2001, Muir et al. 2002 all cited in Courtney et al. 2004) report that variable density thinning in younger stands has the potential to develop stand characteristics to support spotted owls and dense prey populations. Based on the above discussion, the project is *likely to adversely affect* spotted owls due to potential noise disturbance in unsurveyed old forest habitat along Road 23, but would have *no effect* on spotted owl critical habitat as none occurs in the project area.

Marbled Murrelet

Under Alternatives B the areas of vegetation impact are not currently suitable nesting habitat for the marbled murrelet. Therefore, there would be no effect to habitat for this species, including the designated critical habitat at MP 5.8 and MP 6.45.

Alternatives B has the potential to result in adverse effects to nesting marbled murrelets due to noise disturbance at sites at MP 3.4, MP 3.5, MP 5.8, MP 6.45, and MP 8.5. Activities at these locations would involve heavy machinery, which would result in adverse noise impacts up to 35 yards from the sites. The area within 35 yards of these activities includes a maximum of 41 acres of suitable marbled murrelet habitat.

Noise impacts would be reduced for this species through the implementation of a mitigation measure restricting operations to 2 hours after sunrise and 2 hours before sunset. Although the mitigation measure would not affect incubating murrelets, it would reduce the possibility of adverse effects that could occur during post-hatching feeding events. Only 10 percent of marbled murrelets feeding activity occurs during the time of day when equipment would be operating, so most feedings would be unaffected. Based on the above discussion, the project is *likely to adversely affect* marbled murrelets due to potential noise disturbance in unsurveyed old forest adjacent to Road 23, but would have *no effect* on marbled murrelet critical habitat.

Regional Forester's Sensitive Listed Species

Harlequin Duck

Under Alternatives B the areas of vegetation impact are not currently suitable nesting habitat for harlequin duck, therefore there would be no indirect or direct effect to habitat for this species. Activities could impact harlequin ducks due to noise disturbance. Activities associated with repair or decommissioning would involve heavy machinery, which may disturb ducks in the vicinity of individual project sites. However, this disturbance would be short-term and would have negligible effects to harlequin ducks given the existing level of human activity associated with Road 23. Alternative B may impact individual harlequin ducks, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Townsend's Big-eared Bat

Townsend's big-eared bats may forage along Road 23. Habitat removal under Alternatives B would not result in a minor reduction in foraging habitat for this species. As noted above, there are not suitable roost sits within the project area. Therefore, Alternative B may impact individual big-eared bats and their habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Johnson's Hairstreak

Suitable Johnson's hairstreak habitat is available within the White Chuck drainage, but suitable habitat is low in the project work sites due to lack of old-growth and mature forest. The two to three acres of early and mid seral habitat removed under Alternative B, would not result in a reduction in high quality habitat for this species. Alternative B may impact individual Johnson's hairstreaks, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Bald Eagle

Project activity would occur at distances greater than 1.0 mile from any known active nest site and is not expected to result in disturbance to nesting eagles. Construction activities would occur during the summer and early fall (i.e., no work would occur between October 31 and March 15); therefore, there would be no disturbance to foraging or roosting eagles during the winter and would not affect the bald eagle or its habitat.

Wolverine

Denning habitat is not present in or near the project sites due to their low elevation, as well as the level of human activity associated with Road 23. In addition, the road relocations at MP 2.4 and MP 3.4 would not cause an appreciable reduction in foraging habitat availability. Similar to the grizzly bear and gray wolf, the decommissioning of approximately 4.5 miles of Road 23 would beneficially affect this species by reducing the level of human activity associated with the road. Due to the absence of denning habitat and the lack of habitat impact, this alternative will have no negative impact to the wolverine.

Management Indicator Species

Pileated Woodpecker

Alternative B would not remove old-growth and mature forest habitat. The habitat that would be removed is of low quality for nesting due to the low number and small size of snags found in young forest. Any impacts to foraging resources are expected to be negligible given the minor amount of habitat removal and due to the mitigation measures that require snags and downed logs to be maintained to the extent practicable. Therefore, impacts to pileated woodpeckers or their habitat would be negligible.

Black-tailed Deer

Deer use of the White Chuck drainage is low and use of the project area occurs outside of the wintering season due to the cold air drainage of the White Chuck and snow accumulations. Construction and repair activities would coincide with potential deer presence in the project area and therefore Alternative B may temporarily disturb deer during the construction period. The damaged road sites are within second growth forests that serve as thermal cover habitat

for deer. However, the very limited amount of vegetation removal of 2 to 3 acres associated with reroutes at Sites #2 (MP 2.4) and #3 (MP 3.4) would not be expected to impact deer habitat conditions or availability at the scale of a deer's home range.

Human use of the project area would be expected to increase along Road 23 up to the junction with Road 27 due to restored vehicle access and continued recreation activities of hiking, camping, hunting, and other dispersed recreational use. This use would be expected to occur during outside of the winter season, when roads are accessible. Therefore, Alternative B would have negligible impact to black-tailed deer or and no impacts to black-tailed deer winter range.

Mountain Goat

Mountain goats have been documented on the opposite side of the river (north side) from the road repair sites and over a mile away. Noise effects associated with construction and repair activities would not be expected to disturb mountain goats using this area due to their distance and because they would occur temporarily during the construction season.

Pine Marten

As noted above, the project area does not occur in forest zones characterized by high marten densities and habitat at the repair sites is of lower quality for marten because it consists of early seral forests. Although portions of habitat along Road 23 contain mature forest suitable for marten, none would be removed under Alternative B. Vegetation removal would result in a minor reduction in potential foraging habitat; however, it would be negligible at the scale of an individual marten home range.

Primary Cavity Excavators

Primary cavity excavators require snags and downed wood for nesting and foraging. The project would not remove any mature or old-growth forest habitat. Three snags greater than 20 inches in diameter would be removed from any of the repair sites (all others would be less than 12 inches in diameter), and downed wood at Sites #2 (MP 2.4) and #3 (MP 3.4) where road construction would occur would be retained onsite to the extent practicable. Therefore, impacts to primary cavity excavators would be negligible.

Executive Order 13186 Migratory Landbirds

Alternative B would remove up to 3 acres of land bird habitat, primarily affecting species associated with young forest or riparian vegetation. Due to the small area impacted at each site, impacts would be on a within-territory scale, and would not likely result in the removal of individual territories. Conversion of forest habitat to road at Sites #2 (MP 2.4) and #3 (MP 3.4) would improve habitat suitability for some species (i.e., those associated with shrubby vegetation that would potentially be maintained along road sides) and reduce habitat suitability for others (i.e., those associated with mid- to upper-canopy tree layers). However, impacts would be localized and not be expected to impact landbird species populations.

Biodiversity

Given the small scale of the project and availability of suitable habitat for riparian species outside of the project area, implementing Alternative B poses no long-term affects to biodiversity.

Alternative C

As under Alternative B, Alternative C would result in the removal of up to 3 acres of habitat associate with the two reroutes at Sites #2 (MP 2.4) and #3 (MP 3.4) and the re-establishment of vehicle access along Road 23 up to the junction with Road 27. Thus, impacts to wildlife associated with habitat loss and increased in human access along Road 23 would be the same under both alternatives over the short term. This would include the generation of noise above ambient levels associated with construction and repair activities that have the potential to disturb marbled murrelets and northern spotted owls; therefore, Alternative C would have a risk assessment of *likely to adversely affect* these species (covered by the Programmatic Biological Opinion), but would have *no effect* on marbled murrelet critical habitat.

The primary difference between Alternatives B and C is that under Alternative C, Road 23 from MP 5.8 to the end of the road would be placed in storage rather than decommissioned. Thus, although human use would be expected to decrease from MP 5.8 to the White Chuck Trailhead over the short term, use could return to pre-storm damage levels should the Forest Service decide to take the road out of storage (i.e., improve it for vehicle use). Therefore, over the short term there would be an increase in the amount of core/security habitat for species sensitive to human activity, such as the grizzly bear and gray wolves (see discussion above under Alternative B). However, over the long term, because the road designation could return to its current maintenance level, core/security habitat would also return to current levels. Thus, Alternative C would not change the 1997 core habitat security acres and is *not likely to adversely affect* these species.

Alternative D

Under Alternative D, like Alternatives B and C, would result in the removal of up to 3 acres of habitat associate with the two reroutes at Sites #2 (MP 2.4) and #3 (MP 3.4). Thus, there would be little change physically to the habitat conditions within the project area and habitat related effects to wildlife species would be the same as those described under Alternative B. Road construction and repair activities would and result in temporary noise impacts during construction, which could result in disturbance during critical seasons for some species (see Alternative B for additional discussion).

In contrast to Alternatives B and C, under Alternative D vehicle access would be re-established along the entire length of Road 23 up to the White Chuck Trailhead. This could potentially result in the return of human activity in the upper drainage to pre-flood damage levels, including activity by recreationists in the Glacier Peak wilderness using Road 23 for access. This would result in greater disturbance to wildlife species that are sensitive to human activity, than under Alternatives B and C. However, because the reestablishment of vehicle access up to MP 5.8 would not change the mapped status of roads and trail systems within any of the BMUs or watersheds overlapping the project area, the actual amount core habitat for grizzly bears and security habitat for wolves would not change from current levels.

By re-establishing vehicle access along the length of Road 23, Alternative D would also provide access to Matrix lands for timber management accessible in the upper drainage and along roads 2311 and 2314. As described under Alternative A, forest management can have both positive and negative impacts to wildlife species, benefiting some by improving habitat quality while adversely affecting others through increased disturbance, habitat loss, or fragmentation.

Alternative D would have a risk assessment of *likely to adversely affect* spotted owls and marbled murrelets due to potential noise levels generated by project activities, but would have *no effect* on marbled murrelet critical habitat. Alternative D would result in the same open road configuration as existed in 1997, so there would be no net loss of core habitat acres (based on 1997 core habitat acres) or increase in disturbance to grizzly bears and gray wolves. Alternative D would have a risk assessment of *not likely to adversely affect* these species due to their wide-ranging nature and low likelihood of occurring in the project area, and the high core habitat within BMU 9.

Wildlife Cumulative Effects

A cumulative effect is the effect on the environment that results from the incremental effect of the action (the proposed project), when added to the effects of other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes the other actions and regardless of land ownership on which the other actions occur. An individual action when considered alone may not have a measurable effect, but when its effects are considered in sum with the effects of other past, present, and reasonably foreseeable future actions, the effects may be measurable. They can occur when small, incremental amounts of habitat are lost over time through a variety of management activities across a landscape.

The cumulative effects area for the wildlife review encompasses the White Chuck River drainage from the confluence of the White Chuck River with the Sauk River to the head waters for a variety of species. The White Chuck River drainage and portions of the Sauk River were reviewed for effects to the bald eagle. The White Chuck drainage and closest critical habitat were reviewed for impacts to marbled murrelet and spotted owl. Bear Management Unit (BMU) #9 was reviewed for potential impacts to core habitat. Table 24 displays projects that were found to be past, present and reasonably foreseeable actions that would spatially and temporally overlap with the White Chuck cumulative effects for wildlife

Table 24. Wildlife Cumulative Effects Determination

Project	Species - habitat Potential Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?
Past Timber Harvest on National Forest System land, White Chuck watershed (1928 – 1995)	Spotted owls and murrelets: harvest of ~25% of lower elevation old forest – in 5th field watershed loss of suitable nesting habitat.	Yes	Yes	No	Proposed removal of 3 acres of second growth forests will not add to the residual effect from past actions to spotted owl, marbled murrelet habitat. And other species habitat.
	Townsend's Big-eared Bat – Past harvest modified feeding habitat, but it remains suitable.	Yes	Yes	No	No known differences between forested / non-forested feeding habitat quality for Townsend's bat, roost sites not affected.
	Woodpeckers - reduced foraging/nesting habitat on harvested acres	Yes	Yes	No	Since 80% moderate to high-quality habitat remains in watershed, viability analyses indicated 100% likelihood of all woodpecker species remaining viable
Past Commercial Thins Bench Thin, Rib Thin, Too Thin, and Funnybone Thin	Variable density canopy retention. Thinning done in the 1992 – 2006 at confluence area of Sauk/white Chuck Rivers	Yes	Yes	Yes	Project for timber stand development retains dispersal habitat. Mitigation measures were adhered to, no adverse affects to listed species or other special status species.
	Reduction in small diameter snags, increase in ungulate forage and stand diversity	Yes	Yes	No	Viability analyses indicated 100% likelihood of all woodpecker species remaining viable, snag recruitment over time.
2003 Flood repair road projects Gold Mountain repairs including White Chuck Bridge	Bald eagle: Disturbance on winter forage habitat in Nov/Dec.	No	Yes	No	Work is outside of bald eagle winter forage season.
	Spotted owl/marbled murrelets - noise Disturbance during breeding season	No	Yes	No	Project completed Fall 2008, over 90% of suitable habitat not disturbed.
2003 Flood repair road projects Boundary bridge Repairs – Road 25	Bald eagle: Disturbance on winter forage habitat in Nov/Dec.	Yes	Yes	No	Work is outside of bald eagle winter forage season.
	Grizzly bear core habitat	Yes	Yes	Yes – beneficial	Project creates additional core habitat due to road closure or decommissioning.
	Gray wolf security habitat	Yes	Yes	Yes - beneficial	Project creates additional security habitat due to road closure or decommissioning.

Table 24. Wildlife Cumulative Effects Determination (continued)

Project	Species - habitat Potential Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?
Design analysis work for White Chuck Road Repair in spring 2009. Will occur at MP 1.9, 2.4, and 3.5 of Road 23	Spotted owl/marbled murrelets - noise Disturbance during breeding season	No	Yes	No	Helicopter will be used to access drilling sites. All work will be completed within applicable work windows and all permits required will be obtained prior to drilling. No overlap in time so there would be no contribution to cumulative effects.

Alternative A would not result in a change in cumulative impacts to wildlife species because no repairs would be made at this time along Road 23. Under Alternatives B and C, due to a lack of measurable direct or indirect effects from the White Chuck Road 23 Repair projects, there would be no contribution to cumulative effects for the bald eagle, common loon, American peregrine falcon, Townsend's big-eared bat, California wolverine, Larch Mountain salamander, Van Dyke's salamander, Harlequin duck, Puget Oregonian, evening fieldslug, warty jumping slug, Oregon megomphix, shiny tightcoil, Johnson's hairstreak, pileated woodpecker, pine marten, mountain goat, black-tailed deer/elk, primary cavity excavators, migratory land birds, or biodiversity. The following discussion addresses major types of activities within the analysis area:

Past Timber Harvest. Over the past 100 years, timber harvest and associated road construction have reduced nesting habitat for the northern spotted owl and marbled murrelet in a limited portion of the White Chuck drainage. It has also modified foraging habitat for the Townsend's big-eared bat, and has reduced snag availability for pileated woodpeckers and other cavity nesting species.

The second-growth habitat that would be removed under the action alternatives does not provide suitable nesting habitat for spotted owls or marbled murrelets. Although in the long term, these vegetation types could develop into old-growth forest capable of supporting nesting activities of both species, the areas where forested habitat would be removed are negligible relative to the size of the home ranges for these species. For example, the average spotted owl home range in the project area is estimated to be 4,270 acres. Therefore, the area impacted is, at most, 0.023 percent of the average home range. The sizes of the areas where vegetation would be removed are smaller than the natural gaps that commonly occur within old-growth forests that provide nesting habitat for both species. Therefore, because no suitable spotted owl or marbled murrelet habitat would be affected, none of the alternatives would cumulatively add to past reductions in habitat area that contributed to the listing of the two species.

