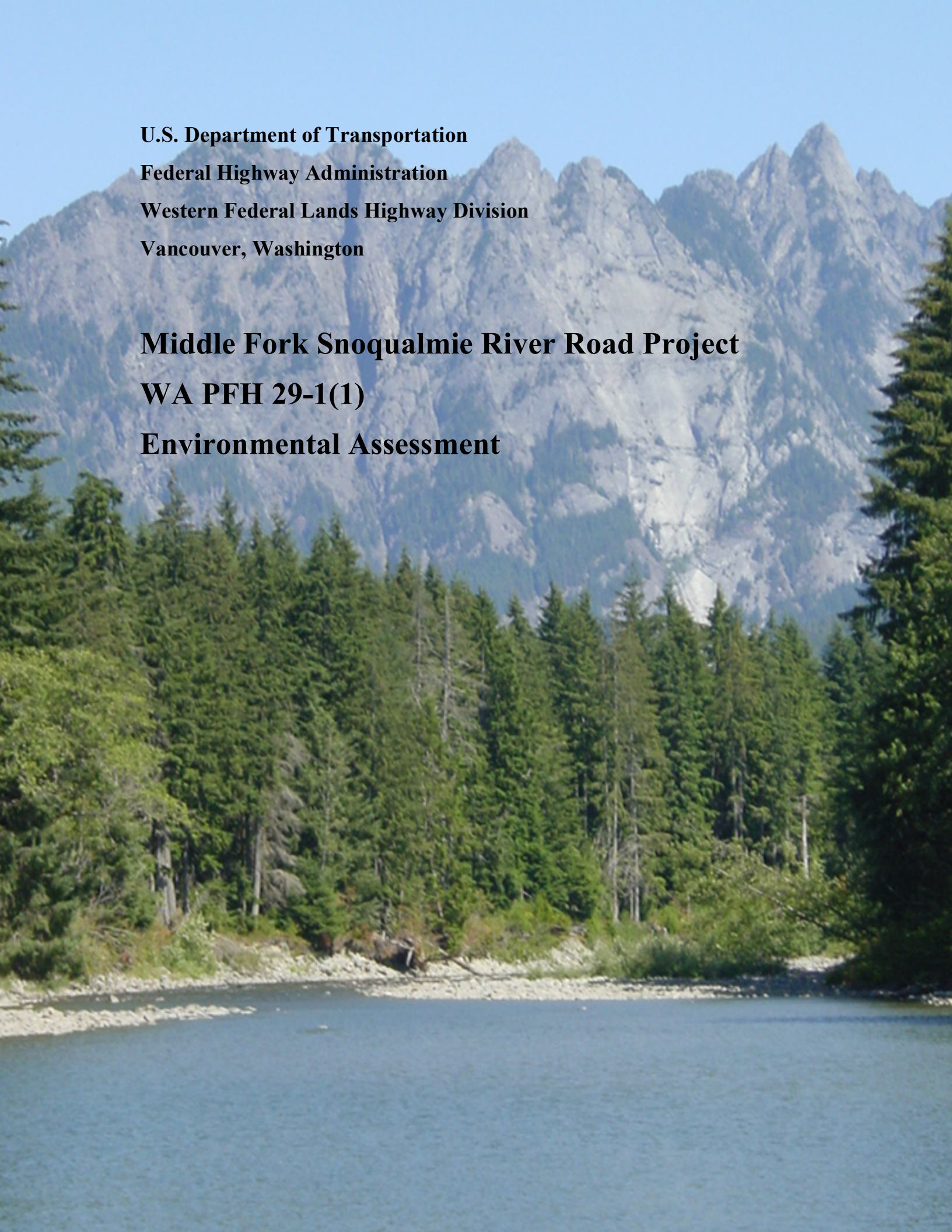

U.S. Department of Transportation

Federal Highway Administration

Western Federal Lands Highway Division

Vancouver, Washington

Middle Fork Snoqualmie River Road Project

WA PFH 29-1(1)

Environmental Assessment

Middle Fork Snoqualmie River Road Project
King County, Washington
Environmental Assessment

WA PFH 29-1(1)

Submitted

Pursuant to Public Law 91-190

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Participating Agencies

U.S. Department of Agriculture, Forest Service

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Executive Summary

The Federal Highway Administration, Western Federal Lands Highway Division (FHWA), in partnership with the U.S. Forest Service (USFS) and King County, Washington, is planning to improve approximately 9.7 miles of Washington Forest Road 56, Middle Fork Snoqualmie River Road (Washington Forest Highway 29), commonly known and hereafter referred to as Middle Fork Road. The project is located just east of the city of North Bend, beginning within King County at Milepost (MP) 2.7 and ending within the Mount Baker-Snoqualmie National Forest at the new Middle Fork Campground located at MP 12.4.

The route serves as the only motorized access to the Middle Fork Snoqualmie River valley, a popular recreation area located less than an hour's drive from the Seattle metropolitan area. The area provides a wide range of recreational opportunities; these activities include hiking, mountain biking, kayaking, rafting, swimming, hunting, fishing, camping, using hot springs, and participating in other activities.

The purpose of the proposed project is to improve the Middle Fork Road's operational safety and reduce excessive annual maintenance efforts while improving access to recreational opportunities. To meet this purpose, several conditions of Middle Fork Road require relief, including the following: varying, inconsistent roadway widths; a substandard driving surface that has potholes, washboarding, and loose gravel; excessive maintenance needs and cost; insufficient drainage; inadequate road warning signage; and lack of designated travel lanes.

Partner agencies, other federal and state agencies, and the public identified additional considerations that the proposed project should attempt to meet. The considerations include the following:

- Completing improvements in a cost-effective manner
- Minimizing impacts on natural habitat, aesthetics, water quality, and recreation
- Improving fish passage when feasible
- Including feasible measures to discourage excessive speeds

Two alternatives are evaluated within this Environmental Assessment (EA), the no action alternative and the preferred alternative. The no action alternative would leave Middle Fork Road in its current condition with no improvements proposed. King County and the U.S. Forest Service Service (USFS) would continue maintenance operations. Periodic storm and flood events would continue to overtop and damage the roadway.

The preferred alternative was developed to best address the project's purpose and need, while meeting additional considerations. The preferred alternative would accomplish the following:

- Reconstruct and pave the existing Middle Fork Road from approximately MP 2.7 to MP 12.4 to create a uniform, 20-foot-wide paved road with isolated sections of 18-foot-wide paved road in areas with severe terrain constraints.
- Raise the grade where needed to ensure roadway stability and minimize flood damage to the roadway.

- Perform minor alignment adjustments to soften sharp curves.
- Replace three bridges and numerous culverts.
- Upgrade signage.
- Provide other roadside safety features.

The table below contains a summary of potential effects of the no action and preferred alternatives. The potential effects are further detailed in the body of this EA. Any adverse impacts resulting from the preferred alternative would be minimized to the extent feasible, and mitigation measures would be implemented to further reduce and/or offset potential impacts.

Table S-1. Summary of Environmental Impacts

Parameter	No Action Alternative	Preferred Alternative
Projected 2031 Traffic Volume (MP 2.9)	347 Average daily traffic (ADT) would occur.	371 ADT
Community Character	No change would occur.	Temporary impacts would occur due to construction. The preferred alternative would cause minor visual impacts during and following construction, though the majority would be temporary, as vegetation would quickly grow back within disturbed areas. Long-term, in association with trailhead improvements, a more formalized visual recreational setting would be developed along the road.
Cultural Resources	There would be no impact under either alternative.	
Recreation	No change would occur. Access to recreation would continue to be impacted by roadway conditions and would be exacerbated as anticipated traffic volumes would increase.	Access to recreational opportunities would be restricted during construction activities. Long-term, access would be improved with the preferred alternative and would better accommodate existing and future traffic loads while requiring less maintenance.
Noise	No change would occur.	No change would occur in long-term noise. Noise would increase temporarily during construction activities.
Air Quality	No change would occur. Dust would continue to be created by vehicles on the roadway during dry weather.	A potential short-term increase in dust would occur during construction. A long-term decrease in dust would occur through the elimination of roadway dust associated with a gravel road.
Visual Impacts	No change would occur.	Temporary impacts would occur due to construction. The preferred alternative would cause minor visual impacts during and following construction. Most effects would be temporary as vegetation would grow back within the disturbed areas. Long-term, in association with trailhead improvements, a more formalized recreational setting would be developed along the road.

Table S-1. Summary of Environmental Impacts (continued)

Parameter	No Action Alternative	Preferred Alternative
Water Resources	No change would occur. Existing deficiencies and barriers to fish passage would persist. Existing areas of erosion and sedimentation would continue.	A short-term increase in potential for erosion, sedimentation, and turbidity would occur during construction activities. Following project completion, there would be improved floodplain connectivity, reduced areas of erosion and sedimentation, and improved fish passage.
Wetlands	No impact would occur.	Approximately 1.2 acres of wetlands would be filled. Compensatory mitigation would be required to offset this impact.
Soils and Geology	No impact would occur. Areas of existing erosion would persist.	A minor impact to soils and geology would occur immediately adjacent to the roadway as a result of construction. A short-term increase in erosion potential would occur while soils were exposed during construction.
Vegetation	No impact would occur.	A permanent loss of approximately 2.5 acres of existing adjacent vegetation would occur. A temporary loss of approximately 33 acres would occur during construction until vegetation becomes reestablished. Approximately 3.5 acres of existing roadway would be restored and revegetated.
Wildlife	No impact would occur.	A minor loss of adjacent roadside habitat would occur until vegetation reestablished. Wildlife would avoid the project area during construction activities.
Fisheries	No change would occur. Existing barriers to fish passage would persist.	A short-term increase in potential for erosion, sedimentation, and turbidity would occur during construction activities. A short-term potential avoidance of the project area would occur during construction activities. A long-term increase in potential available habitat would occur as a result of replacing existing barriers with fish passage culverts and reducing potential erosion and sedimentation from the roadway.
Resource Commitment	No change would occur.	The preferred alternative would involve using raw materials and fuel during construction.

Note: Impacts are based on preliminary design cut and fill amounts.