The 2006 White Chuck watershed analysis (Forest Service 2004) examined the natural range of variability of seral stage composition within the watershed and two other watersheds, in an effort to assess habitat trends, recognizing that ecosystems naturally vary over space and time. The underlying assumption in this analysis is that if seral stage composition is not

within the natural range of variability there is an increased risk of adverse effects to biodiversity and ecological function. The analysis indicated that the composition of seral stages in the White Chuck watershed was within or near the normal range of variability (Forest Service 2006). Over the short term, some impacts to biodiversity may result from timber sales. However, in the long term, biodiversity would benefit from increased stand heterogeneity and coarse woody debris recruitment. The removal of two to three acres of mid-seral vegetation would not result in a change in the distribution of seral stages within the watershed.

Past Commercial Thinning. Between 1992 and 2006, thinning projects have been implemented at confluence area of Sauk/White Chuck Rivers. These projects have resulted in local reductions in small diameter snags, increased ungulate forage, and increased stand diversity. Suitable dispersal habitat for the northern spotted owl has been maintained with canopy retention of greater than 40 percent. Dispersal habitat is also maintained with over 70 percent of the landscape within the White Chuck drainage being wilderness, where no forest management activities take place. The removal of two to three acres of early seral vegetation associated with the action alternatives would not contribute cumulatively to the effects of past thinning projects.

2003 Flood Repair Projects. No suitable nesting habitat for the spotted owl or marbled murrelet was or will be modified during the Gold Mountain Road and Boundary Bridge repair projects or the White Chuck Bench, White Chuck, and PCT repair projects. Noise disturbance from these projects during the breeding season may result in short-term disruption of owls or murrelets from nesting activities (one exception being the PCT, which occurs outside of murrelets habitat). The Gold Mountain project, completed in the fall of 2008, and the ongoing and scheduled trail repair projects include the implementation of timing restrictions to avoid the early breeding season for marbled murrelets. These projects in combination with the Road 23 Repair Project would result in a minor increase in cumulative noise disturbance, given that over 90 percent of the suitable habitat for northern spotted owls and marbled murrelets in the drainage would have no noise disturbance (see Wildlife Specialist Report).

The Boundary Bridge project, along with Suiattle River Access Travel Management actions, would involve road closure and decommissioning resulting in a future net increase in grizzly bear core habitat. Alternatives B and C would also result in an increase in core habitat. These projects would have a beneficial cumulative effect on grizzly bears.

Potential disturbance that could result from implementing the action alternatives could result in a reduction of winter forage habitat use by bald eagles during the first 2 weeks of the winter eagle season (November 1 to 15) when the Road 23 Repair Project would be constructed. Bald eagles are not known to winter in the White Chuck River, but due to the presence of small numbers of spawning salmon, may occur in low numbers at some time during the winter. Because the proposed road repair activities would occur in early November—when it is remotely possible that bald eagles may be present—there would be possibility of contributing cumulative effects from the White Chuck Bench Trail repair activities the first 2 weeks of November during the year of project construction (and none, thereafter). The cumulative disturbance is of a local area (less than 2 miles of river) within a larger foraging area of the Sauk, Suiattle, and Skagit Rivers (greater than 50 miles of river) and therefore any displaced eagles would have alternate feeding areas.

Ongoing Annual Recreational Site, Roads and Trail Repair and Maintenance. Road (20, 23, 24, and 27), trail (#643, #643.01, #643.02, #639, #657, #646, and #2000 and trailheads), and recreation site (White Chuck boat launch) repairs and scheduled maintenance are currently active and planned within the White Chuck drainage and the Sauk River drainage. Implementing any of the action alternatives would result in noise disturbance to suitable nesting habitat for both the spotted owl and murrelet in the White Chuck drainage. However, the road and trail projects have timing restrictions, where necessary, to prevent noise disturbance to listed species, or are limited in scale and scope of impacts. Due to the distribution of these project areas spatially and potentially temporally, only limited cumulative noise impacts to these species would be expected.

Consistency with the Forest Plan

All Alternatives would be consistent with the Forest Plan, as amended.

Botany Affected Environment

The analysis area for direct and indirect effects to botanical resources is the project area. Botanical surveys were conducted at Site #1 and Site #2, and a proposed reroute between Road 2311 and 23 on June 23, 2004. A botanical survey of Site #3 occurred on September 26, 2008. These were Level 5 surveys (intuitive controlled). Surveys were not conducted at Sites #4 through #8 because the affected area and the proposed repairs are all within the road prism, which is not considered suitable habitat for Sensitive or other rare and uncommon species.

At the time of the 2004 surveys, the Survey and Manage provisions had been removed from the Northwest Forest Plan, and the Regional Forester's Sensitive Species list was the only one in effect. As of January 2006, the Forest Service was directed to not authorize any ground disturbing activities unless such activities were in compliance with the 2001 ROD, as it existed on March 21, 2004. Mt. Baker-Snoqualmie National Forest Botany Program procedures direct botanists, to the extent possible, to document all species (vascular plants, bryophytes, lichens, and fungi) during pre-disturbance surveys, regardless of what is on the agency lists at the time of the survey. Therefore, all of the project areas have been surveyed to protocol, further surveys are not necessary, and this project complies with the 2001 ROD.

At Sites #1 and #3 vegetation consists of second growth hardwood dominated by primarily red alder, bigleaf maple, and black cottonwood. The understory is primarily salmonberry, devil's club, and piggyback plant. The same habitat and dominant species exist at the proposed excavator route at Site #2. The reroute from Road 2311 to Road 23, located between Site #2 and Site #3, is a second growth mixed hardwood-conifer stand of primarily red alder, western hemlock, and bigleaf maple. The understory varies, depending on moisture level. The wet sites support skunk cabbage, devils' club, and stink currant. The drier sites typically support sword fern, salmonberry, and piggyback plant. There are several wet sites along the route, with saturated soils even during the middle of summer.

During the surveys, the Sensitive lichen *Usnea longissima* was found as litterfall at both Site #2 and the reroute between Road 2311 and 23. It apparently came in from the adjacent stands of forest because it was not observed on trees within the project areas. The pieces were found as litterfall and will not survive on the ground, so this is not considered an

occupied site that can be managed to perpetuate the population. No other Sensitive or other rare and uncommon species were found during the surveys. A review of the rare plant database on September 6, 2006, and again on September 29, 2008, shows the nearest other Sensitive or other rare and uncommon species to be *Platanthera orbiculata* and *Cudonia monticola*, both over a mile away from the project sites.

The noxious weed herb Robert (*Geranium robertianum*) was found along Road 23 sporadically from the Mountain Loop Highway to Site #1, and sporadically between Sites #1 and #3. It was also found along Road 2311 from the junction with Road 23 to the start of the proposed reroute, and approximately 20 feet downslope from the start of the reroute into the adjacent vegetation. Herb Robert is a Class B non-designated weed, where control is required but is a lower priority than other weed species.

There is a population of orange hawkweed (*Hieracium aurantiacum)* along the White Chuck Road at Owl Creek, approximately 1.5 miles west of the east end of the White Chuck Road. This population was first discovered in 2000. It was dug in 2002 and 2003 but has not been eliminated because digging has been found to be very ineffective. There is also a site of tansy ragwort (*Senecio jacobaea)*, first documented in 2002, near MP 5.7, which is approximately 0.2 mile west of Site #5. These were pulled in 2002. Since the flood in October 2003, no one has been able to visit the sites of orange hawkweed and tansy ragwort to attempt any weed control and the status of these populations is unknown. Although orange hawkweed and tansy ragwort are Class B non-designated weeds, the Snohomish County Noxious Weed Board requires control of these two species.

Botany Environmental Consequences

Sensitive Species

There will be no impact to the *Usnea longissima* found in the project area because the pieces observed were found as litterfall and will not survive on the substrate on which they were found. *Usnea longissima* was noted in several places in the White Chuck valley; both along the main road and across the river along the north bank. Further, *U. longissima* is relatively abundant on the north end of the Forest, which leads to no concern for the long-term viability of the species in this area. Thus, there will be *no impact* to individuals, populations, of Sensitive or other rare and uncommon plant species under any of the Alternatives.

Noxious Weeds

The chances of weed spread are considered slightly higher under Alternative A (the No Action Alternative) because of the difficulty of access to the known sites of noxious weeds. Since the flood in October 2003, no one has been able to visit the sites of orange hawkweed and tansy ragwort to attempt any weed control Under Alternative A, this would likely continue until sufficient funding could be obtained to pay for the cost of accessing and treating the sites. As a result, the existing weed populations are expected to increase and would become more costly and time consuming to control.

Under the proposed action (Alternative B) and Alternative C, the spread of orange hawkweed and tansy ragwort is still expected because the road will be decommissioned (Alternative B) or placed in storage (Alternative C) near the junction with Road 27, thus, making access to

and control of these sites difficult. However, under these two alternatives, vehicular access would be restored to the sites of herb Robert infestations and treatment of those sites could occur.

Under Alternative D, vehicular access would be restored and treatment of populations of all three known noxious weed species could occur, potentially decreasing the spread of noxious weeds under this alternative.

Further, the mitigation measures specified (see Chapter 2) are expected to minimize the spread of existing weed populations and prevent new project-induced infestations. Informing the botanist of the location of any material hauled off site will allow monitoring of the material and early treatment of any germinants. Cleaning equipment before leaving the site prevents seeds from being spread far distances. Seeding and mulching helps establish a ground cover quickly, which hinders germination of weed seeds.

Botany Cumulative Effects

Sensitive species

Because there are no direct or indirect impacts to Sensitive or other rare and uncommon species from the proposed action, there would be no contribution to cumulative effects to either.

Noxious weeds

In considering cumulative effects on noxious weeds, the area analyzed was the White Chuck Road and the Mountain Loop Highway between Darrington and Barlow Falls. This is because roads and the vehicles using them tend to be good vectors for weed spread (Lonsdale and Lane 1994; Sheley and Petroff 1999; Tyser and Worley 1992).

Noxious weeds are present in a few scattered sites in the project area. Herb Robert is present along Road 23 sporadically from the Mountain Loop Highway to Site #1, and sporadically between Sites #1 and #3. Herb Robert is also found in the area of the proposed reroute between Roads 23 and 2311. Tansy ragwort is present in one site near MP 5.7, and there is a population of orange hawkweed along the White Chuck Road at Owl Creek, approximately 1.5 miles west of the east end of the White Chuck Road. Along the Mountain Loop, there are several small populations of weeds. Orange hawkweed is present along the Mountain Loop south of Darrington to near the junction with Road 23. Canada thistle (*Cirsium arvense*) is present in spots between Darrington and the Forest boundary. Knotweed (*Polygonum* spp.) is present in patches in and south of Darrington and within the middle reach of the Sauk River.

The County has been treating the orange hawkweed and thistle south of Darrington for several years, but control of the hawkweed there has been spotty. The Nature Conservancy has been treating the knotweed patches within the Sauk River as part of the overall effort to control knotweed in the Upper Skagit system. Many of the patches within the middle Sauk River have been eradicated. Along the White Chuck Road, the population of orange hawkweed at Owl Creek was being treated annually until the road was washed out in 2003. The tansy ragwort population was pulled once in 2002.

Implementation of Alternative B would not likely contribute cumulatively in any meaningful way to weed spread, beyond what would be expected with typical traffic and natural seed dispersal, because of the following:

- Weed control efforts along the Mountain Loop are on-going, and some weed infestations have been eradicated;
- Establishing competitive, desirable plants along the roadside (see specified seed mix Chapter 2) helps prevent establishment of new weed infestations (Sheley and Petroff 1999; Losensky 1989);
- Weed free mulch and fill will be used; and
- Equipment will be weed-free.

Consistency with the Forest Plan

All Alternatives would be consistent with the Forest Plan, as amended.

Visual Resources Affected Environment

The analysis area for direct and indirect effects to visual resources included the area viewed from Roads 23 and 2311**.** The flood damage sites along Road 23 are located within Matrix, with an underlying land allocation of MA 2A, Scenic Viewshed, Foreground (Forest Service 1990). The slopes above Road 23 (White Chuck and Pugh Mountains) are allocated to MA 2B, Scenic Viewshed Middleground. Scenic Viewshed accommodates a variety of activities, which, to the casual observer, are either not evident or are visually subordinate to the natural landscape.

Forest Plan standards for MA 2A (Congressionally Designated Wild and Scenic Rivers) for transportation planning include the requirement for roads in the seen or potentially seen area to blend with natural form, line, color, and texture (Forest Service 1990). Road construction and reconstruction standards and guidelines state: "[c]ut and fill slopes should be revegetated within one year of construction" (Forest Service 1990).

The major travel corridor in the project area is Road 23. The middleground slope of White Chuck Mountain is visible from the first two flood damaged sites along Road 23, and at the bridge near Crystal Creek. The sites where people can view White Chuck Mountain were reviewed for current condition of the viewshed. Various aged forest stands could be seen, as a result of past harvest and fires. Roads are visible, but are not the dominant features of the landscape, and may not be evident to the causal observer.

Visual Resources Environmental Consequences

Alternative A

If no action were taken, the effects to the visual resource would be minimal to none. The damaged portion of Road 23 is not visible to recreational boaters because use does not occur downstream on this section of the White Chuck River. Eroded, non-vegetated portions of the former roadbed plus remnants of the old road would remain, but exposed or bare ground is not uncommon along the gravel portion of the road. Over time, the terrace with the old

roadbed would be vegetated by a young, mixed forest stand. Portions of the terrace at Sites #1, #2, and #3 may slump into the river during high water events. Additional slumping along the upper road may be visible from points on the river but would not dominate the view. Natural river evulsions would continue to impact the look of the area to anyone recreating along the river or roadway.

Alternative B

If Alternative B were implemented, no proposed activities would change the surrounding foreground viewshed, as viewed from Road 23. The roadway and views would be similar in character to the pre-2003 flood condition, and the scenery would not be altered noticeably beyond the construction sites. Any bare soils resulting from construction activities would be stabilized and revegetated to minimize erosion potential. At Site #2, the reroute of Road 23 would utilize Road 2311, as well as a through cut, that would minimize visual impacts of the road to recreationists along the river. Similarly, the reroute at Site #3 would involve only approximately 600 feet of new road and this would be placed 400 feet from the White Chuck River above the washout. Abandoned road sections on either side of Sites #2 and #3 would be revegetated where needed and impacts to scenery would likely be short term. Exposed or bare ground is not uncommon in views of the river from sections of Road 23. Once vegetation has been reestablished, this change would not be evident.

The road decommissioning associated with Alternative B would eventually result in the revegetation of the remaining road prism at Sites #5 through #8, which would obscure the view of Road 23 from the river. The activities associated with road construction and decommissioning under Alternative B would not detract from the overall appearance of the Road 23 corridor.

Alternative C

The effects to the visual resource under Alternative C would be as described under Alternative B as long as the upper road (MP 5.8 to road terminus) was kept in storage. Even if the upper section of Road 23 was taken out of storage and re-constructed, these re-construction activities would not change the surrounding foreground viewshed, as viewed from Road 23. If the road is reconstructed, the roadway and views would be similar in character to the pre-flood condition, and the scenery would not be altered noticeably beyond the construction site. Any bare soils resulting from construction activities would be stabilized and revegetated to minimize erosion potential.

Alternative D

If Alternative D were implemented, no proposed activities would change the surrounding foreground viewshed, as viewed from Road 23. The roadway and views would be similar in character to the pre-flood condition, and the scenery would not be altered noticeably beyond the construction sites. Road repair activities and their effects to the visual resource for Sites #1 through #4 are as described under Alternative B. Repairs to Sites #5 through #8, would involve shifting the road into the hillside to bypass slumping portions of the road. Any bare soils resulting from construction activities would be stabilized and revegetated to minimize erosion potential. Exposed or bare ground is not uncommon in views of the river from

sections of Road 23. Once vegetation has been reestablished, this change would not be evident.