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List of Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
ADT	average daily traffic
BMP	best management practice
CAA	Clean Air Act
CCC	Civilian Conservation Corps
CFR	Code of Federal Regulations
CWA	Clean Water Act
dBA	A-weighted decibels
DNR	Washington Department of Natural Resources
DOE	Washington Department of Ecology
EA	environmental assessment
EO	Executive Order
ERFO	Emergency Relief for Federally Owned Roads
ESA	Endangered Species Act
FHWA	Federal Highway Administration
I-90	Interstate 90
LRMP	Land and Resource Management Plan
Middle Fork ATM Plan	*Middle Fork Snoqualmie River Watershed Access and Travel Management Plan* (USFS 2005a)
MBS	Mount Baker-Snoqualmie National Forest
MP	milepost
mph	miles per hour
Mt.	Mount
NAAQS	National Ambient Air Quality Standards
NBLC	North Bend Lumber Company
NBTC	North Bend Timber Company
NFS	National Forest System
NRHP	National Register of Historic Places
ORV	outstandingly remarkable value
PM_{10}	particulate matter
PL	public law
ROW	right of way
TCP	traditional cultural property
USACE	United States Army Corps of Engineers
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
valley	Middle Fork Snoqualmie River valley
VLVLR	very low volume local roads
VQO	Visual Quality Objective
WDFW	Washington Department of Fish and Wildlife

1 Introduction

1.1 Project Location

Western Federal Lands Highway Division of the Federal Highway Administration (FHWA), in partnership with the Mount (Mt.) Baker-Snoqualmie National Forest (MBS) of the U.S. Forest Service (USFS) and King County, proposes to improve approximately 9.7 miles of Forest Highway 29 (also called the Middle Fork Snoqualmie River Road, Road 56, and Lake Dorothy Road) in King County, Washington. Hereafter, the road will be called Middle Fork Road, its local name. The road is located east of North Bend, Washington. It is accessed via Exit 34 off Interstate 90 (I-90) at Edgewick (468th Street). The roadway from I-90 is called 468th Street for approximately 0.5 mile north of the exit, where there is a three-way intersection with the road (signed as the Lake Dorothy Road). The project begins on Middle Fork Road at approximately Milepost (MP) 2.7. It ends at the entrance to the Middle Fork Campground at MP 12.4. Proposed project limits, as well as key features of the proposed project corridor, are shown on Figure 1-1.

The Middle Fork Road is the only gateway to 109,000 acres of MBS, and it is a primary access point for the Alpine Lakes Wilderness. The Middle Fork Road is located in the eastern half of King County, less than an hour's drive from the densely populated Seattle metropolitan area. The area provides a wide range of recreational opportunities; these activities include hiking, mountain biking, kayaking, rafting, swimming, hunting, fishing, camping, using hot springs, and participating in other activities.

1.2 Project History

The development of the Middle Fork Road project began when King County and the USFS submitted an application to FHWA to improve the Middle Fork Road from the end of the existing pavement to the USFS boundary. The project limits went through multiple iterations during project scoping as the partner agencies examined potential inclusions of various segments along the entire Middle Fork Road, such as the couplet residential area near the beginning of the project (Figure 1-1). Due to the funding restrictions for the proposed project and the high cost and impacts associated with segments such as the couplet, the partner agencies ultimately decided that the project limits would begin after the couplet area at MP 2.7 and would extend approximately 9.7 miles to the Middle Fork Campground at MP 12.4.

FHWA, USFS, and King County identified needs that have guided the development of the proposed project. The project purpose and need were developed based on deficiencies identified by the partner agencies during project scoping. Alternatives were developed based on whether they would meet the purpose and need. They were further developed, refined, or rejected during project scoping, and in response to public and agency comments received during outreach efforts. As a result of the analysis, the partner agencies endorsed the preferred alternative presented within this Environmental Assessment (EA).

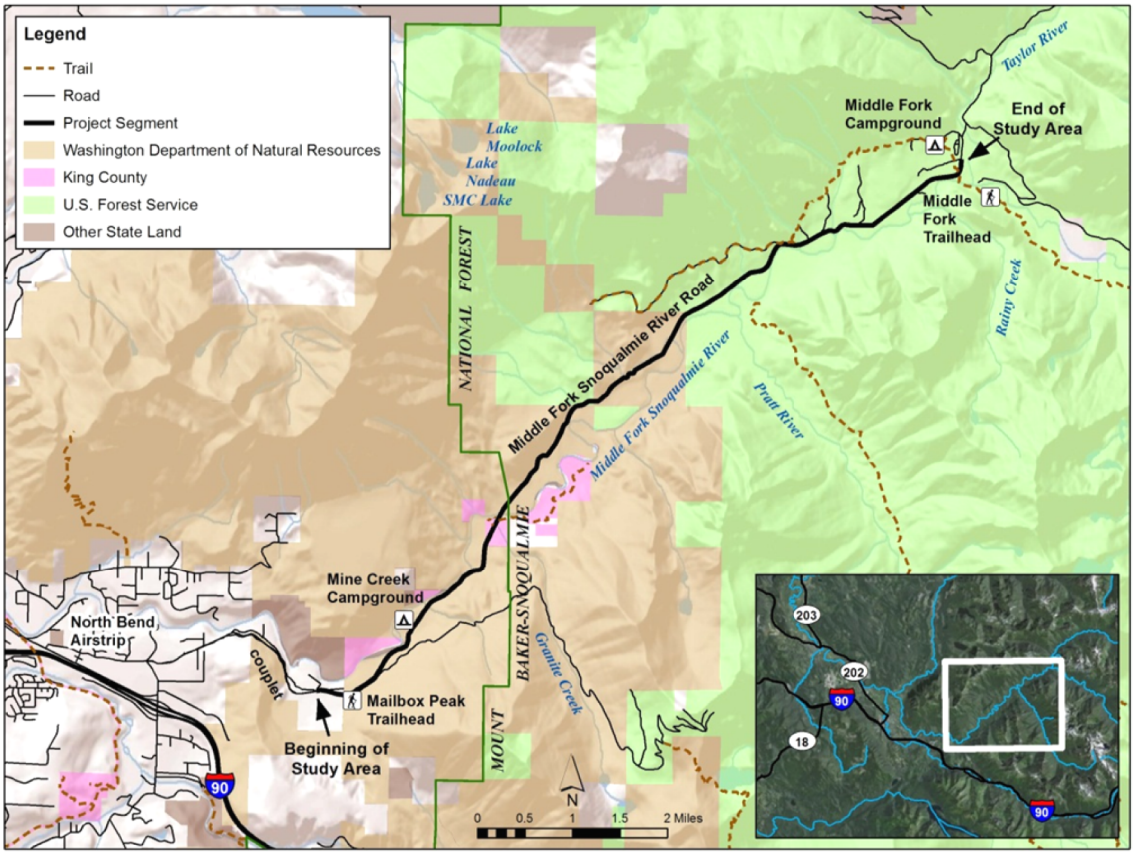

Figure 1-1. Project area location map and key features

1.3 Scope and Nature of the Proposed Project

The proposed project involves the following actions:

- Reconstructing and paving the existing Middle Fork Road from approximately MP 2.7 to MP 12.4 to create a uniform 20-foot-wide paved road with isolated sections of 18-foot-wide paved road in areas with severe terrain constraints
- Raising grade where needed to ensure roadway stability and minimize flood damage to the roadway
- Performing minor alignment adjustments to soften sharp curves
- Replacing three bridges and numerous culverts
- Upgrading signing and other roadside safety features

1.4 Public and Agency Involvement

Throughout the development of this project, FHWA conducted public meetings, interagency meetings, tribal coordination, and meetings with interested parties. Public meetings took place to inform and update the public and to solicit public and agency input on the project. The public

meetings took place in North Bend or during site visits to the project area. Interagency meetings were held to identify concerns about potential project impacts and regulatory issues.

Interagency meetings included representatives from FHWA, USFS, Washington Department of Natural Resources (DNR), U.S. Fish and Wildlife Service (USFWS), King County, Environmental Protection Agency (EPA), Washington Department of Fish and Wildlife (WDFW), and consultants, though attendance at meetings varied. Interested parties included the Middle Fork Outdoor Recreation Coalition, Sierra Club, Issaquah Alpine Lakes Protection Society, Mountains to Sound Greenway Trust, and interested members of the public. FHWA has consulted, and will continue to coordinate with, the Snoqualmie Tribe, Tulalip Tribes, and Yakama Nation to identify any potential concerns. Public involvement and agency coordination events are displayed below in Table 1-1.

Table 1-1. Public Involvement and Agency Coordination Events

Date	Coordination Event
May 2000	Project Agreement signed.
March 2001	Public newsletter distributed.
April 27, 2001	Notice of Intent filed in Federal Register.
May 9, 2001	Public meeting held (North Bend, Washington).
November 11, 2003	Public notice issued for November 19, 2003, Open House.
November 19, 2003	Public meeting held; informational open house (North Bend, Washington).
November 21, 2003	Agency and interested parties meeting held (Project Site).
December 16, 2003	Second agency and interested parties meeting held (Project Site).
February 19, 2004	Public notice mailed advertising March 4, 2004, Open House 2.
March 4, 2004	Public meeting held—informational open house 2 (North Bend, Washington).
May 15, 2004	Public notice mailed advertising June 2, 2004, informational open house.
June 2, 2004	Public meeting held—informational open house, North Bend, Washington.
November 2007	Project newsletter issued updating public on the status of the environmental process.
December 7, 2010	Public open house held to restart project and present preliminary preferred alternative to interested parties.
February 28, 2011	Notice to Rescind the Notice of Intent filed in Federal Register.
June 8, 2011	Public open house held to restart project and present preliminary preferred alternative conceptual design features to interested parties.

1.5 Jurisdiction

The portions of Middle Fork Road within the project area are under the jurisdiction of King County and the USFS. From the start of the project to Camp Brown (MP 11.9), Middle Fork Road is a county road owned by King County. From Camp Brown to the end of the project, the route is a National Forest System (NFS) road maintained by the USFS. By agreement, USFS also sets the maintenance level and maintains the road from MP 8.78 to MP 11.9 (Camp Brown).

1.6 Funding

Funding for the project would come from the Public Lands Highway Program, which is financed by the Federal Highway Trust Fund. The Public Lands Highway Program provides monies for improvements to Forest Highways that are selected public roads wholly or partly within, or adjacent to, and serving the NFS. These roads are necessary for the protection, administration, and use of the NFS and the use and development of its resources. FHWA, USFS, and the Washington State Department of Transportation administer the Public Lands Highway Program jointly in Washington as a group, collectively referred to as the Tri-Agency.

As an administrator of the Forest Highway Program, FHWA is responsible for developing the proposed project and is the lead agency for compliance with requirements of the National Environmental Policy Act. USFS and King County are cooperating agencies. King County is responsible for coordinating and financing all necessary right-of-way (ROW) acquisitions.

2 Purpose and Need

2.1 Introduction

The Middle Fork Road is the only public motorized access to the Middle Fork Snoqualmie River valley (valley). The valley is a popular recreation area located within an approximately 1-hour drive for over 3 million people within the greater Seattle metropolitan area. The valley provides a wide range of recreational opportunities, and Middle Fork Road provides access to wilderness and non-wilderness trails and trailheads for parking, river access points, and dispersed sites for day use and overnight camping.

The USFS, DNR, King County, and a consortium of other interested parties have developed concept plans and projects, including the *Middle Fork Snoqualmie River Watershed Access and Travel Management Plan* (Middle Fork ATM Plan) (USFS 2005a) and the *Middle Fork Snoqualmie River Park Natural Area Site Management Plan* (King County 1999) for public use of the area, including improvements on NFS lands, state lands, and county lands managed by the King County Department of Natural Resources and Parks. These plans point to the need for improved facilities within the valley to handle the expected increase in recreational use over the next 25 years. A key component of these plans is a transportation facility to provide access to the various recreational use areas within the valley, while maintaining the aesthetic values currently present along Middle Fork Road.

The recreational opportunities within the valley, as well as access to private residences located at its beginning, generate most of the traffic on Middle Fork Road. The road is important to recreational users because it provides access for many uses including the following:

- Sightseeing
- Hiking
- Mountain biking
- Pack-and saddle-horse use
- Rafting
- Kayaking
- Floating
- Mineral collection
- Swimming
- Fishing
- Camping
- Climbing
- Hot-spring use
- Picnicking
- Hunting

Traffic on the roadway would likely increase as the population of the region continued to grow and due to the recent development of a new campground at the eastern end of the project area (DJ&A 2004). Because of the high recreational use and lack of facilities, uncontrolled recreational access and use occur at numerous locations in the project area, damaging the natural environment, including riparian and other sensitive areas. The lack of designated travel lanes encourages parking along and within the roadway near recreational areas, often constricting the roadway to a single lane.

Numerous problems along the road pose challenges for the traveling public and the maintaining agencies. The existing road contains narrow roadway segments; poor drainage occurs in areas;

and erosion, landslides, and rockfall create maintenance problems and prevent access at times. The road varies from a single-lane, 12-foot-wide roadway to a two-lane roadway more than 30 feet wide. Long, wide, straight sections of the road that encourage high vehicle speeds are followed by sharp curves and narrow segments, which is counter to drivers' expectations. The gravel surface requires frequent maintenance, and it often becomes rutted and washboarded[1] after rain events due to poor road conditions. Two of the bridges in the project area have documented problems, and numerous culverts on the project act as barriers to fish passage. Section 2.2, Purpose and Need for the Project, below, lays out the proposed action, its inherent costs, and the environmental impacts.

2.2 Purpose and Need for the Project

The overall purpose of the proposed project is to improve access to recreational opportunities along the Middle Fork Road by addressing two main needs: a need to improve operational safety on the route and a need to reduce maintenance costs and efforts. To meet these needs, several conditions of the Middle Fork require relief. These conditions include the following:

- Varying, inconsistent roadway widths
- Driving surface containing potholes, washboarding, loose gravel, and excessive dust
- Excessive maintenance needs and cost
- Inadequate drainage
- Inadequate road warning signs and lack of designated travel lanes

These conditions are summarized below and are discussed throughout this EA.

2.2.1 Varying, Inconsistent, and Narrow Roadway Widths

The existing roadway varies considerably from a narrow, 12-foot-wide single lane to a two-lane, 30-foot-wide gravel road. The wide sections tend to be long and straight, encouraging increased speeds, followed by narrow sections on tight curves, which are counter to drivers' expectations and create a safety concern. The narrow, single-lane sections can lead to passing conflicts and are not well signed.

2.2.2 Substandard Driving Surface Containing Potholes, Washboarding, and Loose Gravel

The existing roadway surface does not hold up to current traffic volume loads in some areas due to poor drainage and subgrade conditions. The roadway is prone to potholes, washboarding, and loose gravel. These deficiencies can have the following effects:

- Cause drivers to reduce speeds below the posted limit.
- Create hazards as drivers occupy the wrong side of the road when weaving around potholes.
- Present impediments to vehicles that lack the capability to travel on very rough roads.
- Discourage drivers concerned about excessive wear on their vehicles from using the roadway.
- Cause vehicles to lose traction and limit vehicle control.

2.2.3 Excessive Maintenance Needs and Costs

The combination of the high amount of precipitation in the area, the poor subgrade of the existing road, and frequent flood damage contributes to a high need for maintenance along the route. These problems lead to funding and logistical limitations for maintenance that is already underbudgeted for this road.

King County maintains the road up to Camp Brown at MP 11.9; USFS maintains the remainder of the roadway. Given current funding limitations, these agencies have not been able to maintain the gravel roadway to safe standards at all times. Undersized and ill-placed culverts, as well as frequent high precipitation events, result in road damage that increases the need for intensive maintenance and repair work at some locations.

USFS, King County, and the public have cited road-maintenance problems. Public comments included mention of the poor condition of the roadway and the lack of road maintenance. USFS and King County have indicated that existing annual maintenance costs average approximately $8,000 per mile and can be as high as $500,000 in a year when significant storm damage occurs. The road deteriorates quickly after grading and repairs. The road surface is re-graded up to twice a year, and other maintenance, such as culvert cleaning and repairing drainage problems, is performed intermittently. Damage from storm events, resulting flooding, and landslides further increase the maintenance needs and costs along this route. Outstanding and ongoing maintenance needs associated with bridges along the route exacerbate the effort and funds needed to maintain the road.

2.2.4 Inadequate Drainage

Many culverts along the route are undersized under present standards, leading to excessive scour and erosion at several locations, overtopping of the roadway, and barriers to fish passage. Inadequate drainage contributes to maintenance problems, creates sediment inputs to waterways along the route, and results in unsafe road conditions.

Undersized culverts cause upstream flooding, deposition of sediment above the culverts, and overtopping and erosion of the road surface and road prism. Additionally, scour can occur downstream of the culvert from the resulting constriction of the water as flow velocities increase through the undersized culvert or because of an improperly placed outlet (Figure 2-1). Scour was noted at approximately one third of the culverts along the route.

Some culverts contain dirt and debris to the point that their capacity has been limited. (Figures 2-2 and 2-3). Some culverts at stream crossings in the project area are considered barriers to fish migration (Figure 2-4; see Section 4.2.13, Fisheries). Beavers have also plugged several culverts at times, resulting in the stream overtopping the roadway.

Figure 2-1. Erosion from culvert outfall

Figure 2-2. Partially plugged culvert

Figure 2-3. Water across road from plugged culvert

Figure 2-4. Fish barrier created by undersized culvert

2.2.5 Inadequate Road Safety Signage and Lack of Designated Travel Lanes

The existing roadway has a number of narrow sharp curves. The sharp curves provide little room for opposing traffic to pass. There are also several long straight sections of roadway followed by curves, which present safety challenges along the road. Vehicle speeds tend to increase in the long straight sections, and the existing narrow curves are not well signed. The lack of designated travel lanes within narrow, single-lane sections of the roadway causes vehicle conflicts, and the curves are not signed.

2.3 Traffic Volumes

2.3.1 Existing Traffic Volumes

Traffic counts took place in 2001, 2003, and 2004. Results of the 2003-2004 traffic counts were used to calculate average daily traffic (ADT) in 2004. The ADT was then adjusted for the increase in traffic anticipated with the newly completed Middle Fork Campground at the eastern

end of the project area. Traffic counts indicated that existing Middle Fork Road use varies. Traffic counts show that approximately 60 percent of the use is local traffic associated with private residences along the lower leg of the couplet to before the project area. The weekly adjusted ADT in 2004 varied from 258 near the beginning of the project to 109 near the end of the project past the Middle Fork Trailhead at MP 12.0 (Table 2-1). Traffic counts were extrapolated to 2011 based on U.S. Census data results that showed King County population grew by approximately 11 percent from 2000 to 2010 (U.S. Census Bureau 2011). This averages to an annual growth rate of 1.1 percent.

Table 2-1. Current and Future Traffic Volume Data for Middle Fork Road

Year	MP 2.7 ADT	MP 12 ADT
2004	258	109
2011(estimated)	279	121
2031(estimated)	347	163

2.3.2 Future Traffic Conditions

Future traffic will likely increase within the project area due to anticipated growth in the surrounding communities, as well as to increased use of the road resulting from road improvements (DJ&A 2004). The future ADT will likely increase within the project area, along with growth in King County over the next 20 years, highlighting the need for an adequate transportation infrastructure to serve the traveling public. To calculate future ADT under the no action alternative, an annual traffic increase of 1.1 percent was selected to account for the County's annual growth rate based on the recent U.S. Census data. This would result in a rise from the current 2011 estimate of 279 vehicles to approximately 347 vehicles in 2031 at MP 2.7 near the beginning of the project (Table 2-1).

The future ADT for an improved road surface was calculated by using an annual traffic increase of 1.5 percent to account for the county's annual growth rate, as well as the potential for increased visitation resulting from the attraction of an improved Middle Fork Road. The Middle Fork Road ADT near the beginning of the project area would likely rise from the 2011 estimate of 279 vehicles to approximately 371 vehicles in 2031 at MP 2.7 if the road surface is improved.