Visual Resources Cumulative Effects

The affected area for cumulative effects to visual resources includes the area viewed from the road system within the White Chuck watershed**.** As there would be no project effects to the foreground viewshed of the surrounding lands, when viewed from Road 23, there would be no effects from the proposed flood repairs that could be added cumulatively to effects from other projects.

The only noticeable changes would be to the road itself, including the realignment at Site #2 and Site #3 and the inclusion of road adjacent to the White Chuck floodplain at Site #1, with less than two to three acre of newly excavated soils over one mile of road work. The road construction associated with Alternative B would not detract from the overall appearance of the Road 23 corridor. These changes are already on disturbed sites from the original road construction and are not expected to detract from the overall appearance of the White Chuck River corridor. The road decommissioning associated with Alternative B would eventually result in the revegetation of the remaining road prism at Sites #5 to #8, which would obscure the view of Road 23 from the river. Effects under Alternative C would be similar to those under Alternative B as long as the road remains in storage. Alternative D effects for the lower road would be the same as described for Alternative B. Restoring the upper road would not add to cumulative effects on the viewshed.

Other past, current, and reasonably-foreseeable future projects that were assessed for this cumulative effects analysis are either located outside of the seen area of the repair sites, or any residual effects (such as the White Chuck Bench Trail repairs, or ongoing road maintenance of the Road 23) are so minor that they would not, cumulatively, impact the visual resource.

Consistency with the Forest Plan

All Alternatives would meet the visual quality objectives and would be consistent with the Forest Plan as amended, for scenic quality.

Heritage Affected Environment

The White Chuck Road Repair Project would be financed with Federal funds through the Forest Service and is therefore subject to the consideration of historic properties as provided in Section 106 of the National Historic Preservation Act of 1966 (as amended). Regulations that implement Section 106 are included in 36 CFR Part 800, the "Protection of Historic Properties."

The White Chuck Watershed Analysis (Forest Service 2004) provides an overview of the past uses and known heritage resources near the Project analysis area. The Area of Potential Effects (APE) is the area within which a project has the potential to affect historic properties, should any such properties exist. Concurrence with the determination of the APE for this Project was via communication with the Forest Service Heritage Specialist. The APE for the current Project extends from MP 0.5 of Road 23 to its termination at the Owl Creek

Campground/White Chuck Trailhead. While Forest Service Road 2311-011 is technically included in the Project APE, ground-disturbing activities would be confined to the existing area of disturbance (i.e., the road prism and ditches). Because of its prior disturbance, this area was not included in the analysis of archaeological sensitivity and the field survey.

Information specific to the area was gathered by reviewing environmental, geological, ethnographic, and historical data, and reviewing previously recorded archaeological sites in the vicinity of the Project. It was determined through this review that there was a low to moderate probability for pre-contact archaeological materials along the more moderate slopes and river terraces of the Project APE, and a low to moderate probability for ethnographic and historic-period Native American and Euroamerican archaeological materials through the remaining APE (and especially along the southern bank of the White Chuck River). Information gathered because of these efforts is summarized below.

General Land Office maps, dating to between 1893 and 1926, show several historic-period features along the White Chuck River (United States Surveyor General [USSG] 1894, 1929, 1931). Along the southern bank of the river, the White Chuck Trail and Forest Service Telephone Line is marked clearly on the GLO maps (surveyed in 1926). The Forest Service constructed the White Chuck Trail in 1913 as a fire trail (Field 1950 and Lindeman and Mierendorf 1979). During the previous archaeological survey of a portion of the current APE, a single transmission line insulator was observed in a tree (Hall 2005). The possibility was suggested that this insulator might be associated with the Forest Service Telephone Line.

The 1926 GLO map shows a logging railroad crossing the White Chuck River, angling from southwest to northeast. The 1893 GLO map does not show the continuation of this railroad. However, an historic map on file at the Forest Service office in Everett shows that, once it crossed the White Chuck, the railroad (labeled "W") turned to the southwest (Historical Map of Railroad Grades Sauk Valley unknown date; USSG 1894, 1929). This railroad spur was utilized after 1924 or 1927 (Historical Map of Railroad Grades Sauk Valley unknown date; Hollenbeck personal communication 2008).

From 1943 to 1945, the Sauk River Lumber Company (SRLC) operated the White Chuck Camp, which was the last forest camp occupied by the SRLC. The White Chuck Camp has been included with six other SRLC forest camps in a nomination to the NRHP as the SRLC Historic District. The Forest Service determined this resource eligible for listing in the NRHP, and the Washington State Historic Preservation Officer has concurred (Hollenbeck 2002).

A field survey including subsurface archaeological probes was conducted in August and September 2008 (Gilpin 2009). The field methodology complied with the procedures outlined in the Forest's Cultural Resource Inventory Strategy (Hearne and Hollenbeck 1996).

The single transmission line insulator observed in 2005 was not observed during the current field survey (Gilpin 2009). The surveyor observed the plugged wooden box culvert at MP 3.5, which would be replaced during this project if already damaged or if it is damaged during proposed repair activities; or, once funding is secured, the box culvert will be replaced with a crossing that would accommodate fish passage. The exposed section of the box culvert (including the northwestern wing wall) measures approximately 5 meters (16 feet) north-south by 3 meters (10 feet) east-west. This feature most likely is associated with the construction of the White Chuck Road and dates to the historic period. A Mt. Baker National

Forest map from 1936 shows a trail up the White Chuck, but the 1949 map shows the White Chuck Road constructed to approximately Owl Creek.

The railroad grade portrayed on historic maps would be considered a contributing element to the SRLC Historic District. However, neither railroad grade nor historic materials were observed on the surface within the first mile (1.6 kilometers) of the Project APE. A large roadside "berm," resembling remnants of other SRLC railroad grades (as determined in conversation with Hollenbeck during post-field research), was observed further to the east of the mapped location of the "W" railroad and is believed to be distinct from that railroad grade. No shovel probes were excavated within this portion of the APE (Gilpin 2009).

No cultural resources meeting the definition of "historic properties" (as defined in regulation 36 CFR 800 of the National Historic Preservation Act of 1966, as amended) were observed during the cultural resources survey (Gilpin 2009). With the exceptions of the plugged wooden box culvert at M.P. 3.5, two lengths of logging chain and several springboard-notched tree stumps, no cultural materials older than 50 years were observed during the survey of the Project APE. The wooden box culvert does not meet the criteria required for eligibility in the NRHP: it is not associated with an important event in history, nor with a well-known architect or engineer (Criteria A and B). The culvert is most likely not a unique example of water engineering designs, and is not likely to yield information important to history (Criteria C and D). Its material integrity and position also may be compromised by previous flood and repair incidents. None of these resources is considered eligible for the NRHP, and were not considered further. Only one historic property has been identified in the vicinity of the APE; known or suspected resources associated with the SRLC Historic District, however, will be avoided in all the action alternatives.

Treaty Resources and Reserved Indian Rights

Federal Indian policy and "trust responsibilities" have developed from court decisions, congressional laws, and Executive Orders. For this project, the Forest Service has fulfilled its general trust responsibilities through the proper management of natural resources as determined in the Forest Plan, and through continued consultation with Indian tribal governments. Letters were sent to representatives of the Lummi Nation, Samish Indian Tribe, Sauk-Suiattle Indian Tribe, Stillaguamish Indian Tribe, Swinomish Indian Tribe, Tulalip Tribes, and the Upper Skagit Indian Tribe. No issues related to treaty or other tribal rights have been identified, and no significant effects have been identified for any known treaty resources.

Treaties, statutes, and executive orders obligate federal agencies to fulfill certain trust responsibilities. The extent to which treaty resources (related to reserved rights of hunting, gathering, and fishing on National Forest System lands) are present or to which federally recognized tribes depend on the project area to access or obtain treaty resources is not fully known.

The rights of Tribal members to access National Forest System lands and exercise off-reservation Treaty rights are unchanged. There may be effects to Tribal hunting, gathering and fishing practices related to changes in forest management, access, and effects to fish, wildlife and plant resources. These effects may be positive (e.g., fish habitat improvements)

or negative (e.g., limited vehicle access). Refer to the various resource sections for discussions of environmental consequences.

The Sauk watershed was part of the ancestral territory of the present day Sauk-Suiattle Tribe. Traditional American Indian uses include fishing, hunting, and gathering. Current uses of the watershed by tribal members include the exercise of treaty rights and practices of ceremonial and religious significance. Issues of privacy and purity surrounding these practices are of concern to the Indian community.

Heritage Environmental Consequences

Alternative A

There would be no effect on historic properties, known or unknown, because there would be no disturbance from repairs. No effects to materials or features potentially associated with the activities of the Sauk River Lumber Company (06050200031) are anticipated under this alternative. Such materials will continue to deteriorate due to natural forces, and organic materials will decompose.

Tribal members' ability to access (by driving) National Forest lands to exercise treaty rights would continue to be limited. Road access to the White Chuck valley would not be available unless the Suiattle River Road 26 and Boundary Bridge are repaired and Road 27 is available; however, access would be seasonally limited. Effects to Tribal practices as they relate to access and effects to fish, wildlife and plant resources are discussed in the various Specialist Reports prepared for this project.

Alternatives B, C, and D

With the mitigation measures provided in Chapter 2, including an adequate buffer around potential resources within the APE and field checks for any additional, unobserved resources, these Alternatives will have no direct or indirect effects on historic properties within the APE.

There may be unknown historic artifacts because of difficulties locating resources in areas of steep topography or where the forest undergrowth or duff is thick and may obscure visibility. If previously unidentified resources are discovered during project implementation, the Heritage Specialist or Forest Line Officer shall be notified and responsibilities fulfilled in accordance with the Programmatic Agreement to address effects to any heritage resources.

An appropriate inventory has been conducted for this undertaking and no historic properties were located. Any features that may be associated with the operations of the Sauk River Lumber Company will be adequately avoided. These findings have been forwarded to the State Historic Preservation Officer for concurrence in accordance with the Programmatic Agreement (Stipulation III.B.4).

Tribal members' rights to access National Forest System lands and exercise treaty rights are unchanged. The proposed repair of White Chuck Road 23 would partially restore (under Alternatives B and C) and fully restore (Alternative D) vehicle access. . Effects to Tribal practices as they relate to access and effects to fish, wildlife and plant resources are discussed

in the various other resource sections in Chapter 3 and in the Specialist Reports prepared for this project.

Heritage Cumulative Effects

The affected area for cumulative effects to cultural resources is the extent of the Project APE.

The Forest Service has identified two distinct dimensions of the cumulative effects for the proposed project. The Treaty rights of Native American groups in the vicinity of the Project APE are recognized by the Forest Service. No issues related to treaty or other tribal rights have been identified, and no significant effects have been identified for any known treaty resources.

For cumulative effects to historic properties, the Forest Service states that past actions and natural events that preceded the creation of the National Historic Preservation Act of 1966 and other historic preservation laws have impacted an unknown number of heritage resources that might today qualify as National Historic Properties. No historic properties would be affected by the action; therefore, this action, added to preceding and foreseeable actions, would not bring additional loss.

Consistency with the Forest Plan

All Alternatives would be consistent with the Forest Plan, as amended, in terms of their effects on archaeological and historic properties. All Alternatives would comply with Section 106 of the National Historic Preservation Act under the terms of the Programmatic Agreement and consultation with the State Historic Preservation Office is complete.

Local Economy/Tourism Affected Environment

According to the U.S. Census, the four primary industry types in the local area (Census Tract 537) in 2000 were: 1) manufacturing; 2) education, health, and social services; 3) construction; and 4) agriculture, forestry, fishing, hunting, and mining. The median household income in this area in 2000 was $35,052, approximately 66 percent of the average in Snohomish County, and approximately 11.3 percent of households had incomes below the poverty level in 1999, compared to 6.9 percent in Snohomish County as a whole (U.S. Census Bureau 2000).

The town of Darrington is the closest community to the project area and accounted for approximately 40 percent of the population in Census Tract 537 in 2000. The population in Darrington increased by an estimated 19 percent between 2000 and 2007, with an estimated 1,347 residents identified in Darrington in 2007 (U.S. Census Bureau 2007).

Major employers in Darrington include the Hampton Lumber Company, the Darrington School District and the Forest Service (Town of Darrington 2008). The community has attempted to diversify the local economy to increase tourism and recreation with support for state and national archery tournaments, the Darrington Bluegrass Festival, a local rodeo, and has supported festivals in Darrington and neighboring communities (Wildflower Festival, Skagit Bald Eagle Festival, Festival of the River, etc.).

Visitors are attracted to the area for a variety of outdoor recreation pursuits and driving for pleasure. Access to recreation sites and activities is important to local residents and visitors to the area. Visitors spend money on food, transportation, lodging, fuel, supplies and other services, and contribute directly to the local economy, supporting jobs and income in the affected sectors. These purchases occur in Darrington and the surrounding area, as well as in other communities located along travel routes between the project area and Seattle and Everett, including Granite Falls and Arlington.

The White Chuck River drainage receives from local residents, as well as visitors from the greater Puget Sound area, and further afield. The Sauk River and the White Chuck Boat Launch has been a popular destination for both private and commercial river rafters, and kayakers. Recreation activities along or accessed from Road 23 include developed camping, dispersed camping, hiking, driving for pleasure, hunting, mushroom picking, berry picking, mountain biking, snow shoeing, cross country skiing, snowmobiling, and other dispersed activities. Road 23 is a major entry point into the Glacier Peak Wilderness where recreation activities include hiking, climbing, horseback riding, fishing, hunting, and camping. Much of the use in the area is day use, but use includes extended backpack and climbing trips into Glacier Peak Wilderness.

Available data on visitors to the project area are summarized in the Recreation section of this document. There was a noticeable decrease in the number of visitors to the Darrington Ranger District following the 2003 flood event (Table 25) and local businesses have reported impacts to sales due to decreases in the number of visitors to the Forest, as noted in an August 2005 letter from the Mayor of Darrington (letter on file at the Darrington Ranger District). It is not possible to quantify the impact of the closure of Road 23 on the local economy, but the overall trend following the 2003 flood event, which damaged a number of roads and trails in the Sauk, Suiattle, and White Chuck river drainages, appears to have been negative.

Table 25. Visitors to Darrington Ranger District Office

Year	Number of Visitors[1/]
2005	7,361
2004	7,011
2003	10 851
2002	11,021
2001	9,824
2000	8,941

Note:
1/ These numbers are for walk-in-the-door counts only, and do not include phone calls, mail, or e-mail responses from other visitors who may use the area.

Local Economy/Tourism Environmental Consequences

Potential impacts to the local economy would mainly result from changes in spending by recreationists and changes in timber harvested in the project area. Road repair activities would also have small positive benefits through purchases of local supplies and equipment rental. Impacts to recreation and timber are discussed in detail in the Recreation and Timber Management sections of this document.

The harvest assessment prepared for this project identified 918 acres of manageable timber that would be tributary to Road 23, meaning that Road 23 would be used to yard and/or truck logs harvested from these lands. Changes in access to these acres would affect the ability of the Forest Service and others to harvest this land, but improved access and reduced haul costs, relative to no action, does not necessarily mean that timber harvest would occur.

Alternative A

Alternative A, if implemented, would mean that no repairs would be made to Road 23. The road would be blocked at MP 1.6 and there would be no vehicular access to the White Chuck Bench/Crystal Creek and White Chuck trailheads and associated trails. Some hikers may continue to access these trails by walking or biking along Road 23, but trail use would be expected to remain at current low levels. There would be limited access to timber management acres (see above) under this alternative and haul costs for the minor amounts of timber in the upper watershed that could still be harvested would remain relatively high.