2.4 Accident Data

King County collects accident data along Middle Fork Road. Records from 1993 to 2007 indicate there were 13 accidents in the project area. Of the 13 accidents, 1 resulted in a fatality, 5 resulted in injury, and the remaining 7 resulted in property damage. The accident data indicated causes of the accidents included leaving the roadway and striking fixed objects, sideswiping passing vehicles, striking parked or stopped vehicles, and overturning vehicles. Most of the accidents involved exceeding a reasonably safe speed for the roadway. Weather conditions did not seem to play an important role in the cause of the accidents, and accident data indicated no single area of concern within the project area.

2.5 Additional Considerations

Partner agencies, other federal and state agencies, and the public identified additional needs that the proposed project should attempt to meet. These considerations, presented in Table 2-2, are based on concerns expressed by the Tri-Agency, partner agencies, other federal and state agencies, and the public. The additional considerations were used in developing a preferred alternative, but meeting the purpose and need was the overriding determining factor in alternative selection.

Table 2-2. Additional Considerations of the Middle Fork Snoqualmie River Road Improvement Project

1.	Complete improvements in a cost-effective manner.
2.	Minimize impacts on natural habitat, aesthetics.
3.	Improve fish passage when feasible.
4.	Include feasible measures to discourage excessive speeds.

The existing condition of the Middle Fork Road is causing several adverse environmental effects, including sediment input from the road into local streams, rivers, and wetlands resulting from uncontrolled runoff from the gravel road surface. These conditions contribute to increased maintenance needs and costs and are discussed further above in Section 2.2.3, Excessive Maintenance Needs and Costs. Undersized culverts and culverts that create barriers to fish passage are also present; both affect stream and floodplain function and fish habitat availability (see Section 4.2.13, Fisheries, for a more complete discussion of fish resources).

The public frequently identified recreation concerns during scoping as recreation is the predominant use in the area. Lack of adequate parking facilities at popular recreation spots was a common theme. The addition of pullouts or parking areas is outside the scope of this project, though small parking areas (six to eight sites) may be added in limited locations where topography would accommodate placement. However, existing pullouts would be retained where feasible and may be improved where practicable. Some concerns were expressed about overuse of the facilities in the valley if the road were improved. This issue is outside the scope of this project, and the land management agencies will continue to be responsible for managing recreation and uses impacting the area. Other users expressed concern about the potential for speeding if the road were improved. This issue is addressed in Section 3.1.3, Design Speed.

3 Alternatives

This chapter discusses the no action alternative and the preferred alternative. The chapter also contains a discussion of other alternatives considered during the scoping phase of the project.

3.1 Alternatives Development

FHWA developed alternatives to address and respond to the project's purpose and need. The agency follows standard guidelines when designing any road, most notably the American Association of State Highway and Transportation Officials (AASHTO) roadway design guidelines. FHWA based specific design criteria on traffic volume and the unique characteristics and surroundings (such as the scenic quality of the Middle Fork Snoqualmie River and the recreational opportunities present along the roadway) of Middle Fork Road. The following sections explain the selection of certain design criteria or characteristics for the preferred alternative.

3.1.1 Functional Classification

The Middle Fork Road is a rural minor collector or rural local road in mountainous terrain with a USFS designation of maintenance level 4 and a King County Tier 4 maintenance service level. Maintenance level 4 is applied to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads in this category are double-lane, paved roadways. However, some roads may be single-lane or may be unpaved and dust-abated roadways. Tier 4 maintenance service levels are generally for local, residential, dead-end roads, and these roads account for 5 percent of the King County Road System's total daily trips. Tier 4 maintenance service level roads receive virtually no storm and snow response; maintenance is limited to activities that preserve access.

3.1.2 Average Daily Traffic

The adjusted ADT for Middle Fork Road in 2031 is forecast to be approximately 347 vehicles at MP 2.7 if no improvements occur to the road and 371 if the road is paved, compared to the current 2011 estimated ADT of 279 at this location. This traffic volume was used to help determine appropriate road designs according to AASHTO guidelines (AASHTO 2004).

3.1.3 Design Speed

King County defines the legal speed limit on Middle Fork Road, outside of the residential area, as 35 miles per hour (mph). Average speeds measured along the route were approximately 26 mph eastbound and 29 mph westbound. A design speed of 35 mph was selected for this roadway based on the existing speed limits in place, the existing use of the facility, and the overall projected future primary use of the roadway by recreational users. Areas of lower speed limit may be posted, and additional traffic calming measures may be placed in areas where additional concerns, such as limited sight distance or congestion, would warrant a lower speed.

3.1.4 Design Vehicle

Most vehicles currently using this roadway are cars and light trucks, although a few motor homes, large trucks, and commercial trucks also use Middle Fork Road. USFS and DNR may occasionally use a truck for carrying maintenance equipment. Given that the primary use of this roadway is for recreation, minimum design criteria were based on a typical recreational vehicle, in this case, a motor home. The design criteria for a motor home are similar to those of the single unit vehicle (AASHTO 2004), which requires a similar turning radius. Therefore, a single unit vehicle was selected as the design vehicle for this project.

3.1.5 Project Limits

The project begins at approximately MP 2.7 and continues on to the Middle Fork Campground at approximately MP 12.4. The project partners considered including the couplet area (before MP 2.7), but, after initial investigations revealed that improvements to this area would be cost-prohibitive, the project start was returned to the original location of MP 2.7, past the east intersection of the couplet. The project originally terminated at the Middle Fork Trailhead at MP 12; following construction of the Middle Fork Campground, however, FHWA moved the project end to the campground entrance (MP 12.4) to facilitate traffic to this destination.

3.2 Alternatives Advanced

Most of the alignments that realistically could be constructed mirrored the existing alignment of Middle Fork Road. Several areas identified along the road had alignments that could vary slightly from the existing alignment, most notably at some of the sharper curves.

Initially, FHWA evaluated potential action alternatives during the scoping phase of the project for their ability to meet the purpose and need. During the design process, and with the exception of the no action alternative, FHWA did not consider alternatives that rated “poor” for any of the criteria because they would not meet the purpose and need. The public received this information for review and comment during scoping. The partner agencies developed the preferred alternative initially carried forward based on public comments received during ongoing scoping efforts. The concern was to minimize environmental impacts and to maintain the existing character of the route, as well as meeting limited project funding for the project. The preferred alternative would reconstruct the road to a 20-foot width along the existing alignment, with slight alignment adjustments at sharp, narrow curves.

3.2.1 No Action Alternative

Under the no action alternative, no construction activities would occur, and no forest highway funds would be spent for improvements to Middle Fork Road. The no action alternative would not address the deficiencies identified in the project purpose and need statement. Roadway maintenance needs would continue to be high, and King County and USFS would continue funding and performing maintenance activities at current levels. Users of the roadway would continue to experience the rough roadway. No construction costs are associated with this alternative.

3.2.2 Preferred Alternative

The preferred alternative generally follows the existing road alignment, while creating a uniform width of the roadway. The AASHTO *Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400), 2001 Edition* (VLVLR), would be used to design the entire portion of the Middle Fork Road reconstruction. These standards often refer to AASHTO's *A Policy on Geometric Design of Highway and Streets, 2004 Edition* (AASHTO 2004). The design standards used in AASHTO (2004) are in the section entitled, *Local Roads and Streets (Rural Roads)*, pages 379 to 388.

The minimum width of traveled way and shoulders according to VLVLR standards is 18.0 feet for new construction of a 35-mph road. Total roadway width includes the width of both the traveled way and the shoulders. The existing roadway width varies along its length. It was measured between approximately 12 and 30 feet, typically. The proposed design of Middle Fork Road would be a 20-foot paved roadway width with sections of 18-foot width used in constrained locations. Both of these roadway widths are acceptable according to VLVLR. FHWA might make minor horizontal and vertical alignment adjustments as needed to help promote a design that would improve safety and blend with the context of the valley.

Rather than excessively alter the existing alignment, traffic control devices would be placed at some of the tighter curves to improve safety and warn motorists of roadway conditions. The overall roadway area would be approximately 1.6 acres less than the existing roadway. Figures 3-1 to 3-4 illustrate typical sections of the preferred alternative within fill, cut, and rock cut areas. Table 3-1 shows the major features of the two alternatives under consideration. Annual maintenance needs would be lowered as the paved surface would better hold up to traffic levels and weather conditions.

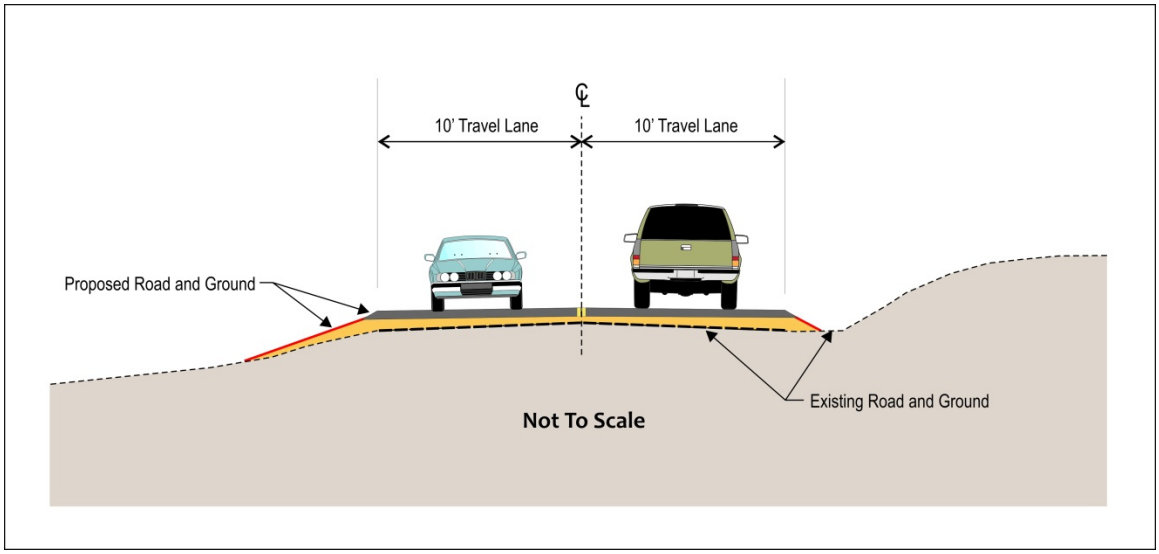

Figure 3-1. Section in fill condition

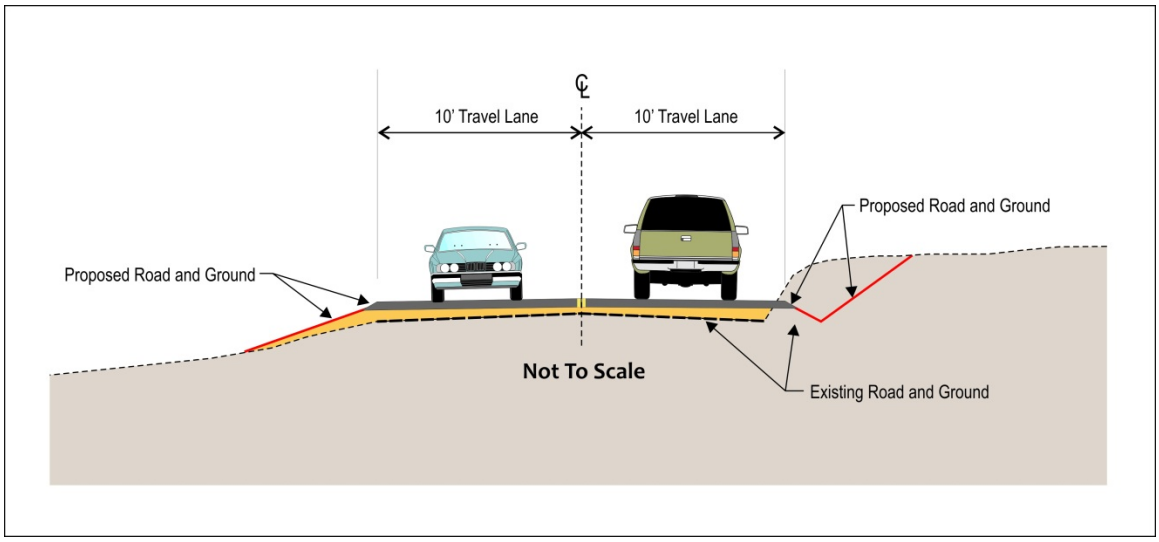

Figure 3-2. Section in soil cut condition

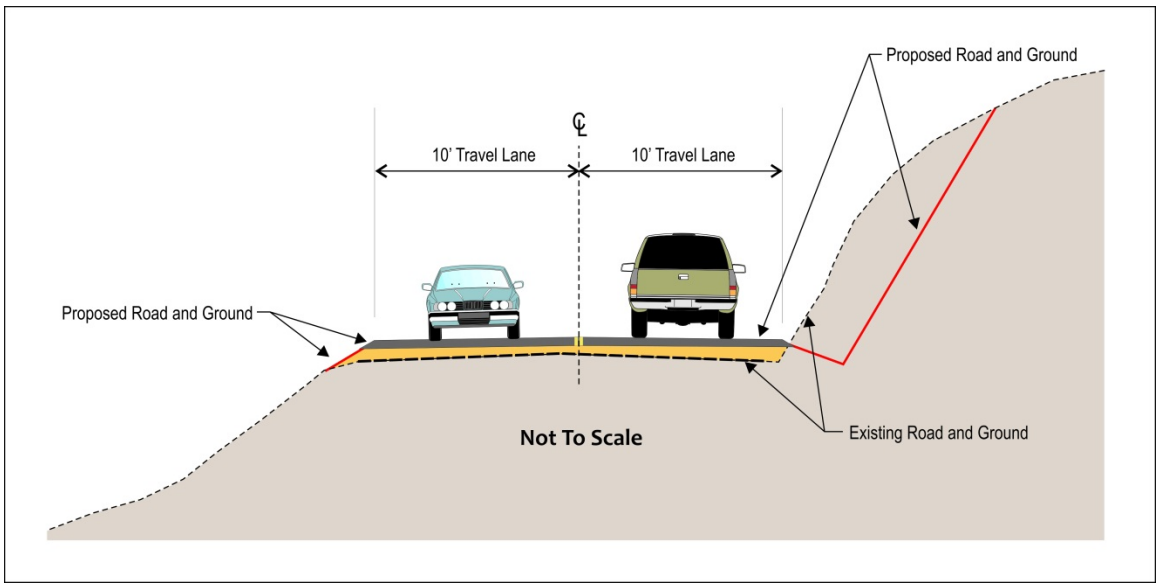

Figure 3-3. Section in rock cut condition

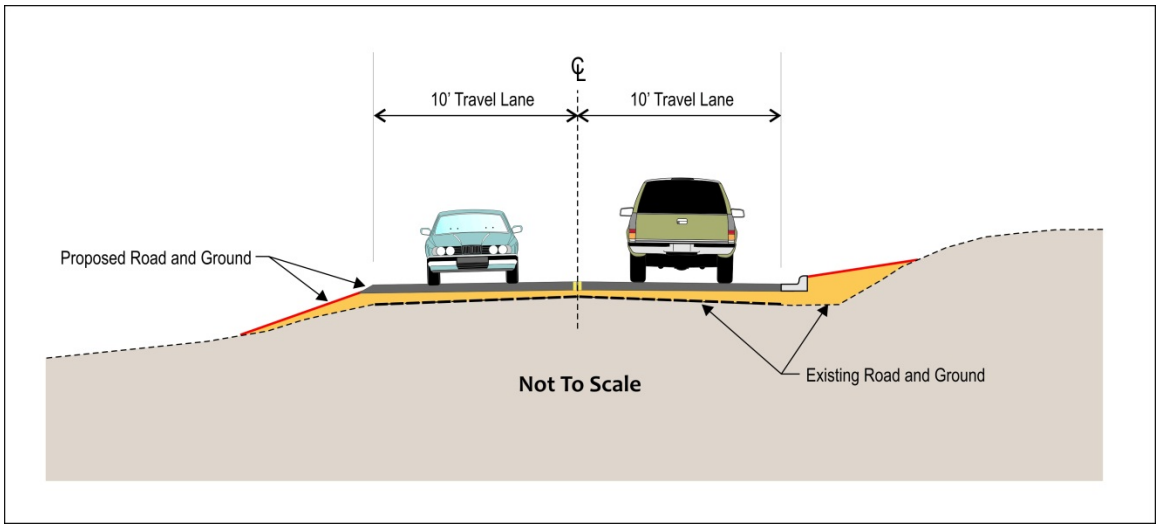

Figure 3-4. Section with curb and gutter

Table 3-1. Design Elements by Alternative

Design Element	No Action Alternative	Preferred Alternative
Total roadway width	12-30 feet	20 feet
Shoulder width	None	None
Total roadway area	25.6 acres	24.01 acres
Additional roadway area	N/A	-1.59 acres
Substandard curves throughout	N/A	Improve radius and add signage.
Bridge at 326+00	N/A	Surfacing
Bridge at 344+00	N/A	Replace with 19-foot-wide culvert.
Curve at 368+00	N/A	Sign; increase radius
Curve at 393+00	N/A	Realign vertical.
Curves at 435+00 to 445+00	N/A	Add signage; increase roadway width.
Bridge at 471+50	N/A	Reconstruction
Curves at 553+00 to 561+00	N/A	Realign vertical; add signage.
Curve and bridge at 588+50	N/A	Increase radius; reconstruct bridge.

Under the preferred alternative, specific features and construction methods would be used along certain sections of the roadway needing additional safety measures, or in areas where it would be difficult to accommodate the proposed typical geometry of the road. Sections where specific construction methods would be used for Middle Fork Road are identified below. The amount and

extent of these areas and methods would be based on the results of continuing engineering investigations. Selected sections and methods of potential interest are presented below.

3.2.2.1 Culvert Replacements

Under the preferred alternative, many of the existing culverts would be replaced or would be subject to maintenance to restore function. Existing culverts that could not survive a 100-year flood would be replaced with larger culverts that could pass such a flood event, including associated bedload and debris. Replacement culverts should accommodate the stream's bankfull width where fish passage is recommended, as well as both streamflow and bedload transport. Appropriate-size culverts would eliminate entrance erosion and outlet scour pools. Five culverts would be replaced with larger culverts at small stream locations to facilitate fish passage that is currently impeded.

3.2.2.2 Bridge Replacements

Four bridges currently exist within the project area. Under the preferred alternative, the large concrete bridge spanning the Middle Fork Snoqualmie River at MP 5.7 would remain in its current condition except for surface treatments and the addition of approach guardrail, which would help preserve the existing structure. The small 20-foot concrete bridge at MP 6.0 has deteriorated abutments and substandard railing. This bridge would be replaced with a 19-foot by 6-foot concrete box culvert. The timber log bridge at MP 8.4 is functionally obsolete and structurally deficient due to its decayed condition, and it would be replaced. The concrete bridge at MP 10.6 would be replaced as scour has undermined it at its abutments.

The new culvert and bridges would be sized to pass a 100-year flood event and associated bedload and debris. Stormwater runoff from the impervious surfaces at the three remaining bridges would flow to vegetated areas near bridge abutments for filtering before entering the streams.

Pile driving would be required at the bridge replacement locations at MPs 8.4 and 10.6. A temporary detour bridge may be constructed immediately adjacent to the culvert and bridge replacements at MP 6.0 to facilitate traffic during construction. Temporary closures during construction of the culvert at MP 6.0 and the bridge at MP 10.6 would facilitate construction while avoiding effects on surrounding vegetation associated with a temporary detour bridge or culvert. Areas impacted by the installation and removal of these detours bridges would be rehabilitated and revegetated.

3.2.2.3 Retaining Wall Sections or Shoulder Stabilization Sections

Retaining walls may be used in areas where it is necessary to elevate or widen the road on down-sloping hillsides next to the Middle Fork Snoqualmie River where an embankment fillslope would not be possible. Wall locations may also require the addition of guardrail. The project area has several locations with existing retaining walls because of high fills, particularly in the narrow sections at the westernmost end of the project. These walls would have to be evaluated to determine if they would be maintained and, in some cases, be extended, modified, or replaced.

Other retaining walls may be used in areas where short walls would help reduce impacts on either the fill side or cut side of the road. Fill-side retaining walls help reduce encroachment of the road

prism into wetlands, riparian areas, and streams. Cut-side retaining walls may also be used to help reduce the height of a cut.