Alternative B

Alternative B would restore vehicular access along Road 23 to the junction with Road 27. This alternative would likely result in increased use by recreationists in areas accessed by the lower portion of Road 23, specifically the White Chuck Bench/Crystal Creek and Meadow Mountain trailheads and associated trails. Use levels in these areas could return to pre-flood levels or higher due to demand from recreationists displaced from the White Chuck Trail and other trails formerly accessed via the White Chuck Trailhead. Increases in the number of recreationists visiting the area could result in increased local spending and modest positive impacts for local businesses and the local economy. However, overall use of the area is not expected to return to pre-flood levels under this alternative.

This alternative would provide access to a portion of the timber management acres along Road 23, as well as reduce haul costs for timber that would otherwise be hauled via Road 27. This access and relative reduction in haul costs would make timber harvest more economic, relative to no action, but would not necessarily result in that harvest occurring. Road repairs under this alternative would likely generate small positive local impacts through expenditures for local supplies and equipment rental.

Alternative C

Alternative C is similar to Alternative B and consists of restoring vehicle access along Road 23 to the junction with Road 27. However, under this alternative, the upper section of Road 23 (from MP 5.8 to the road terminus) would be placed in storage, rather than decommissioned. The impacts to the local economy are expected to be similar under this alternative as they would be under Alternative B. These impacts would change if the Forest Service exercised the option to re-construct the upper section of the road at some point in the future. If that were to occur, the impacts would be similar to those described below for Alternative D.

Alternative D

Alternative D would restore vehicle access along the entire length of Road 23, all the way to the White Chuck Trailhead. This would provide direct vehicular access to the White Chuck Bench/Crystal Creek, Meadow Mountain, White Chuck trailheads, and associated trails. Use of the trails accessed from these trailheads by hikers could, as a result, return to pre-flood levels after trail repairs, and would be expected to be higher than under the alternatives. Increases in the number of recreationists visiting the area could result in increased local spending and modest positive impacts for local businesses and the local economy.

Alternative D would provide access to all of the timber management acres accessed by Road 23, as well as reduce haul costs for timber that would otherwise be hauled via Road 27. This access and relative reduction in haul costs would make timber harvest more economic, relative to no action, but would not necessarily result in that harvest occurring. Road repairs under this alternative would likely generate small positive local impacts through expenditures for local supplies and equipment rental. Impacts to the local economy under this alternative would likely be modest, but generally higher than those under the other alternatives.

Local Economy/Tourism Cumulative Effects

The floods of 2003 and 2006/2007 damaged a number of roads and trails in the Sauk, Suiattle, and White Chuck river drainages. Damage occurred to six main roads, including Road 23, that provide recreational access to developed and dispersed recreation opportunities (Figure 17 Flood Damaged Road Repair Sites). The other five roads and their current status (as of January 2009) are identified in Table 8. The potential cumulative effects to recreation use are discussed in detail in the Recreation section of this document. Increases in the number of visitors to the area would be expected to result in increased local spending and positive impacts for local businesses and the local economy.

Viewed in the context of access for timber harvest, Alternative A would contribute to a continued net reduction in the acres of Matrix land on the MBS National Forest unavailable for harvest. Alternatives B and C would result in minor effects to access to Matrix land; Alternative D would restore access to Matrix lands to pre-flood levels. Changes in access could result in a potential increase in harvest and associated benefits to the local economy, but this assumption does not factor in other resource considerations that may limit harvest in the upper White Chuck drainage. Timber harvest is discussed in more detail in the Timber Management section of this document.

Road repairs under Alternatives B through D, in conjunction with road and trail repairs elsewhere on the district, would likely generate small positive local impacts through expenditures for local supplies and equipment rental.

Consistency with the Forest Plan

The White Chuck Road Repair Project complies with the Forest Plan, as amended, Standards and Guidelines that the Forest Service considers financial efficiency in planning and implementing projects.

Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires each federal agency to make the achievement of environmental justice part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low income populations. The Order further stipulates that the agencies conduct their programs and activities in a manner that does not have the effect of excluding persons from participation in, denying persons the benefits of, or subjecting persons to discrimination because of their race, color, or national origin.

The Forest Service has considered all input from persons or groups regardless of race, income status, or other social and economic characteristics. In 2004, the Forest Service mailed a scoping letter describing initiation of the environmental analysis of repairs to roads across the MBS National Forest that were damaged in 2003 and received comments from the Swinomish Tribe, the Skagit River System Cooperative representing the Sauk-Suiattle and the Swinomish Indian Tribes, three organizations, and seven individuals. In April 2008, the Forest Service mailed a scoping letter describing the additional damage and initiating an environmental analysis of proposed repairs to Road 23 from both the 2003 and 2006 floods. Comments in response to the 2008 scoping initiative were received from six organizations and 13 individuals. Comments received from both scoping periods are addressed in the Scoping Report included as Appendix B to this document.

Potentially affected minority populations include American Indian tribes with an interest in the federal lands that could be affected. The Forest Service initiated government-to-government consultation with the Lummi Nation, Samish Indian Nation, Sauk-Suiattle Indian Tribe, Stillagaumish Indian Tribe, Swinomish Indian Tribe, Tulalip Tribes, and Upper Skagit Tribe in April 2008. The Samish Tribe responded stating that they are not interested in participating as a consulting party on the Road 23 repair project at this time. In addition, the Forest received a letter from a member of the Sauk-Suiattle Tribe in response to the Suiattle Access Travel Management scoping effort; the letter included comments on the importance of roads in the White Chuck to the tribal members.

The population in Census Tract 537, which includes the entire project area, was 94 percent White in 2000, compared to respective county and state averages of 83 percent and 79 percent (Table 26). The percent of the population with incomes below the poverty level was higher than the county and State averages, 11.6 percent versus 6.9 percent and 10.6 percent, respectively (Table 26). This percentage, while higher than the county and state averages, does not meet the U.S. Census Bureau's definition of a poverty area. The U.S. Census Bureau defines a poverty area as a census tract or other area where at least 20 percent of residents are below the poverty level (U.S. Census Bureau 2008). The proposed alternatives would, therefore, not result in disproportionately high and adverse effects to minority or low income groups based on proximity because no minority or low income communities were identified in close proximity to the project area. Further, the proposed action and alternatives involve various road repair options that would not be expected to have adverse impacts on human health or the environment, as discussed elsewhere in this document.

Table 26. Race and Ethnicity and Percent of the Population below Poverty

Geographic Area	Total Population 2000	Percent of Total Population					Percent Below Poverty 1999
		White[1/]	American Indian[1/]	Hispanic or Latino	Other Race[1/2/]	Two or More Races[1/]	
Washington	5,894,121	79%	1%	7%	9%	3%	10.6%
Snohomish County	606,024	83%	1%	5%	8%	3%	6.9%
Census Tract 537[3/]	2,821	94%	2%	1%	1%	2%	11.6%
Darrington	1,136	94%	2%	1%	0%	3%	8.9%

Notes:
1/ Non-Hispanic only. The federal government considers race and Hispanic/Latino origin to be two separate and distinct concepts. People identifying Hispanic or Latino origin may be of any race. The data summarized in this table present Hispanic/Latino as a separate category.
2/ The "Other Race" category presented here includes census respondents identifying as "Black or African American," "Asian," "Native Hawaiian and Other Pacific Islander," or "Some Other Race."
3/ Census Tract 537 includes the project area.
Source: U.S. Census Bureau 2000a, 2000b

The project area is used for recreation and includes Matrix lands suitable for timber harvest (see the Recreation and Timber Management sections of this document). It is also used for Tribal hunting, fishing, and gathering. The proposed alternatives would offer different types of access to the project area that would affect how Tribal members would be able to hunt, fish, and gather in the area. These access issues are discussed under dispersed recreation in the Recreation section of this document. None of the alternatives are expected to have detectable effects on fish resources, and impacts to wildlife would be negligible, regardless of alternative implemented due to the large percentage of the White Chuck River drainage that is within wilderness or semi-primitive non-motorized designations (greater than 70 percent of the drainage), and because the majority of the proposed work is within the road prism or adjacent to the existing Road 23. These resources are discussed in detail in the Fisheries and Wildlife sections of this document. Effects to vegetation are discussed in the Botany section of the document.

Other Resources

Air Quality Effects

The Glacier Peak Wilderness is a Class I area for air quality protection. Visibility is a value that is protected primarily within the boundaries of the Class I area. Glacier Peak Wilderness visibility is officially monitored at a site shared with the National Park Service and located at Ross Lake. Another site is located at Snoqualmie Pass for Alpine Lakes Wilderness. This site has some applicability to conditions such as visibility at Glacier Peak, and probably falls somewhere in between what is measured at the two sites. Average natural visibility in the western United States is estimated to be about 110 to 115 miles. The visual range measured at Ross Lake is very close to this, showing that the visibility is generally excellent. Visibility at Snoqualmie Pass is more impaired.

No burning is planned with this Project, so there would not be any impacts on visibility from smoke. Use of vehicles and equipment would return to previous levels. Such uses would contribute negligibly to reduced visibility.

Prime Forestland, Prime Farmland, Rangeland, etc.

Prime forestland, as defined by Natural Resources Conservation Service[17] may be found on the MBS National Forest. However, it is estimated that none of the alternatives, including No Action, would have any measurable impact on such land.

There is no prime farmland or rangeland within the project area. Noise, climate, minerals, energy, fire insects, disease, etc., were considered, but are not described in further detail here because they are associated with limited or no impacts.

Wetlands and Floodplains Effects

Wetlands

Under the Alternative A, there would be no impacts to wetlands.

Under Alternatives B, C, and D there would be no impacts to wetlands. A small wetland was identified near the proposed road reroute at Site #2; however, it would not be impacted as the proposed reroute at Site #2 avoids the wetland. The new road cut slope may intercept subsurface water; however, the wetland would not be affected. The proposed repairs would not cause short- or long-term impacts to wetlands and there would be no irretrievable impacts to wetlands under any of the alternatives.

Floodplains

Under the Alternative A, there would be no restriction on channel migration at these sites other than what the natural landscape imposes through steep inner gorge slopes all along the White Chuck River.

Under Alternatives B, C, and D, repairs at Site #1 may influence channel dynamics. Site #1 would reconstruct the roadway on a flood terrace of the White Chuck River. Refer to the Hydrology and Fish sections for a discussion of these effects. None of these effects would compromise the overall processes of the river and watershed.

Repairs at Site #1 are designed to minimize the effect of the road on the river. Repairs at Sites #2 through #8 are not within the floodplain. The repairs at Sites #2 and #3 allow the opportunity to relocate a portion of the road, avoiding the encroaching river.

Irreversible and Irretrievable Commitment of Resources

An irretrievable commitment of resources occurs when opportunities are foregone for the period of time that the resource cannot be used. Road 23, and associated spur roads are a reversible commitment because it is possible to decommission the entire road site and return the area essentially to its previous condition. The upper road would be decommissioned under Alternative B, reducing the irretrievable commitment of resources for as long as this portion of the road. The majority of the road system would not be decommissioned under any of the alternatives; however, roads are a valued asset to the surrounding communities and the federal government. The removal and utilization of rock resources for road

[17] Land capable of growing wood at the rate of 85 cubic feet per acre per year at culmination of mean annual increment.

reconstruction would be an example of a common irreversible commitment of resources (Final EIS for the Forest Plan IV-203).

Potential Conflicts with Plans and Policies of Other Jurisdictions

Several private individuals, groups, and governmental agencies including Tribal representatives have been contacted in regards to this project (refer to Appendix B). Further, several articles have been published in various forms of the media. There are no known conflicts between the alternatives discussed in this document and the plans and policies of these other jurisdictions.

4. Agencies and Persons Consulted

The Forest Service consulted the following individuals, federal, state and local agencies, and non-Forest Service persons during the development of this EA:

Federal, State, and Local Agencies

Federal Highways Administration
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Washington State Department of Fish and Wildlife
U.S. Fish and Wildlife Service
State Historic Preservation Office

ID Team Members, Consultants, and Preparers:

Forest Service
Phyllis Reed – Team Leader
Dawn Erickson – Trails
Carol Gladsjo – Recreation
Ann Risvold – Botanist
Jan Hollenbeck – Forest Archeologist
Gary L Ketcheson – Forest Hydrologist, retired
David Kendrick – Forest Veg. Manager
Curtis Spalding – Forest Environmental Coordinator
Jesse Plumage – Forest Wildlife Biologist
Loren Everest – Fisheries Biologist
James B Mitchell – Supervisory Engineer/Road Manager
Greta Movassaghi – Wild and Scenic River Specialist
Roger A Nichols – Geologist
Amy Lieb – Forest Hydrologist

Tetra Tech EC Inc.
Joe Iozzi – ID Team Leader
Chris James – Hydrologist
John Knutzen – Fish Biologist
Brita Woeck – Wildlife Biologist
Karen Brimacombe – Botanist
Matt Dadswell – Recreation, Socioeconomics
Dave Cox – Geologist
Brent Hicks – Heritage/Cultural Resources Specialist
Jennifer Gilpin – Archeologist
Wayne Hamilton – Transportation Engineer
Chuck LaMay – Timber
Maggie Huffer – Editor

This page is intentionally left blank.

5. References

Aubry, K., and C. Raley. 2002. The Pileated Woodpecker as a Keystone Habitat Modifier in the Pacific Northwest. In: W. Laudenslayer, Jr., P. Shea, B. Valentine, C. Weatherspoon, and T. Lisle (technical coordinators), pp. 257-274. Proceedings of the Symposium on the Ecology and Management of Dead Wood in Western Forests. USDA Forest Service General Technical Report PSW-GTR-181. Berkeley, California.

Beck, R.W. 1995. Mt. Loop Highway Project. Reconnaissance Report Project PFH7 Work Order No. 95 A L020. Alpha Engineering Group, Inc. for Federal Highways Administration Section III B. Hydrology, p. 4.

Beechie, T. J., C. N. Veldhuisen, E. M. Beamer, D. E. Schuett-Hames, R. H. Conrad, P. DeVries. 2005. Monitoring Treatments to Reduce Sediment and Hydrologic Effects from Roads. Pages 35-65. In: Roni, P. (Ed.) Monitoring stream and watershed restoration. American Fisheries Society, Bethesda, Maryland.

Bertwistle J. 2004. Research into wildlife/vehicle collisions in Jasper National Park. IN: Proceedings of the 2003 International Conference on Ecology and Transportation, Eds. Irwin CL, Garrett P, McDermott KP. Center for Transportation and the Environment, North Carolina State University, Raleigh, NC: p. 384. (Abstract)

Brown, T.M. 2002. Short-term total suspended-solid concentrations resulting from stream crossing obliteration in the Clearwater National Forest, Idaho. Thesis (M.S.) - University of Washington.

Bull E., and J. Jackson. 1995. Pileated Woodpecker (Dryocopus pileatus). In: A. Poole and F. Gill (eds.). The Birds of North America. *Academy of National Science and American Ornithologists' Union.* Philadelphia, Pennsylvania

Bunte and MacDonald. 1998. Scale Considerations and the Detectability of Sedimentation Cumulative Effects, Colorado State University, NCASI Tech Bulletin # 0776, January 1999.

Burroughs, E.R., and J.G. King. 1989. Reduction of soil erosion on forest roads USDA Forest Service General Tech. Report INT-264

Carey, A.B. 2003. Biocomplexity and Restoration of Biodiversity in Temperate Coniferous Forest: Inducing Spatial Heterogeneity with Variable-Density Thinning. *Forestry* 76(2):127-136.