Shoulder stabilization could be accomplished using several methods such as rock, soil cement, or geotextile fabric reinforcement of the fill sections. These treatments would enable steepening the fill slopes to reduce the roadway footprint and impacts on surrounding areas. Guardrails in shoulder stabilization sections would be evaluated and used based on stabilization design.

3.2.2.4 Rock Cuts

Blasting of existing rock slopes would potentially be required at up to five locations under the preferred alternative to accommodate the roadway width within existing narrow roadway sections and to create rockfall catchment ditches. Proposed blasting sites are at the following approximate MPs: 3.78 to 3.89, 4.63 to 4.65, 4.75 to 4.94, 6.91 to 7.1, and 9.96 to 10.02. Rock cuts would generally be 30 feet or less in height, with the exception of the cut at MPs 4.74 to 4.94, which would vary considerably from 30 feet up to 80 feet in height. Rock catchment ditches would be 6 to 8 feet wide (as measured from edge of pavement to the bottom of the rock slope), with the exception of the higher rock cut (MP 4.74 to 4.94), where rockfall catchment ditches would vary from 8 to 15 feet due to height. Rock cuts would be performed to mimic natural rock faces to the extent practicable. Rockfall catchment ditches would be revegetated with native species.

3.2.2.5 Erosion and Sediment Control and Drainage

Construction zones would have erosion and sediment control measures in place before ground-disturbing activities commence to lower surface and gully erosion potential and to prevent sedimentation of waterways. Disturbed areas would be revegetated with native seed and plants as work is completed.

To drain water away from the roadway and reduce erosion potential, ditch-relief culverts would be installed to drain water concentrated in roadway ditches. Rock-lined ditches would be placed as needed in areas where slopes are steep, and ditches are susceptible to erosion. Additional rock protection would be added as needed in areas where ditch-relief culverts discharge onto steep, erosion-prone slopes.

In-water work would be restricted to expected low-flow periods to minimize potential erosion and sedimentation within streams. Where the roadway is either adjacent to or would require adding fill to riparian and wetland areas, fill slopes would be steepened as feasible with reinforced slopes, rock embankments, and guardrail sections to help reduce the amount of fill and exposed embankment required. Newly constructed slopes would be temporarily reseeded, where practicable, because of the high precipitation in the project area. Slopes would again be seeded with a native seed mix immediately following construction completion. Roadway design would incorporate buffer zones where practicable so that water from the roadway and ditches would filter through vegetation before entering the streams (see Section 4.2.9, Water Resources, for a discussion of best management practices [BMPs]).

3.2.2.6 Pullouts/Parking Areas

Existing pullout areas would be preserved when current parking does not extend into the roadway and present a safety risk. Improvements to existing pullout and parking areas, such as paving and widening, may occur as part of the project if funding is available, though these areas would not appreciably increase the amount of impervious surface and would not extend outside the construction limits examined as part of this EA.

Coordination among FHWA, USFS, King County, and DNR has occurred to assist in identifying key areas of existing pullouts and parking, such as those that exist near the Mailbox Peak and Mine Creek Trailheads. As currently designed, identified key areas of existing pullouts and parking would be maintained should the preferred alternative be implemented.

Off-road vehicular access that threatens sensitive areas along the roadway, such as wetland and riparian areas, would be restricted as needed to protect sensitive resource areas. On NFS lands, USFS has closed many of these off-road vehicle access sites by using large boulders to preclude vehicular access and to help protect the riparian area adjacent to the river. Additional measures would be installed within the project corridor to minimize unauthorized vehicle access and to aid in restoring disturbed riparian vegetation at areas identified by FHWA, USFS, King County, and DNR.

3.2.2.7 Low Roadway Sections

Areas where the roadway could be overtopped by flood events would be redesigned to accommodate a 100-year flood event (including associated bedload and debris) without overtopping. This would effectively reduce potential roadway erosion and closure during flood events. Appropriate raising and armoring of the roadway where this risk exists may be included as feasible in an attempt to prevent a roadway embankment failure during high flows. Sufficient culverts and crossdrains would be included to maintain hydrology through these areas. At MP 10.2, an alluvial debris fan has damaged and closed the road in the past. Concrete low water crossings would be installed at this site to accommodate expected future debris flows resulting from future storm events, minimizing damage to, and facilitating removal of, material from the roadway.

3.2.2.8 Hauling

Construction of the preferred alternative would take approximately 2.5 years. Construction activities would take place between approximately February and December subject to weather and timing restrictions to protect wildlife. Construction would likely begin at the east end of the project and move to the west end to minimize hauling material over newly constructed or rehabilitated areas.

Truck trips would occur irregularly throughout the project construction period. On some days, there would be little or no construction truck traffic traveling through the Edgewick area just outside the northeast end of North Bend. On other days, when certain construction activities such as surfacing and paving operations would occur, construction traffic would be more frequent since more materials would be required during such operations.

The primary haul route would be along 468th Street, accessed from I-90, Exit 34, to the intersection of Middle Fork Road. This would result in minimal disruption to the city of North Bend. The Middle Fork Road passes through a small residential couplet section before it reaches the beginning of the project. Trucks would be restricted to the upper portion of the couplet to avoid impacts on residences and local traffic. In addition to the route itself, hauling would be limited to times when the least disturbance would occur for residences. Any damage to the upper couplet caused by hauling operations would be repaired as needed.

3.2.2.9 Material Source Locations and Staging Areas

It would be the contractor's responsibility to obtain and permit the necessary source for the base, surfacing, and pavement gravels; any additional select borrow material needed for the project; and any disposal sites for excess or unsuitable materials (soil). Materials imported onto the project site would have to be certified as weed-free. Potential sites within the project corridor, such as pullout areas and existing trailheads, may be used as staging areas for equipment staging and material stockpiles. Use of these sites may reduce parking capacity at areas where public access would be allowed during construction, potentially affecting visitors' use of these sites.

3.2.2.10 Traffic Delays and Road Closures

Road reconstruction activities under the preferred alternative would require road closures for efficient roadway reconstruction. Closures would vary throughout construction depending on the work location and the type of activities. Timed closures may occur daily, weekly, seasonally, and by location to minimize impacts on the public. For example, closures may be time-limited to weekday business hours to maintain access to some recreation sites in the evenings, may occur for a work week (Monday to Friday) to accommodate construction activities and allow for public recreation on the weekends, or full closures may occur in the fall when there are fewer visitors. Closures may also occur by location, such as at the concrete bridge, to accommodate more intensive and lengthy construction activities that would impede safe travel along the route, or when allowing access would delay completing work, such as with blasting and bridge replacement activities.

The current plan would be to open the road for public access on weekends (2:00 p.m. Friday through 10:00 a.m. Monday), though as noted above access may be restricted at times to just a portion of the project area when the entire road cannot safely be opened to public traffic. The longest anticipated closure area would be the bridge replacement at MP 10.6, which may require up to an 8-week closure before vehicle access through the area could be restored.

Local agency, landowner, and in-holder needs would be accommodated when possible. A public information plan with information concerning potential closures and delays would be written and distributed to the public. It would detail posting delays and closure periods on a weekly basis to the project website.

3.3 Alternatives Considered But Eliminated from Detailed Study

Nine action alternatives were initially developed and evaluated against the project's purpose and need. These alternatives varied from 30-foot-wide roadways to an 18-foot width, as well as from alignments that significantly departed from the existing roadway to significant realignments to

remaining on the existing alignment. While several alternatives also met the purpose and need for the project to some degree, these alternatives were eliminated from detailed study within this EA as the 20-foot-wide roadway alternative was the sole alternative identified that best met the purpose and need for the project, was within funding limitations for the project, and met King County design standards for width, while also having the lowest environmental impacts and meeting additional considerations for the project. The eight dismissed alternatives are described briefly in the following sections.

3.3.1 Alternative 1

Alternative 1 was presented to the public during the original public involvement process in 2001. It was not well received. This alternative consisted of a 26-foot-wide, paved roadway with wide ditches and a new alignment through most of the curves. The public associated the width of the corridor and the straightened roadway with more of a through route, rather than a local access road. This alternative was eliminated from detailed study because it was not feasible due to the high project cost for ROW acquisition and construction of a new roadway alignment, high impacts on the environment at realignment sections, lack of public support, and failure to meet the overall objectives of the project.

3.3.2 Alternative 2

Alternative 2 would reconstruct the road to a 24-foot width and use the lower leg of the couplet, starting at approximately MP 1.4, as the primary access to the valley, rather than the upper leg of the couplet, which would be obliterated and restored. A one-way loop through the couplet was also considered. This alternative would have forced traffic onto the lower leg of the couplet residential area, which would have high ROW acquisition and associated costs. Alternative 2 was eliminated from detailed study due to impacts on the residential neighborhood (including directing all recreational traffic through the residential area) and extensive public opposition. Due to project funding limitations, the beginning of the project was subsequently located at MP 2.7, just past the couplet.

3.3.3 Alternative 3

Alternative 3 would keep the roadway an unpaved gravel surface with a uniform width of at least 22 feet. This alternative would not meet County Code, which requires that public streets maintained by King County include a hard surface (King County 2007, Section 4.01). Furthermore, an unpaved road would still require that King County provide a high level of continued maintenance. This alternative was unacceptable to the county from a long-term maintenance and budgeting standpoint. The sediment and dust issues related to the gravel road surface would not be improved by this alternative. An unpaved roadway would perpetuate the existing maintenance problems. Alternative 3 was, therefore, eliminated from detailed study as it did not meet the purpose and need with respect to maintenance.

3.3.4 Alternative 4

Alternative 4 would construct a 22-foot-wide paved road following the existing alignment. This alternative was not carried forward due to its similarities to the 20-foot-wide preferred alternative.

Most public comments demonstrated a preference for a roadway that would minimize environmental impacts, while maintaining the existing character of the route. Those objectives would best be fulfilled by the preferred alternative.