Carey, A.B. and S.M. Wilson. 2001. Induced spatial heterogeneity in forest canopies: responses of small mammals. *Journal of Wildlife Management.* 65(4):1014-1027.

Courtney S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Frankling, J.F. Franklin, R.J. Gutiérrez, J.M. Marzluff, and L. Sztukowski. 2004. Scientific Evaluation of the Status of the Northern Spotted Owl Sustainable Ecosystems Institute (SEI), Portland, Oregon.

Doyle, J. 2000. Cumulative Effects Assessment for the Upper Skagit River Basin (Baker Lake/River, Cascade, Sauk, White Chuck, Suiattle Rivers). Internal Forest Service document. Mt. Baker-Snoqualmie National Forest, Mountlake Terrace, Washington. 9pp.

Doyle, J. 2005. Suspected Effects of Recent Flood Disturbance to the Aquatic Environmental Baseline Conditions in the Forest River Systems. Internal Forest Service document. Mt. Baker-Snoqualmie National Forest, Mountlake Terrace, Washington. 3pp.

Field, N. 1950. The Mount Baker Almanac: Mt. Baker National Forest: A Book of Historical Facts and Figures. Mt. Baker National Forest, Washington.

Forest Service and BLM (Bureau of Land Management). 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. Portland, Oregon.

Forest Service and BLM. 1994b. Record of Decision; Attachment A, Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl.

Forest Service and BLM. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. Portland, Oregon.

Forest Service and BLM. 2004. Record of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines Portland, Oregon.

Forest Service (USDA Forest Service). 1981. Guide for predicting sediment yields from forested watersheds. U.S. Department of Agriculture, Forest Service, Northern Region, Missoula, MT and Intermountain Region, Ogden, Utah.

Forest Service. 1990. Land and Resource Management Plan, Mt. Baker-Snoqualmie National Forest, Final Environmental Impact Statement and Appendices. Mt. Baker-Snoqualmie National Forest. USDA Forest Service, Pacific Northwest Region.

Forest Service. 1996. Sauk River and Sauk River Forks Watershed Analysis. Darrington Ranger District. Mt. Baker-Snoqualmie National Forest, Pacific Northwest Region.

Forest Service. 2002. Programmatic Biological Assessment for Forest Management on the Mt. Baker-Snoqualmie National Forest. Pacific Northwest Region, Mt. Baker-Snoqualmie National Forest Mountlake Terrace, Washington

Forest Service. 2003. Mt. Baker-Snoqualmie National Forest Roads Analysis. Unpublished document and database. Pacific Northwest Region, Mt. Baker-Snoqualmie National Forest, Mountlake Terrace, WA.

Forest Service. 2004. White Chuck Watershed Analysis. Mt. Baker-Snoqualmie National Forest, Mountlake Terrace, WA.

Forest Service. 2005. Pacific Northwest Region Invasive Plant Program. Record of Decision for Preventing and Managing Invasive Plants. R6-NR-FHP-PR-02-05.

Forest Service. 2006. Forgotten Thin Plus Commercial Thin EA. Mt. Baker-Snoqualmie National Forest, Pacific Northwest Region. Darrington, Washington.

Forest Service. 2008a. Regional Forester's Special Status Species List. Portland, Oregon: USDA Forest Service, Pacific Northwest Region. Available online at: http://www.fs.fed.us/r6/sfpnw/issssp/agency-policy/ (Accessed January 2008).

Forest Service. 2008b. Draft Biological Assessment and Evaluation for the White Chuck Road 23 ERFO Repair. Mt. Baker-Snoqualmie National Forest, Pacific Northwest Region. Darrington, Washington.

Forest Service. 2009. Mt. Baker-Snoqualmie National Forest, Forest Road Conditions Report, Darrington Ranger District. Available online at: http://www.fs.fed.us/r6/mbs/conditions/road_conditions_report.shtml (Accessed January 27, 2009)

Gaines, W., P. Singleton, and R. Ross. 2003. Assessing the Cumulative Effects of Linear Recreation Routes on Wildlife Habitats on the Okanogan and Wenatchee National Forests. General Technical Report PNW-GTR-586. Portland, Oregon: USDA Forest Service, Pacific Northwest Research Station. 79 pp.

Gilpin, J. 2009. Cultural Resources Assessment for the United States Forest Service Road 23 Repair and Decommissioning Project, Mt. Baker-Snoqualmie National Forest, Snohomish County, Washington. Confidential Report submitted to the USDA Forest Service, Northwest Region, Everett, by Historical Research Associates, Inc., Seattle, Washington.

Hall, A. 2005. Cultural Resource Reconnaissance Report #R2006-06-05-0003: White Chuck Road 23 MP 1.9, MP 2.4, MP 3.5, MP 5.7 ERFO. Prepared for the Darrington Ranger District, Mt. Baker-Snoqualmie National Forest.

Hall, A. 2006. Adrienne Hall, Recreation Specialist, pers. comm. Darrington Ranger District, Darrington, Washington.

Hearne, C.T., and J.L. Hollenbeck. 1996. Cultural Resource Inventory Strategy: Mt. Baker-Snoqualmie National Forest. USDA Forest Service, Pacific Northwest Region, Mt. Baker-Snoqualmie National Forest, Mountlake Terrace, Washington.

Hinchliff, J. 1996. An Atlas of Oregon Butterflies. The Evergreen Aurelians. Corvallis OR. Cited by The Xerces Society 2008 Society for Invertebrate Conservation website. http://www.xerces.org/johnsons-hairstreak/

Holland, A. 1980. Switchbacks. The Mountaineers, Seattle Washington, pages 156.

Hollenbeck, J.L. 2002. Sauk River Lumber Company National Register of Historic Places

Huijser, M.P., P. McGowen, J. Fuller, A. Hardy, A. Kociolek, A.P. Clevenger, D. Smith & R. Ament. 2007. Wildlife-vehicle collision reduction study. Report to congress. U.S. Department of Transportation, Federal Highway Administration, Washington D.C., USA.

Johnson, R.E., and K.M. Cassidy. 1997. Terrestrial mammals of Washington State: location data and predicted distributions. Vol 3. In: Cassidy KM, Grue CE, Smith MR, Dvornich KM, editors. Washington State GAP analysis—final report.Washington

Coopeative Fish and Wildlife Research Unit. Seattle, Washington: University of Washington.

Jones, L.L.C., and M.G. Raphael. 1990. Ecology and management of marten in fragmented habitats of the Pacific Northwest. Unpubl. Progress Report, USDA Forest Service, Pacific Northwest Research Station, Olympia, Washington.

Lindeman, G. and R. Mierendorf. 1979. Cultural Resource Inventory of the Ponder, Dubor, and White Chuck Timber Sales, Darrington Ranger District, Mt. Baker-Snoqualmie National Forest. Project Report Number 92, prepared for the Mt. Baker-Snoqualmie National Forest, Seattle, Washington by the Washington Archaeological Research Center, Pullman, Washington.

Lonsdale, W.M, and A.M. Lane. 1994. Tourist vehicle as vectors of weed seed in Kakadu National Park, northern Australia. *Biological Conservation* 69: 277-283.

Losensky, B.J. 1989. Effect of roadside vegetation cover on spotted knapweed density. In:Fay, P.K, and J.R. Lacey, eds. Proc.1989 knapweed symposium. EB 45. Bozeman, MT. *Montana State University Extension Service:* 144-150.

Luce, C.H. 1997. Effectiveness of road ripping in restoring infiltration capacity of forest roads. *Restoration Ecology* Vol. 5 (3):263-270.

Luce, C.H., and T.A. Black, 2001, Spatial and Temporal Patterns in Erosion from Forest Roads. In: Influence of Urban and Forest Land Uses on the Hydrologic-Geomorphic Responses of Watersheds, Edited by M.S. Wigmosta and S.J. Burges. Water Resources Monographs, American Geophysical Union, Washington, D.C. pp. 165-178.

Madej, M.A. 2001. Erosion and Sediment Delivery following Removal of Forest Roads. U.S. Geological Survey Western Ecological Research Center. Arcata, California.

Metcalf, R.C. 1979. Energy dissipation during sub-glacial abrasion at Nisqually Glacier, Washington, USA; *Journal of Glaciology*, v. 23, n. 89, p. 233-246.

Montgomery, D. R. 1994. Road surface drainage, channel initiation, and slope stability, *Water Resources Research*, v. 30, p. 1925-1932.

Moyer, C., K. Gallo, and S. Lanigan. 2003. Watershed monitoring for the Northwest Forest Plan, data summary report 2003. Lower White Chuck River, Mt. Baker-Snoqualmie National Forest. Aquatic and Riparian Effectiveness Monitoring Team. USDA Forest Service Pacific Northwest Regional Office and Bureau of Land Management Oregon State Office, Corvallis, Oregon.

Mt. Baker-Snoqualmie National Forest. 2008. Road conditions on internet at: http://www.fs.fed.us/r6/mbs/conditions/road-trail-conditions.shtml#roads

Muir P.S., R.L. Mattingly, J.C. Tappeiner II, J.D. Bailey, W.E. Elliott, J.C. Hagar, J.C. Miller, E.B. Petersen, and E.E. Starkey. 2002. Managing for Biodiversity in Young Douglas-Fir Forests of Western Oregon. U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center, Biological Science Report, USGS/BRD/BSR-2002-0006.

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer (Accessed: September 2008).

Pacific Crest Trail Association. 2008. Pacific Crest Trail Overview. Available online at: http://www.pcta.org/about_trail/overview.asp (Accessed October 6, 2008).

Pacific Fishery Management Council. 1999. Amendment 14 to the Pacific Coast Salmon Plan. Appendix A: Description and Identification of Essential Fish Habitat, Adverse Impacts and Recommended Conservation Measures for Salmon. Portland, Oregon.

Perkins, J., and C. Levesque. 1987. Distribution, Status and Habitat Affinities of Townsend's Bigeared Bat (*Plecotus townsendii*) in Oregon. Oregon Department of Fish and Wildlife Technical Report, 86- 5-01:1-50.

PLAE, Inc. 1993. Universal Access to Outdoor Recreation: A Design Guide. PLAE, Inc., Berkeley, California. 240 pp.

Reed, P. 2004. Personal Communication. Mt. Baker-Snoqualmie National Forest, Darrington Ranger District, Darrington, Washington.

Ruggiero, L.F., and K.B. Aubry. 1994. The scientific basis for conserving forest carnivores. General Technical Report RM-GTR-254. Fort Collins, Colorado: Rocky Mountain Forest and Range Experimental Station.

Sheley, R.L., and J.K. Petroff. 1999. Biology and management of noxious rangeland weeds. Corvallis, Oregon. Oregon State University Press.

Stalmaster, M.V., and J.L. Kaiser. 1998. Effects of recreational activity on wintering bald eagles. *Wildlife Monographs* 137.

Stinson, D., J. Watson, and K. McAllister. 2001. Washington State Status Report for the Bald Eagle. Washington State Department of Fish and Wildlife, Olympia, Washington. USDA Forest Service. 1990. Mt. Baker-Snoqualmie National Forest Land and Resource Management Plan. Seattle, Washington.

Swanson, F. J., M.M. Swanson, and C. Woods. 1981. Analysis of debris avalanche erosion from steep forested lands: An example from Mapleton Oregon, USA; *International Assoc. Hydrol. Sci. Pub.* 132, p. 67-75.

Switalski, T. A.; J. A. Bissonette; T. H. DeLuca; C. H. Luce; M.A. Madej. 2004. Benefits and Impacts of Raod Removal. Frontiers in Ecology and the Environment. Vol. 2(1) pp. 21-28.

Town of Darrington. 2008. Darrington's Economy. Available online at: www.darringtonwa.org/economy

Tyser, R.W., and C.A. Worley. 1992. Alien flora in grasslands adjacent to road and trail corridors in Glacier National Park, Montana. *Conservation Biology* 6(2).

U.S. Census Bureau. 2000. Table P1. Total Population. Census 2000 Summary File 1 (SF 1) 100-Percent Data. Available online at: www.census.gov

U.S. Census Bureau. 2000a. Tables P53 Median Household Income in 1999 and P87 Poverty Status in 1999 by age. Census 2000 Summary File 3 (SF 3) - Sample Data. Available online at: www.census.gov

U.S. Census Bureau. 2000b. Table P8 Hispanic or Latino by Race. Census 2000 Summary File 1 (SF 1) 100-Percent Data. Available online at: www.census.gov

U.S. Census Bureau. 2007. Table T1. Population Estimates. Census 2007 Population Estimates. Available online at: www.census.gov

U.S. Census Bureau. 2008. Poverty Definitions. Available online at: http://www.census.gov/hhes/www/poverty/definitions.html

United States Department of Commerce (USDC). National Oceanic and Atmospheric Administration (NOAA). National Marine Fisheries Service. Lohn, D. R., Regional Administrator. 2005. Re: Endangered Species Act Interagency Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Whitechuck River ERFO Funded Bridge and Road 23 Repair Project, 6th field HUC: 171100060106, Snohomish County, Washington. NMFS Tracking No. 2005/00639. Seattle, WA. 45 pp.

USSG (United States Surveyor General). 1894. General Land Office Map, Township 31 North, Range 10 East, Willamette Meridian. Washington State Department of Natural Resources, Olympia, Washington.

United States Surveyor General. 1929. General Land Office Map, Township 31 North, Range 11 East, Willamette Meridian. Washington State Department of Natural Resources, Olympia, Washington.

United States Surveyor General. 1931. General Land Office Map, Township 31 North, Range 12 East, Willamette Meridian. Washington State Department of Natural Resources, Olympia.

USFWS (U.S. Fish and Wildlife Service). 2002a. Biological Opinion of the Effects of Mt. Baker-Snoqualmie National Forest Program of Activities for 2003-2007 (FWS Reference Number 1-3-02-F-1583). Lacey, Washington.

USFWS. 2002b. Birds of Conservation Concern 2002. Division of Migratory Bird Management, Arlington, Virginia. Abvailable online at: http://migratorybirds.fws.gov/reports/bcc2002.pdf

USFWS. 2004. Marbled murrelet 5-year status review. Oregon Fish and Wildlife Office, Region 1.

USFWS. 2007. 2007 draft recovery plan for the northern spotted owl (*Strix occidentalis caurina*): merged options 1 and 2. Portland, Oregon, USA.

USFWS. 2008. Final Recovery Plan for the Northern Spotted Owl, *Strix occidentalis caurina.* U.S. Fish and wildlife Service. Portland, Oregon. 142 pp.

USFWS. 2005. Biological Opinion and Conference Report for Effects to Coastal-Puget Sound Bull Trout and Proposed Bull Trout Critical Habitat from the 2005 Sauk River Subbasin Flood Repairs, Darrington Ranger District, Mt. Baker-Snoqualmie National Forest, Washington. FWS Reference Numbers: 1-3-05-F-0368, 1-3-05-C-0369, 1-3-

05-F-0370, 1-3-05-IC-0371, 1-3-05-F-0372, 1-3-05-IC-0373, 1-3-05-F-0374, and 1-3-05-IC-0375. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Western Washington Fish and Wildlife Office. Lacey, Washington.

Waller, J.S., and C. Servheen. 2005. Effects of transportation infrastructure on grizzly bears in northwestern montana. *Journal of Wildlife Management* 69:985-1000.

Washington Department of Ecology. 2006. River and Stream Water Quality Monitoring. Monitoring Station 04C070 Sauk River near Rockport. http://www.ecy.wa.gov/apps/watersheds/riv/station.asp?theyear=&tab=final_data&scrolly=186&wria=04&sta=04C070 (Accessed February 10, 2006).

Washington Department of Fish and Wildlife and Western Washington Treaty Indian Tribes. 1994. 1992. Washington State Salmon and Steelhead Stock Inventory. Appendix One, Puget Sound Stocks. North Puget Sound Volume. Olympia, Washington. 418pp.

Washington Department of Fish and Wildlife and Western Washington Treaty Indian Tribes. 2002 (draft). Washington State Salmon and Steelhead Stock Inventory. Olympia, Washington.

Washington Department of Fish and Wildlife. 1998. Washington State Salmonid Stock Inventory, Bull Trout/Dolly Varden Appendix. Olympia, Washington.

Washington Department of Fish and Wildlife. 2000. Washington State Salmonid Stock Inventory, Coastal Cutthroat Trout Appendix. Olympia, Washington.

Washington Department of Fish and Wildlife. Olympia. Cited in Alberta Sustainable Resources Development. 2003. Management plan for mountain goats in Alberta. Wildlife management planning series no. 7. Edmonton, Alberta.

Washington Department of Fish and Wildlife. 2004. Washington State Salmonid Stock Inventory, Bull trout/Dolly Varden Appendix. Olympia, Washington.

Washington Department of Wildlife. 1991. Mountain goat summary [computer file]. Available online at: http://wdfw.wa.gov/archives/pdf/94025968.pdf

Washington State Crop Improvement Association (WSCIA). 2003. Certified Seed Programs and Prohibited Noxious Weeds. Washington State Crop Improvement Association, Yakima, Washington.

Washington State Department of Fisheries, Washington Department of Wildlife, and Western Washington Treaty Indian Tribes. 1993. 1992 Washington State salmon and steelhead stock inventory. Olympia, Washington.

Watson, J., and J. Pierce. 1998. Skagit River Bald Eagles: movements, origins and breeding population status. Washington State Department of Fish and Wildlife. Olympia, Washington: pp. 80.

WDFW (Washington Department of Fish and Wildlife). 2008. Priority habitat and species list. Olympia, Washington, USA.

White Chuck Road Repair. Aquatic Conservation Strategy Special Status. 2008.

White Chuck Road Repair. Cultural Resources Specialist Report. 2009.

White Chuck Road Repair. Engineering Specialist Report. 2008.

White Chuck Road Repair. Geology, Soils, and Hydrology Specialist Report. 2009.

White Chuck Road Repair. Recreation Specialist Report. 2009.

White Chuck Road Repair. Wildlife Specialist Report. 2008.

White Chuck Road Repair. Wildlife Specialist Report. 2009.

White Chuck Road Repair. Botany Specialist Report. 2008.

White Chuck Road Repair. Harvest Assessment and Financial Analysis Specialist Report. 2008.

Williams, R.W., R.M. Laramie, and J.J. Ames. 1975. A Catalog of Washington Streams and Salmon Utilization. Vol. 1, Puget Sound Region. Washington Department of Fisheries. Olympia, Washington.

Zeiner, D., W. Laudenslayer, K. Mayer, and M. White (eds.). 1990. California's Wildlife: Volume II -Birds. California Department of Fish and Game. Sacramento, California.

Appendix A
Flood History

Appendix A – Flood History

October 2003 Flood Event

The 2003 flood event produced some of the most severe storm damage seen on the Mt. Baker-Snoqualmie National Forest in many years. The event was localized primarily to the North Cascade Mountains, in east Snohomish, Skagit, and Whatcom Counties, on the Darrington and Mt. Baker Ranger Districts.

The normal rain-on-snow event has occurred after a deep snow pack formed at high elevations (above 5,000 feet) and a few inches accumulated at low elevations (less than 3,500 feet). The high elevation snow pack protects the land surface and absorbs much of the water that melts in the snow pack during the storm. In September 2003, the snow pack in the North Cascades was at an unusually high elevation of 7,000 and above, following the warmest September on record.

During a 24-hour period in October, more than six inches of rain fell in the Forest lowlands and up to ten inches in the higher elevation areas. Heavy rain fell onto bare ground and permanent snowfields and glaciers at elevations of 6,000 to 10,000 feet. This record-setting rainfall caused rapid melting of snow and ice, which—coupled with heavy rain at lower elevations—resulted in huge quantities of water and debris in the Nooksack and Skagit River systems, including the Sauk and Suiattle Rivers.

This event was unprecedented in the historical record of flows on the Sauk River. Water flow gauges, in place for over 70 years, measured an overwhelming increase in flows with the Sauk River Gauge going from 4,000 cfs flow to over 100,000 cfs. A U.S. Geological Survey (USGS) stream gauge located on the Sauk River, above its confluence with the White Chuck River, showed that the October 2003 flood event was the largest event recorded since the gauge was installed in 1917.

The 2003 flood event did not cause the typical rain-on-snow type damage, impacting higher elevation roads and trails. Instead, the damage occurred primarily along the river systems that concentrated flows from Glacier Peak and the higher elevation peaks of the North Cascade Mountains. Main arterial roads, bridges, and trails sustained major damage with lesser damage to mid-slope road systems. None of the road or trail bridges on the Suiattle River survived, and only one of two vehicle bridges remained in place on the White Chuck River.

These high flows not only changed river courses, but also contributed to the movement of very large volumes of sediment to the lower river systems, as evidenced by new sediment deposits of three to four feet in depth on gravel bars and in the floodplains. (This perched sediment continues to be transported during high water events.) The flooding also contributed to a major influx of large wood from trees that were uprooted and transported down the river systems. This wood contributed to riverbank erosion while adding desirable large woody debris to the river channel (adding to channel complexity and contributing to fish habitat formation).

Damage on Other Road Systems from the October 2003 Flood

The initial assessment (2003) of needed repairs and estimated funding required to repair flood damage was determined and documented in FHWA's Damaged Survey Reports (see

project record). ERFO roads targets funding for reconstruction of roads that have suffered damage because of a natural disaster over a wide area or from a catastrophic failure.

Early in 2004, a Forest Service team analyzed the various flood-damaged sites and determined that the scattered road damage repairs constitute similar, but not necessarily connected actions. The decision of whether to repair or not and how is not connected to other road repairs. The damage resulted from the same flood event are similar in scope, but the repairs are not connected; and can take place independently of each other. Therefore, for the purposes of site-specific analysis required by the NEPA, the damaged sites were grouped by road system into logical geographic areas, to address the site-specific problems or need for action.

Initially repair of the flood damage sites on Road 23 in the White Chuck River drainage was reviewed with the flood damage to the Boundary Bridge on Road 25 due to the two road systems being connected by Road 27 over Rat Trap Pass. During scoping on the flood projects, additional issues and needs were identified by the public and ID Teams that led to the separation of the Boundary Bridge repair and Road 23 repairs into individual projects. Needs for year-round, passenger-vehicle access facilitated by Road 25 were identified by Tribal landowners in the Suiattle (south side of damaged Boundary Bridge).

This access need would not be accommodated by repairs of Road 23 and seasonal access over Rat Trap Pass on Road 27. Scoping also resulted in the identification of recreational and Matrix land access needs in the White Chuck drainage that would not be met with access over Rat Trap Pass (Road 27). Impacts of the repair /no repair options were not viewed as having significant cumulative impacts.

Damage from the 2006/7 Flood Event

The 2003 flood event was the largest event ever recorded on the Sauk River, with a peak flow of 44,000 cubic feet per second. By contrast, the 2006 event had a peak flow of 33,600 cubic feet per second. Many additional sites were damaged across the Forest, including five additional sites on Road 23; these sites are located at MP 3.4, MP 5.8, MP 6.4, MP 7.2, and MP 8.5. Figure A-1 shows damaged sites from 2003 and 2006/7 flood events.

Past Flood Damage on Road 23

Floods in 1974, 1980, 1989, 1996, and 1999 caused damage to Road 23. Less extensive channel encroachments than what occurred in the 2003 flood event affected the road at different locations in 1980, 1996, and 1999. The only sites that have sustained repeat damage is the abutments for the bridge at MP 5.7 and a culvert at MP 7.5 that is now a low water ford.

Since the mid-1990s, repairs at fish-bearing stream crossings include structures that both pass fish and allow transport of large flood flows and bed-load materials (meeting current Forest Plan standards). Based on the damage and repair records since 1995, the majority of these fixes have withstood repeated flood events.

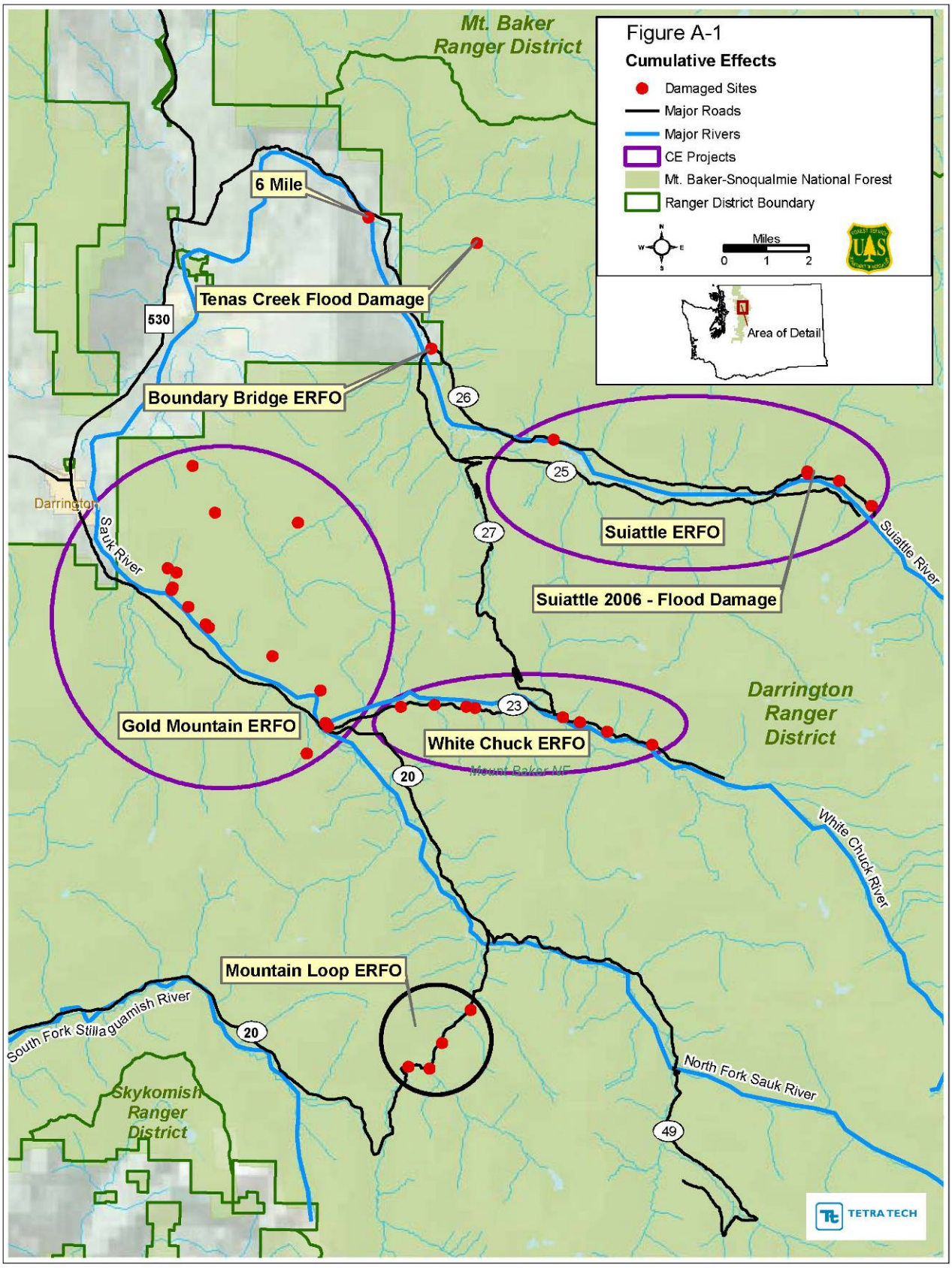


Figure A-1
Cumulative Effects
Damaged Sites
Major Roads
Major Rivers
CE Projects
Mt. Baker-Snoqualmie National Forest
Ranger District Boundary
Miles
0 1 2
Area of Detail
Mt. Baker Ranger District
6 Mile
Tenas Creek Flood Damage
530
Boundary Bridge ERFO
26
25
27
Suiattle ERFO
Suiattle 2006 - Flood Damage
Suiattle River
Darrington
Sauk River
Gold Mountain ERFO
23
White Chuck ERFO
Mount Baker NF
20
Darrington Ranger District
White Chuck River
Mountain Loop ERFO
South Fork Stillaguamish River
20
North Fork Sauk River
49
Skykomish Ranger District
TETRA TECH

Appendix B

White Chuck Road Repair Scoping Report July 2008

Appendix B – White Chuck Road Repair Scoping Report July 2008

Background

In 2004, the Forest Service mailed a scoping letter describing initiation of the environmental analysis of repairs to roads across the Mt. Baker-Snoqualmie National Forest (the Forest) that were damaged in 2003. The Darrington Ranger District proposed to restore vehicular access to the White Chuck drainage by making repairs to three small segments along Road 23: a repair at MP 1.9, a re route-around the damaged road section at MP 2.4, and a repair at MP 3.5. An EA was prepared for this project and was scheduled to be released in 2007 for 30-day public comment. However, in the spring of 2007, Forest Service staff discovered additional damage from the November 2006 flood to this road system. There are five additional sites these are located at MP 3.4, MP 5.8, MP 6.4, MP 7.2, and MP 8.5. Since that time, the Forest Service along with the FHWA staff have inventoried the new damage and documented it in Damage Survey Reports, which identify what flood damage qualifies for ERFO funding. Only MP 3.4 and MP 5.8 sites were approved by FHWA in 2008 for emergency repair funding following the 2006 /2007 events. A vicinity map showing the damaged sites in included in Attachment 1).

2004 Scoping Comments

The Forest Service received scoping comments in 2004 from the Swinomish Tribe, the Skagit River System Cooperative representing the Sauk-Suiattle and the Swinomish Indian Tribes, three organizations (American Rivers, North Cascades Conservation Council, and Washington Recreation River Runners), and seven individuals. A summary of these comments is attached (Attachment 2). Comments included the following:

- Recommendations that Road 23 be decommissioned beyond MP 1.9 to avoid future damage to water quality and fish habitat and because it is uneconomical to try to maintain the road;
- Recommendations that road be repaired because it is important for recreation;
- Recommendation that Road 23 be relocated uphill to protect water quality and fish habitat; and
- Various recommendations that other roads in the White Chuck watershed or the Suiattle watershed be either repaired or decommissioned and that various improvements be made to the trail system.

Using the comments from the public, other agencies, and Tribes, as well as internal scoping comments, the Forest ID Team developed a list of issues to address in the EA that was prepared to address the 2003 flood damage. Issues were separated into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence.

The Forest Service identified five significant topics during the 2004 scoping period:

Issue 1: Loss of, or restricted access to, popular trailheads that access the Glacier Peak Wilderness and to a network of other trails, including loop trails, for hikers, mountain climbers, and stock users.

Issue 2: Changes to dispersed recreation along Road 23 affecting berry and mushroom gathering, hunting, fishing, picnicking, driving for pleasure, and views, snowmobiling, cross country skiing. This may lead to increased use elsewhere.

Issue 3: Loss of access to Matrix lands designated for timber management.

Issue 4: Sedimentation from road repair, as well as from future washouts of the repaired road, could adversely affect water quality and fish, including listed species.