3.3.5 Alternative 5

Alternative 5 would provide a 24-foot-wide paved roadway with realignment at the curves and at two bridges, along long, straight sections. An 8-foot parallel parking lane would be provided at specified locations along the route where river access is most common. This alternative was not carried forward due to its similarities to the 20-foot-wide alternative, while adding additional environmental impacts and costs at realignment sections when compared to a 20-foot roadway. Most public comments demonstrated a preference for a roadway that would minimize environmental impacts, while maintaining the existing character of the route. Those objectives would best be fulfilled by the preferred alternative.

3.3.6 Alternative 6

This alternative would provide a 30-foot-wide paved roadway with new alignments at the curves. No changes would be made to the long straight sections. This alternative was not carried forward due to its increase in environmental impacts and costs that would exceed the funding limits available for the project.

3.3.7 Alternative 7

Alternative 7 would reroute the beginning segment of the roadway starting either at 141st Street or at 146th Street near Exit 34 on I-90. The reroute would extend east around the large knob at the couplet area and would reconnect to the existing Middle Fork Road just past the couplet area. This alternative was eliminated from detailed study because it was impractical and infeasible due to the high project cost for ROW acquisition and construction of a new roadway alignment, as well as the high level of environmental impacts resulting from constructing a new alignment.

3.3.8 Alternative 8

Alternative 8 would relocate the upper (eastern) segment of Middle Fork Road. This alternative would require construction of two new bridges over the Middle Fork Snoqualmie River and a new road on the east side of the river in the upper segment of the valley. The existing roadway would be obliterated in the areas of relocation. A new 24-foot-wide paved roadway section would be used. This alternative was eliminated from detailed study because it was impractical and infeasible due to the high project cost for ROW acquisition and construction of a new roadway alignment, as well as the high level of environmental impacts resulting from constructing a new alignment.

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4 Affected Environment and Environmental Consequences

4.1 Introduction

This chapter provides an analysis of potential effects on environmental resources that might result if the alternatives were implemented. Sections within this chapter describe the affected environment associated with a resource category, then the potential environmental consequences (direct and indirect effects) associated with the no action and the preferred alternative, the anticipated cumulative effects, and mitigation that would be included as part of the preferred alternative should it be selected. When effects can be described quantitatively, data are presented; however, most impact analyses are qualitative and use best professional judgment in making assessments.

Unless otherwise noted, the project corridor for which resources were surveyed and evaluated would generally extend 100 feet in both directions from the centerline of the road. Direct effects would be caused by the project and would occur at the same time and place as the project. Direct effects usually result from physical disturbance associated with construction of the project, including such things as disturbance or removal of habitat, noise, dust, and other types of project-related disturbance. Based on preliminary layout, direct effects of the preferred alternative would generally occur within approximately 25 feet of the roadway, with exceptions in areas of varying topography.

Indirect effects would occur later or would be further removed from the project area and would be caused by the existence of the facility and its operation (i.e., traffic, traffic noise, visitor use, etc.). Cumulative effects would result from incremental impacts of a proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (federal or nonfederal) or person would undertake such actions. A complete description of the past, present, and reasonably foreseeable future actions is presented in Section 4.3, Cumulative Impact Analysis.

The following environmental resource categories are considered within this EA:

- Land Ownership and Land Use
- Social Environment
- Cultural Resources
- Section 4(f)/6(f) Resources
- Recreational Resources
- Noise
- Air Quality
- Visual Quality
- Water Resources
- Soils and Geology
- Vegetation
- Wildlife
- Fisheries

4.2 Affected Resources

4.2.1 Land Ownership and Land Use

The lands along Middle Fork Road from just after the couplet to the Middle Fork Campground include NFS lands, state lands, King County, and privately owned lands. The forested land is primarily public land managed by DNR, King County, or USFS (Figure 4-1), though several areas of privately held, undeveloped forest land occur near the beginning of the project area.

The major land use within the project area is dispersed recreation. Public land use primarily consists of recreational activities such as sightseeing, hiking, camping, mountain biking, kayaking, rafting, hunting, and fishing.

Implementation of the preferred alternative would require an easement transfer from USFS and DNR to the maintaining agency, King County. Where the project passes through private property and additional ROW would be needed, the maintaining agency would acquire the additional easements. ROW/easement transfer area requirements stated within this environmental assessment are based on construction limits for the preferred alternative. Final areas required for easement transfers would be dependent on agreements reached between King County and the USFS and DNR. Property acquisitions would be performed in accordance with applicable provisions of the Uniform Relocation and Real Property Act of 1970 (Public Law [PL] 91-646) and the Uniform Relocation Act Amendment of 1987 (PL 100-17). Areas under consideration for ROW acquisitions would consist of land only; no structures exist within these areas.

4.2.1.1 Private Land

Affected Environment

The Middle Fork Road passes through an area of single-family residences on larger, rural-size lots from MP 1.5 to approximately MP 2.7, up to the end of the couplet and immediately before the beginning of the project. Within the project corridor, privately owned lands (without private residences) are located between MPs 2.7 and 4.0, as well as between MPs 5.5 and 6.0, along the south side of the road.

Environmental Consequences

No Action Alternative

Privately owned land would not be affected under the no action alternative. Development pressures on private land and increased use of the road near the residential area just before the project would likely continue to increase as the regional population continues to increase.

Preferred Alternative

Impacts on privately owned land under the preferred alternative would consist of less than 0.1 acre outside the existing ROW from adjacent property to accommodate road widening at various points near the start of the project area. No displacement of homes or businesses would occur. Property owners would be compensated for easements, and access points would be rebuilt where necessary. No change to long-term land uses would be anticipated. Road improvement may slightly increase the number of users of Middle Fork Road due to better driving conditions. However, this increased use would focus on destinations within public lands and would, therefore, be unlikely to impact land use on privately owned properties within the project area. The number of increased vehicles would not appreciably increase compared to the number of users expected under the no action alternative (see Section 4.2.2.1, Traffic).

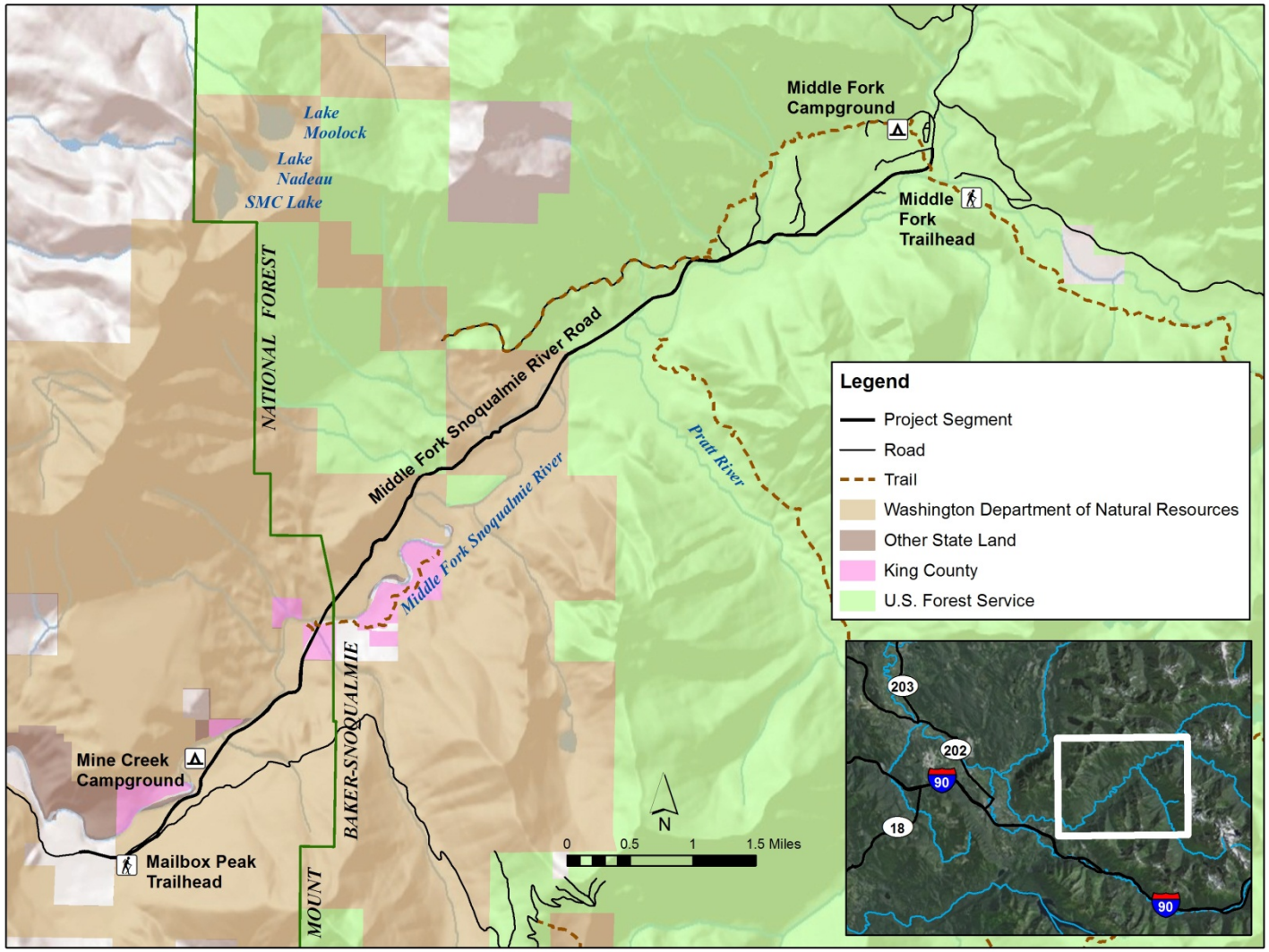

Figure 4-1. Land ownership within the project area

4.2.1.2 King County Land

Affected Environment

King County owns the portion of the project corridor from approximately MP 5.3 to just before the concrete bridge (MP 5.7). The county-owned parcel is located on both sides of Middle Fork Road within unincorporated King County. King County purchased the Granite Creek Flats site under the Waterways 2000 program. In 2004, the county constructed a boater-access path to provide access to the river. As a natural scenic area, this site is managed to protect natural systems, maintain and enhance wildlife habitats and corridors, preserve scenic areas, and, where public use does not compromise these resources, low-impact passive recreational, interpretive, and educational opportunities may be provided (King County 1999).