Issue 5: The White Chuck River is recommended for Wild and Scenic designation. Repairs could adversely affect the characteristics that contribute to its eligibility.

Current Scoping Efforts

Forest aquatic specialists and engineers reviewed the additional damage to Road 23 from the recent flood events in relation to soil and slope stability and determined that the upper road section from MP 5.8 to MP 8.5 of Road 23 is at high risk for continued damage from slope movement. The White Chuck River is expected to continue to erode the toe of the slope with the potential for additional slide activity. Forest staff discussed the options and potential costs for maintaining Road 23, and developed a proposal to repair the White Chuck Road 23 from the beginning of the road to the junction of Road 23 with Road 27 (Rat Trap Pass road). Given current road maintenance funding and the risk assessment, the Forest proposed decommissioning Road 23 beyond the junction with Road 27 to a walkable tread.

As part of its government-to-government responsibility to consult with Native American Tribes, the Forest Service sent letters to representatives of seven Tribes in April 2008 (Attachment 3). These included the:

- Lummi Nation
- Samish Indian Nation
- Sauk-Suiattle Indian Tribe
- Stillagaumish Indian Tribe
- Swinomish Indian Tribe
- Tulalip Tribes
- Upper Skagit Tribe

As of the date of this report, only the Samish Tribe has responded (Attachment 4). The Samish stated that they were not interested in participating as a consulting party on this Project at this time.

Also in April 2008, the Forest Service mailed a scoping letter describing the additional damage and initiating an environmental analysis of proposed repairs to the White Chuck Road from both the 2003 and 2006 floods (Attachment 5). The following preliminary issues were identified in this letter:

- Lower Road 23 repairs at MP 1.9 may have adverse effects to river and floodplain processes, with further effects on aquatic integrity, Riparian Reserve conditions, water quality, and fish habitat.
- Lower Road 23 repairs may be subject to future flood impacts, and therefore not cost effective.
- Lower Road 23 repairs may be high-risk because they are within a river drainage with unstable slopes and flash flows.
- Upper Road 23 decommissioning would adversely affect recreational access into the White Chuck River drainage.
- Upper Road 23 decommissioning would preclude vehicle access to some Matrix lands that are available for timber management.

The Forest received comments from the following organizations and individuals (Attachment 6):

1. Duane B. Acheson
2. Dale and Elaine Wick
3. "Random Walker"
4. Nancy Brodie
5. Allen Sommarstrom
6. Jim Scarborough
7. Kim Brown
8. Bruce Coxley
9. NW Four Wheel Drive Association (Arlene Brooks)
10. Phil Leatherman
11. Jim Kuresman
12. Thomas P. Hammond
13. North Cascades Conservation Council (Patrick D. Goldsworthy)
14. Pilchuck Audubon Society (Kathy Johnson)
15. Sherri Brewer
16. Washington Trails Association (Jonathan Guzzo)
17. North Cascades Conservation Council (Kevin M. Geraghty)
18. Paul Wagner
19. Sierra Club, Cascade Chapter (Mark Lawler)

The comments and questions are summarized by author below.

Comment Summary (refer to Comment Letters in Attachment 6)

1. Duane B. Acheson
Prefer to repair all of Road #23.

2. Dale and Elaine Wick
Recommends that Road 23 only be restored to its junction with Road 27 because of the cost of repair and maintenance. Making the rest of the road a non-motorized trail will buffer the Glacier Peak Wilderness, protect the river, and be less expensive to repair in the future.

3. "Random Walker"

Enjoys snowshoeing Road 23 in the spring. Trail maintenance is needed to keep the trails from "growing in".

4. Nancy Brodie
Repair road to the White Chuck Trail and the Kennedy Hot Springs. Not concerned about road repair's effect on environment. Thin the forest before it burns down. Supports road access to hiking areas.

5. Allen Sommarstrom
The river may further erode the road/trail and there will be no route up the White Chuck. Flesh out the impacts from the action to day hikes, climbers of Glacier Peak, and length of back pack outings to destinations in Glacier Peak Wilderness. Concerned with the overall lack of funds for roads/trails across the Forest. Concerned that if people aren't using road/trail that the Forest Service would see this as a reason to go back into the area for timber harvest.

6. Jim Scarborough
Decommission the upper portion of Road 23. It should never have been built - restore the integrity watershed. Close the lower road, it was poorly sighted. The cost would be high, and there would be little public gain to rebuilding the road. Can't meet the ACS if you rebuild the road. Road 2710 should be decommissioned. A walkable decommissioning road is best.

7. Kim Brown
Restore the road to Straight Creek and build a trailhead for Circle Peak, Crystal and Meadow Lakes, and Meadow Mountain. Closing the road would eliminate access to Glacier Peak from the west, as well as to the Pacific Crest Trail and the Meadow Trail. Consider the upper road for repair in the future, if the White Creek Trail is rerouted and the old Glacier Way Trail is restored. Unless road access is maintained, funding for restoring the trail will be hard to get. If the road is not fixed, classify and maintain it as a trail, creating a loop trail from Meadow Mountain to Fire Creek Trail.

8. Bruce Coxley
Closing the road at MP 1.9 would eliminate access to Glacier Peak from the west, as well as to the Pacific Crest Trail and Meadow Mountain.

9. NW Four Wheel Drive Association (Arlene Brooks)
Road 23 provides access to several trailheads, as well as access for timber and wildlife management. We support restoration of motorized access to the White Chuck drainage. Maintain the current recreation land base.

10. Phil Leatherman
Convert the last 5 miles of Road 23 to a hiking trail. Preserving vehicle access from the Suiattle over Rat Trap Pass to the White Chuck will be expensive. Not every mine to market timber road should be kept.

11. Jim Kuresman
Restore some degree of access to the west side of Glacier Peak. Rebuilding as far as Straight Creek would be a huge improvement, then either the Crystal Creek Road could be cleared or new access could be built from Rat Trap Pass. Decommissioning the rest of the road will make it too hard for day hikers to reach the Glacier Peak Wilderness but backpackers would have access. Rebuild the old Glacier View Trail. I understand that the White Chuck Trail is lost forever, however rerouting one washout on the White Chuck Trail would provide access to the Fire Creek Trail. Restore access to Meadow Mountain Trail before this most loved trail is lost forever.

12. Thomas P. Hammond
Supports decommissioning the upper portion of Road 23 for economic and ecological reasons. Also, adding low elevation flat hiking, bicycling opportunities is good for recreationists. The lower portion of the road should be decommissioned for the same reasons. Relocate the White Chuck, Circle Peak, and Crystal Lake/Meadow Mountain trailheads to enhance the benefits of closing the road. Trailheads can be maintained via hiking and bicycling.

13. North Cascades Conservation Council (Patrick D. Goldsworthy)
Close the White Chuck Road and return the area to wilderness, it should never have been built. Without the Kennedy Hot Springs as a destination there's less reason to have the road. Closing the road would improve fish habitat, aquatic integrity, water quality, and riparian reserve conditions. Protect additional areas in the White Chuck as Wilderness.

14. Pilchuck Audubon Society (Kathy Johnson)
Decommission the upper road for economic and environmental reasons. This would also be good for recreation, it will increase low elevation trail miles. Decommission to lower road beginning at MP 1.9 (to decrease sedimentation, restore hydrologic integrity, and reduce incidental to from vehicles and other human-caused damage) and relocate the White Chuck, Circle Peak and Crystal Mountain/Meadow Mountain trailheads. The trails accessed by Road 27 did not receive high use. The trail would still be suitable for day hikes by people using a mountain bike on the closed road in order to reach the trail. Climate change forecasts

indicate, there will be more damaging storm events in the future; closing the road would reduce future damage.

15. Sherri Brewer
If you wonder why you haven't gotten more input, it's because people are too busy to respond. The Forest Service should provide for multiple use, including recreation. Darrington needs recreation and tourism as part of their economy so they must have maintained trails and roads and campgrounds to draw people into the area motorized recreation and day hikes bring income rural communities; backpackers do not contribute to the local economy. We have lost all of our day hikes under 4 miles except Old Sauk Trail, Beaver Lake Trail (which is not being fixed), Boulder River, and Grade Creek/ Tupso Lake, which is fragile meadow and not on the Forest Service trail system. Fix the road to Rat Trap Pass; put the road back to Meadow Mountain and Crystal Creek trailheads so they can be day hikes. Day hikes and low elevation hikes are better for women, children and older people. Restore the road to Goat Creek Trail, maintain the White Chuck Bench Trail. The Forest Service and the environmental groups want to take a man out of the landscape.

16. Washington Trails Association (Jonathan Guzzo)
The White Chuck Road was an important hiker access point for the Glacier Peak Wilderness for hikers and climbers. The washout on the Suiattle River Road is also a concern. We are particularly worried about the Circle Peak and Crystal Lake Trails. We support restoring the road to Rat Trap Pass. The district should decommission the rest of the road and make it a trail, place the decommissioned road on the trail system to ensure its future maintenance.

17. North Cascades Conservation Council (Kevin M. Geraghty)
The road should not be rebuilt past MP 1.9. The road has had repeated washouts and they are likely to be more failures. We support decommissioning the upper road, and we also recommend decommissioning the road after MP 1.9. The road should be turned into a non-motorized trail. The standards and guidelines of the ACS require that you restore aquatic function. The proposed repair at MP 2.4 would require a deep culvert and fill. Deeply buried culverts are time bombs, which are enormously expensive to defuse at a later date. Keep up the White Chuck Bench Trail, it is important for early-season hiking. The trailhead for Circle Peak can be reached from the north via Road 27. This road is proposed for retention in the ATM scoping for the Suiattle basin, which we have not opposed. The area allocated to Matrix and MA 17 is not good operationally for timber. It should be switched with more economic ground elsewhere.

18. Paul Wagner
Just because roads need to be maintained or because they fail is no reason to close them. The lack of funding is no reason to destroy public assets and access to popular areas. The White Chuck Trailhead, has good parking areas with room for cars and stock trailers, toilets and camping. The White Chuck Trail is an important low elevation trail.

19. Sierra Club, Cascade Chapter (Mark Lawler)
The Sierra Club supports decommissioning Road 23 beyond the junction with Road 27, the remainder of the road is unstable, harms water quality, and is expensive to maintain.

Mechanized equipment can leave a good-quality trailhead that can be maintained. Design a trail and make a trailhead parking area with kiosk and toilets near the junction with Road 27. Don't keep Rat Trap Pass open. We don't need access to Crystal Lake/Circle Peak trails from both sides; few people drive the loop. There are water quality and slope stability issues on the Suiattle side. We are concerned about impacts to late-secessional forest that would result from rerouting Road 23 around washouts, and with effects on aquatic habitat if the road is repaired, you will need to mitigate these losses by expanding the LSR. Add late-successional habitat to the list of issues to be analyzed along with aquatic integrity, riparian reserve conditions, water quality, and fish habitat.

Questions Submitted in Response to Scoping:

1. Duane B. Acheson
Would adequate vehicle parking be provided at the beginning area of the decommissioned road, near the intersection with Road 27? What do you propose for support of the walkable trail over the regions where you propose to remove the culverts?
Will primitive type toilet facilities be provided at the White Chuck Trailhead to replace the removed toilets? Will bridges be provided to cross streams on the decommissioned part of the road? Are there washouts on Road 27, are the slopes stable and will the road require rerouting or rebuilding?

3. "Random Walker"
What is the condition of Road 27 are there any wash outs, are the slopes stable, will it require rerouting/rebuilding?

5. Allen Sommarstrom
What change would the proposed action (closing Road 23 at Rat Trap Pass) have on recreational users? What are the plans for the road that would be closed? Does it revert to a trail? Will there be large creeks to cross? If so will there be any maintenance of crossing? If the river further erodes the road/trail and there is no route up the White Chuck what will the Forest Service response be to further erosion of access route? What impact is the loss of Kennedy Hot Springs as an attraction to the use and need of Road 23 by recreational users? Are there efforts to restore access to Round Mountain Trail and the Segelsen Pass areas (these sites are outside of the White Chuck River drainage).

6. Jim Scarborough
What type of forest would be cut if the road is moved to a better location?

15. Sherri Brewer
What happened to the input I submitted to the Forest Service for the 1990 Forest Plan? What about the letters from the Darrington Chamber of Commerce? What about the recreation multiple use survey that our Multiple Use Group did in the early 1990s and the survey on the Suiattle River Road in 1995? Were any of these letters or surveys referred to in the latest public input requests? How many roads and hikes, including all day hikes into the alpine lakes and meadows were there in 1980, and how many are there today. There hasn't been an owl surveys since 1993 so how do we know that the changes we have made in the last 15

years are working? Do you really think that walking away and ignoring the land is going to work? What is happening on this Suiattle River decisions, please keep me informed?

18. Paul Wagner
What will the Forest Service replace the White Chuck campground with if the road is closed? Is the Forest Service afraid of appeals from extremist environmental activists? Where is the option to repair the trail? What is a walkable tread?

Comments within the Scope of and Addressed by the White Chuck Road Repair EA:

Decommission Road 23 beyond MP 1.9 in order to avoid future damage to water quality and fish habitat, to restore the watershed, or because of the cost of repairing and maintaining the road is too high.

Repair Road 23 only between MP 1.9 and its junction with Road 27 and decommission the remainder of the road because the cost of repair and maintenance for the upper road is too high or because of future environmental damage likely to occur.

Repair Road 23 between MP 1.9 and it's junction with Road 27 because it provides access to Meadow Mountain, Crystal Lake, and Circle Peak (via Roads 27 and 2720).

Do not repair Road 23 because access to Meadow Mountain, Crystal Lake, and Circle Peak can be provided from the Suiattle road system.

Repair all of Road 23 because it provides access for recreation, including access for roaded recreation. access to Glacier Peak for climbers, access to the Wilderness and to trails for backpackers, and access to one of the only low elevation trails for day hikers.

Repair and maintain Road 23 because access for day hikes, especially in low elevation areas, and roaded recreation are important to the local economy.

Concern about how the action may affect the current or future trail system, including access to the White Chuck Trail, as well as access to Kennedy Hot Springs.

Concern about meeting the ACS objectives is the road is rebuilt/restored.

If the road is decommissioned and a walkable tread installed, it should become a system trail and maintained as a trail (including removing brush) so that it will be suitable for mountain bike use as well as hiking.

Comments Beyond the Scope of the White Chuck Road Repair EA

Protect additional areas in the White Chuck watershed as Wilderness.

Concern that climate change will lead to more flooding, which will lead to the need for additional road repairs.

Repair the White Chuck, Glacier View, Fire Creek, and Goat Mountain Trails and restore Kennedy Hot Springs.

Trail maintenance is needed on the forest.

Concern over lack of funds for roads and trails on the forest

Concern over increased timber harvest if people stop using roads and rails for recreation.

Decommission Road 27.

Maintain the current recreational land base.

Relocate the White Chuck, Circle Peak, Crystal Lake/Meadow Mountain trailheads.

Fix the road to Rat Trap Pass, and to Meadow Mountain and Crystal Creek trailheads.

Concern about the Suiattle River Road washout.

Reallocate Matrix land.

Manage the forest for multiple use.

The forest could stand a little tree thinning as opposed to having it burned down.

Various recommendations that other roads, either in the White Chuck watershed (including the first 1.9 miles of Road 23, Road 2311, Road 27, and Road 2710) or in the Suiattle watershed, be either repaired or decommissioned.

Comments on the need for various improvements to the trail system, existing campgrounds, and trailheads, either in the White Chuck watershed or in other parts of the Forest.

Decommission all of Road 23 beyond MP 1.9 in order to provide a primitive area as a buffer to the Wilderness and/or to provide additional areas suitable for Wilderness designation (The issue of buffers to wilderness areas was decided in the Wilderness Act).

Appendix C
Cumulative Effects Analysis Process

Appendix C – Cumulative Effects Analysis Process

Definition

Cumulative impact is the impact on the environment, which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor or collectively significant actions taking place over a period of time (40 CFR 1508.7).

Analysis

The analysis was guided by the June 24, 2005, memo *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis*, Executive Office of the President, CEQ. Briefly, the memo states that agencies are to use scoping to determine whether, and to what extent, information about the specific nature, design, or present effects of a past action is useful for the agency's analysis of effects of a proposed action and its reasonable alternatives. "*Agencies are not required to list or analyze the effects of individual past actions unless such information is necessary to describe the cumulative effect of all past actions combined*" (Executive Office of the President, CEQ 2005). The memo also noted that agencies can generally conduct an adequate cumulative effects analysis by focusing on the current aggregate [or remaining, residual] effects of past actions without delving into the historical details of past, individual actions.

To complete the analysis of cumulative effects for the White Chuck Road 23 Repair Project, the ID Team first considered the estimated direct and indirect effects on the environment that would be expected if any of the alternatives analyzed in detail were implemented. Once these effects had been determined, the ID Team then assessed the residual (current aggregate) effects of past actions that are, in the judgment of the resource specialists, relevant, in that they could potentially overlap in time and space with the direct/indirect White Chuck project effects.

The team then assessed the spatial extent of the effects of the alternatives, resource by resource, to determine if they would add to, modify, or mitigate the on-going effects of the past, current, and expected future actions. For each resource, an area of potential effect was determined. The resource specialists then determined if any potential, existing, or residual effects were present from the other identified projects. If there was no overlap in both time (e.g., no remaining effects from past projects) <u>and</u> in space (extent of effects), there was no cumulative effect.

The initial area of potential cumulative effects centered on the damaged section of Road 23, and in some cases extending to the White Chuck River watershed. For larger-ranging wildlife species, the area considered is larger (see Chapter 3).

Table C-1 below lists the past, present, or reasonably foreseeable actions within the vicinity of the White Chuck road repair that spatially and temporally overlap with the estimated effects of the proposed White Chuck road repair, and where cumulative effects could occur.

Table C-1. Past, Present, Reasonably Foreseeable Actions, Spatially and Temporally Overlapping with White Chuck Road Repair, Potential for Cumulative Effects

Activity	Extent	Comment	Miles from the Project
Gold Mountain Road Repair, including White Chuck Bridge	Repair flood damage to the Road 22 System on Gold Mtn., including replacing the White Chuck River bridge.	Decision Notice signed Feb. 14, 2006. Bridge work completed in 2008.	About 1.9 miles (for the bridge) downstream from MP 1.9.
White Chuck Trail Flood Repair	Trail repair and relocation along 5 miles of White Chuck Trail (#643).	Work not scheduled due to lack of funding	Lower end of trail is about 6.8 miles upstream from MP 3.5
Upper White Chuck Pacific Crest Trail Flood Repair	Trail repair and relocation along 9 miles of the Pacific Crest Trail (#2000).	Decision Memo signed Feb. 14, 2006. Most work completed in 20008. One remaining bridge replacement scheduled for 2009	About 13 miles upstream from MP 3.5
Design analysis work for White Chuck Road Repair in spring 2009	Analysis will include drilling 10 to 21 boring holes to identify subsurface conditions.	All work will be completed within applicable work windows and all permits required will be obtained prior to drilling. Helicopter will be used to access drilling sites.	MPs 1.9, 2.4, and 3.5 of Road 23
"Disturbance" activites for Bald Eagle: boating, hiking, fish, residential activities	Along White Chuck River during winter (November) the year of project construction.	Small numbers of eagles may be present during the time of project construction.	Project area and downstream.
Routine annual Noxious Weed Eradication	No major infestations are present in the project area.	Mitigation Measures and Management Practices (Chapter 2) are in place and are effective in preventing the spread of noxious weeds.	District wide control efforts.
Second-growth forest thinning projects between 1992 and 2006	Near the confluence area of Sauk/White Chuck Rivers.	Local reductions in small diameter snags, increased ungulate forage, increased stand diversity and suitable dispersal habitat for the northern spotted owl.	1 to 2 miles
On-going, annual Road Maintenance (Rd 23 and 27 systems)	Brushing/blading road on a rotating schedule as funds allow.	On-going, annual.	Within the project area.

Table C-2 lists projects that have been known to occur in and around the White Chuck River drainage and were found not to contribute to potential cumulative effects because: 1.) these projects have long been completed with no remaining, residual effects (that could overlap temporally with project effects from the White Chuck proposed repair); 2.) the projects are located far enough away from White Chuck road repair that, for all resources, effects would not overlap spatially; 3.) the effects of the projects were only site-specific to the location of that project; or 4.) the estimated effects from White Chuck road repair would not measurably add to any residual effects.

Table C-2. Projects Reviewed and Found Not Contributing to Cumulative Effects

Project	Comments	Rationale for not being considered
Forgotten Thin Plus, Commercial Thinning Sale	394 acres of commercial thinning. Decision Notice signed August 11, 2006. Work to occur in 2007-2009.	These actions are too far away from the proposed project, effects would not combine.
Gold Mountain Radio Tower	A special use authorization was issued to Snohomish County in 2005 to build and operate a radio tower on Gold Mountain.	This action is too far away from White Chuck repair; effects are limited and specific to the site.
Reconstruction/Repair of Roads 24, 2424, 2420, 2097, and 2097010	To be completed for access to Skull/Funnybone Thin Timber Sale.	These actions are too far away from the proposed project, effects would not combine.
County Road Repairs (Darrington to NF boundary)	Repairs of the 2003 flood damage have been completed and regular road maintenance is on-going.	Repairs will occur or have occurred. These actions are too far away from the proposed project, effects would not combine.
Gold Hill Fire Salvage Timber Sale	16 acres of fire salvage, completed; area is to be replanted.	Approximately 3 miles downstream. No overlap in space or time.
Suiattle Road 26 Repair	Decision signed 3/30/06 to repair flood damage.	These actions are too far away from the proposed project, effects would not combine.
Bedal Creek culvert removal (Road 4096)	Completed; located on a road that had been previously closed.	A long-term watershed improvement project for sediment reduction.
Road 4096 decommission, convert to trail	Completed.	A long-term watershed improvement project for sediment reduction.
Decommissioning portions of Roads 2080, 2083, 2084, 2086, 2087	About 11 miles of road have been decommissioned since 1990.	These are long-term improvement activities for sediment reduction, watershed restoration.
Lyle Commercial Thinning Sale	75 acres of commercial thinning. This sale was harvested in 1997.	These actions are too far away from the proposed project, effects would not combine.
Mountain Loop ERFO Repairs	Repair of flood damage from 2003, at MP 33.1, 33.6, 34.8, and 35.6. Decision Notice signed April 14, 2006. Work expected to occur in	These actions are too far away from the proposed project, effects would not combine.

Project	Comments	Rationale for not being considered
	2006-2007.	
Funnybone portion of Skull/Funny-bone Commercial Thinning	431 acres of timber thinned; 25% of ac. in Riparian Reserves with 70% canopy closure (Upper Dan, Sauk). 2001, 15 acres thinned; in 2005, 416 acres thinned. Timing for completion is uncertain.	Action is too far away from the proposed project, effects would not combine
Skull portion of Skull/Funnybone Commercial Thinning	64 acre thinning (15 acres in riparian reserves with 70% canopy closure). Completed in 2005. About 3 mile upstream from confluence of Sauk and White Chuck Rivers.	Action is too far away from the proposed project, effects would not combine
White Chuck Bench Trail Maintenance	Annual trail maintenance along 5 miles of White Chuck Bench Trail (#731).	Effects are limited and specific to the site.
Too/Rib Timber Sale	360-480 acres thinned. 10 acres in riparian reserves with 70% canopy retention (Upper Dan, Sauk River near White Chuck River). Completed in 2000.	Action is too far away from the proposed project, effects would not combine
Dubor and Dontbor Thin	600 ac; 25% within riparian reserves; 70% canopy closure. Completed in 1995. 1-2 miles downstream from project area	Action is too far away from the proposed project, effects would not combine
Decline Timber Sale	250 acres thinning. Proposed for 2008 or 2009. About 5 miles downstream on east side of Sauk River	Action is too far away from the proposed project, effects would not combine
Sauk River Road Reconstruction	Snohomish County owns a road that accesses 20 private properties. Repairs were made in 2006-2007 2.0 to 6.5 miles downstream from project area.	Action is too far away from the proposed project, effects would not combine
Instream Treatments and fish passage projects	Instream habitat projets and culvert removal to improve fish rearing and spawning.	There are no residual effects that could combine cumulatively with effects from this project.
Wishbone Thin Timber Sale	Upper Dan Creek, Sauk River.	Action is too far away from the proposed project, effects would not combine
Timber Stand Improvement (Pugh Ridge and Gold Mountain)	Hydrologic recovery of vegetative cover, and riparian and instream wood.	Effects are limited and specific to TSI sites.
Past ERFO treatments on Road 23	Multiple repairs from past floods on Road 23 system. Replacing fill, riprap, culvert replacement and cleaning, and slide removal.	Repairs took place between 1974 and 1999. There are no remaining measurable residual effects that would be combined cumulatively with the effects from this project.

Appendix D
Climate Change

The global climate has changed through time and will continue to change. An increasing number of scientific models and methodologies project an increasing rate of climate change in upcoming years. Applying regional climate models to site-specific project areas makes the conclusions less certain. However, some general projections are possible for the purpose of environmental analysis.

The following projections for the Pacific Northwest are derived from the Climate Impacts Group of the University of Washington, Seattle. Models developed by the Climate Impacts Group project temperature increases during the 21st century with the potential for a slight increase in precipitation during the fall and winter months (Casola J.H et al., 2005). A 2009 report (draft in review 2009) from The Climate Impacts Group updates the 2005 projections with the following probable regional impacts:

- April 1 snowpack is projected to decrease across the state (30 percent less by 2020) with seasonal streamflow timing shifts, which will be especially noted in sensitive watersheds.
- Rising temperatures may result in increases in stream temperatures that will reduce quality and extent of freshwater salmon habitat
- Increased summer temperatures and decreased summer precipitation may result in large burn areas and increased susceptibility of stands to insect attacks, especially mountain pine beetles (east side of the North Cascades).
- Although there have been few statistically significant changes in extreme precipitation in the Puget Sound area, mode simulation predicts higher precipitation in the Puget Sound area.

A summary of the Intergovernmental Panel on Climate Change (IPCC 2007) also included projections for a future with fewer cold days and nights, more hot days and nights, more heat waves, increasing area affected by drought, and an increase in precipitation that falls as rain.

On a regional basis, reports from the Climate Impacts Group predict a scenario for the Pacific Northwest with future warming of approximately 0.5°F per decade with temperatures increasing in all seasons, but particularly in June through August. A larger percentage of winter precipitation would fall as rain rather than snow, with an earlier spring snowmelt, lower summer stream flows, droughts becoming more common, and a greater risk of floods and wildfires.

It was noted in Washington Climate Change Impacts Assessment from February 2009, that decisions with long-term impacts are being made every day, and today's choices shape tomorrow's vulnerabilities. This includes decisions related to land use planning and development, habitat management, flood control, erosion control, water supply, and infrastructure design. Many adaptive actions may create cost savings through damage avoidance by modifying development plans in areas likely to experience greater flooding.

Options for adapting to impacts were identified in the Washington Climate Change Impacts Assessment: Enhancing or Supplementing Washington's Preparation, Adaptation Working Group recommendations, released February 2009. The following were suggestions for adapting to winter high flows:

- Develop property in areas that are less likely to experience more flooding as a result of climate change to decrease the risk of flood damage to the new structures
- Restore hydrologic function in floodplains
- Improve flood forecasting and emergency management systems
- Alter land use policies
- Strengthen dikes and levees where appropriate
- Increase reservoir storage

The Mt. Baker-Snoqualmie National Forest has experienced flood events over the last several decades and has promoted and developed specific adaptations of road systems to high flows which promoted resiliency. The following options are from the Ranger District files, watershed analyses, and restoration contracts:

- Relocating or moving roads away from river systems when possible
- Increasing culvert sizes for increased flows
- Increased number of relief drainage features
- Increase use of bridges versus culverts
- Use of fords, dips in road gradient, and rock lined waterbars to restore hydrologic functions
- Roads put into storage when not used, with removal of culverts and sidecast roadbed material
- Decommissioning of road systems no longer needed
- Bridges that span the wetted channel
- Incorporation of large wood into projects along riparian areas to encourage capture of additional wood at the stream edge and to work with stream flow patterns.

Specific adaptation options (from Joyce L.A. et. al, 2008, Millar, C.L. et al. 2007) for actions to promote resilience to climate change include the following:

- Planning for projected future conditions, and for unexpected conditions as well as experimenting with novel ideas (or reviving old ideas)
- Assessing decisions in context of barriers and opportunities that limit or facilitate local adaptation

References:

Littell, J.S. (eds), M.M. Elsner, L.W. Binder, A.K. Snover. (in review 2009) ***The Washington Climate Change Impacts Assessment, Evaluating Washington's Future in a Changing Climate***, Executive Summary (Final Draft), A Report by The Climate Impacts Group, University of Washington, February 2009.

Littell, J.S., E.E Oneil, D. Mckenzie, J.A. Hickle, J.A. Lutz, R.A.Norheim, M.M. Elsner. (in review 2009) ***Forest Ecosystems, disturbance and climatic change in Washington State, USA*** Chapter 7 in Littell, J.S.(eds.), M.M. Elsner, L.W. Binder, A.K. Snover. (in review 2009) ***The Washington Climate Change Impacts Assessment, Evaluating Washington's Future in a***

Changing Climate, Executive Summary (Final Draft), A report by The Climate Impacts Group, University of Washington, February 2009.

Joyce, L.A., G.M. Blate, J.S. Littell, S.G. McNulty, C.I. Millar, S.C. Moser, and R.P. Neilson. 2008. ***National Forests.*** Chapter 3 in S.H. Julius, J.M. West (eds.), J.S. Baron, B.Griffith, L.A. Joyce, P. Kareiva, B.D. Keller, M.A. Palmer, C.H. Peterson, and J.M. Scott (Authors), Preliminary Review of Adaptation Options for Climate-Sensitive Ecosystems and Resources. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. U.S. Environmental Protection Agency, Washington, DC, USA, pp. 3-1 to 3-127.

Casola, J.H., J.E. Kay, A.K. Snover, R.A. Norheim, L.C. Whitely Binder, Climate Impacts Group. 2005. ***Climate Impacts on Washington's Hydropower, Water Supply, Forests, Fish, and Agriculture.*** A report prepared for King County (Washington) by the Climate Impacts Group (Center for Science in the Earth System, Joint Institute for the Study of the Atmosphere and Ocean, University of Washington, Seattle).

Millar C.I., Stephenson N.L., Stephenson S.L. 2007. ***Climate change and forests of the future: managing in the face of uncertainly.*** Ecol Appl. 17:2145-2151

Whitely Binder, L.C. with contributions from Jennifer Krencicki Barcelos, Derek B. Booth, Meriel Darzen, Marketa McGuire Elsner1, Richard Fenske, Thomas F. Graham, Alan F.Hamlet, John Hodges-Howell, Daniel D. Huppert, J. Elizabeth Jackson, Catherine Karr, Patrick W. Keys, Jeremy S. Littell, Nathan Mantua1, Jennifer Marlow, Don McKenzie. 2009. **Preparing for climate change in Washington State.** A report by The Climate Impacts Group, University of Washington, February 2009