King County has designated its lands within the project area as Forest Zone lands (King County 2011). The Forest Zone is intended to preserve the forestland base, to conserve and protect the long-term productivity of forestlands, and to restrict uses unrelated to or incompatible with forestry. Lands with a Forest Zone designation are preserved and protected, in part, by providing for outdoor recreation uses that are compatible with forestry and by providing for conservation and protection of municipal watersheds and fish and wildlife habitats.

Environmental Consequences

No Action Alternative

No change to existing land use would occur for King County lands within the project area because of implementation of the no action alternative. Existing roadway impacts that do not contribute to meeting the goals of the Forest Zone designation, such as fugitive dust, erosion, and culverts that restrict fish passage, would continue. Existing maintenance needs would persist and would be exacerbated by the projected traffic increase in the area. The single King County parcel near the concrete bridge would likely see increased use that would mirror regional population trends and overall use of the project area.

Preferred Alternative

Under the preferred alternative, no impacts on properties under King County ownership within the project area would occur, as no easement transfer would be needed to accommodate road widening based on current construction limits. While short-term construction impacts on the surrounding area would occur under the preferred alternative, improvements associated with the roadway, such as drainage improvements and fish passage culverts, would better meet the goals of the Forest Zone designation. As with the no action alternative, the King County parcel near the concrete bridge would likely see increased use that would mirror regional population trends and overall use of the project area.

4.2.1.3 State Land

Affected Environment

The state of Washington owns much of the land between the east end of the couplet area (at the start of the project) and the MBS boundary. This includes lands crossed by Middle Fork Road

from approximately MPs 3.0 to 5.3, MPs 5.7 to 7.1, and MPs 7.3 to 8.7. These lands are located within the Middle Fork Snoqualmie Natural Resources Conservation Area (Conservation Area).

The Conservation Area has significant scenic value and provides opportunities for low-impact recreation. In addition to providing connectivity from the Mt. Si Natural Resources Conservation Area to MBS, the area has the following ecological values:

- It is an essentially unharvested, mid-elevation drainage with old growth forest, subalpine parklands, and mid-elevation lakes.
- It contains approximately 1,100 acres of mid-elevation (primarily silver fir-zone) forest more than 200 years old.
- It contains more than 1,100 acres of potential and suitable marbled murrelet habitat (per DNR's Habitat Conservation Plan [DNR 1997]).
- It contains Northern spotted owl nest patches and nesting, roosting, and foraging habitat (per DNR's Habitat Conservation Plan).
- It contains 2,200 acres of Priority Habitat for mountain goat (per WDFW 2012).d
- It contains potential habitat for a number of rare plant and amphibian species.

Lands within the Conservation Area are to be managed as follows:

- Maintain, enhance, or restore ecological systems, including but not limited to aquatic, coastal, riparian, montane, and geological systems, whether such systems are unique to or typical in the state of Washington.
- Maintain exceptional scenic landscapes.
- Maintain habitat for threatened, endangered, and sensitive species.
- Enhance sites for primitive recreational purposes.
- Provide opportunities for outdoor environmental education.

Environmental Consequences

No Action Alternative

No land-use impacts on state land would occur within the project area because of the no action alternative. Existing roadway impacts that do not contribute to meeting the goals of the Conservation Area, such as culverts that restrict fish passage, would continue. State lands would likely see increased use that would mirror regional population trends and overall use of the project area. Existing maintenance needs would persist and would worsen due to the projected traffic increase in the area.

Preferred Alternative

The preferred alternative would require 1.8 acres of easement transfer to accommodate road widening, based on current construction limits. The easement transfer along state lands would be minimal; it would occur in thin strips along the existing Middle Fork Road. In addition, the minor quantity of such easement is consistent with the Final Habitat Conservation Plan, Forest Practices

Act, and the Forest Resource Plan. While short-term construction impacts on adjacent potential habitat would occur under the preferred alternative, measures associated with the roadway, such as drainage improvements, fish passage culverts, and an improved roadway enabling better access to recreational opportunities, would better meet the management goals of the Conservation Area.

4.2.1.4 Federal Land

Affected Environment

Lands between approximately MPs 7.1 and 7.3 and from approximately MP 8.7 to the end of the project are NFS lands managed by USFS. The 1990 MBS Land and Resource Management Plan (LRMP) (USFS 1990), as amended, provides management direction for NFS lands within the project area. Major Forest Plan amendments include the following:

- *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl* (USFS and BLM 1994), commonly known as the Northwest Forest Plan
- *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines* (USFS and BLM 2001)
- *Record of Decision for the Pacific Northwest Region Invasive Plant Program: Preventing and Managing Invasive Plants* (USFS 2005b)

The 1994 Record of Decision includes seven land allocations that amend the allocations described in the 1990 MBS LRMP. Considerable overlap occurs among some allocations, and more than one set of standards and guidelines may apply to any individual piece of ground. For additional details, refer to either the 1990 MBS LRMP or the 1994 Record of Decision.

Land allocations for the portions of the project area on the NFS lands include Riparian Reserves, Late-Successional Reserves/Late-Successional Old Growth, Matrix, and Tier 2 Key Watersheds. These allocations are outlined in the following subsections.

Riparian Reserves

This allocation includes areas along all streams, wetlands, ponds, lakes, and unstable or potentially unstable areas. Riparian Reserves generally parallel the stream network, but they also include other areas necessary for maintaining hydraulic, geomorphic, and ecological processes on NFS lands. Riparian Reserves overlap all other MBS LRMP land allocations, and the Riparian Reserve standards and guidelines apply wherever Riparian Reserves occur. Approximately 83 acres within the project corridor on NFS lands have been designated within this land allocation. Standards and guidelines applicable to this project include the following:

- Must meet Aquatic Conservation Strategy objectives (USFS and BLM 1994, p. C-32, Standards and Guidelines RF-1, RF-2, and RF-3).
- New culverts, bridges and other stream crossings on NFS land shall be constructed, and existing culverts, bridges and other stream crossing 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. Priority for upgrading will be based on the

potential impact and the ecological value of the riparian resources affected. 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 (USFS and BLM 1994, p. C-33, Standards and Guidelines RF-4).

- Provide and maintain fish passage at all road crossings of existing and potential fish-bearing streams (USFS and BLM 1994, p. C-33, Standards and Guidelines RF-6).

Late-Successional Reserves/Late-Successional Old Growth

The objective of Late-Successional Reserves is to protect and enhance conditions of late-successional and old growth forest ecosystems, which serve as habitat for late-successional and old growth species. As a general guideline, non-silvicultural activities located inside Late-Successional Reserves that are neutral or beneficial to the creation and maintenance of late-successional habitat are allowed (USFS and BLM 1994, p. C-16). Approximately 3.5 acres, less than 4 percent of the NFS lands within the project corridor, are allocated to Late-Successional Reserve/Late-Successional Old Growth.

Matrix

Matrix lands consist of those federal lands outside the other categories of designated areas specified in the Forest Plan (i.e., Congressionally Reserved Areas, Late-Successional Reserves, Adaptive Management Areas, Managed Late-Successional Areas, Administratively Withdrawn Areas, and Riparian Reserves). National Forest Matrix Allocations within the project area are MA 2A – Scenic Viewshed, Foreground; MA 5A – Recommended Wild and Scenic Rivers, Recreation River; and MA 27 – Alpine Lakes Management Area, Scenic Forest.

MA 2A – Scenic Viewshed, Foreground. Approximately 4.5 acres, less than 5 percent of the project corridor NFS lands, are allocated to MA 2A. Management direction for these lands is to meet Visual Quality Objectives (VQOs) of Retention, as viewed from Middle Fork Road, to blend the reconstruction of Middle Fork Road with natural form, line, color, and texture; to revegetate road cut and fill slopes within 1 year of construction activities; and to locate rockpits and stockpile sites outside of seen areas whenever possible and rehabilitate them when located within seen areas (USFS 1990, pp. 4169 through 4-172).

MA 5A – Recommended Wild and Scenic River, Recreation River. All NFS lands in the project area are located within MA 5A. The goal of MA 5A is to protect from degradation the outstandingly remarkable values (ORVs) and wild, scenic, and recreation characteristics of recommended rivers and their environment, pending a decision on inclusion into the National Wild and Scenic River System. The Middle Fork Snoqualmie Wild and Scenic River System is managed to protect and enhance the free-flowing condition, water quality, and ORVs (fisheries, wildlife, and scenic quality) for which the river may be designated, while providing for public recreation and resource uses that do not adversely impact or degrade those values. The VQO for National Forest portions of the project within ¼ mile of the Middle Fork Snoqualmie River is partial retention. Modification is acceptable for necessary structural facilities. For those portions of the project located on NFS lands that are greater than ¼ mile from the Middle Fork Snoqualmie River, the VQO is partial retention (USFS 1990, pp. 4-189 and 4-190).

Alpine Lakes Management Area – MA 27 Scenic Forest. Approximately 98 percent of the NFS lands in the project area are allocated to MA 27 Scenic Forest. The goal of MA 27 is to retain or enhance viewing and recreation experiences. Developments and use in the visible area from recreation sites, roads, and trails will meet VQOs and use will be integrated with the natural landscape. The VQO for MA 27 – Scenic Forest is the same as MA 2A (USFS 1990, p. 4-278).

Tier 2 Key Watersheds

All NFS lands within the Middle Fork Snoqualmie River watershed, including those within the project area, are allocated to Tier 2 key watersheds. The Middle Fork Snoqualmie River watershed was selected as a Tier 2 key watershed to be a source of high-quality water (USFS and BLM 1994, pp. B-18-19 and C-7). MBS LRMP management direction is to reduce existing system and non-system road mileage and to ensure no net increase in roads in key watersheds.

Environmental Consequences

No Action Alternative

The no action alternative, if implemented, would maintain current conditions and access on NFS land within the project area. No direct effects on any of the land allocations within the project area would be anticipated by implementation of the no action alternative. Culverts unable to accommodate 100-year floods or to provide fish passage would remain. Existing maintenance needs would persist and would worsen due to the projected traffic increase in the area.

Preferred Alternative

Approximately 20 acres of designated Riparian Reserve, or 86 percent of the total NFS lands within the proposed construction limits (approximately 23 acres, more than 9 acres of which are existing roadway), would be impacted during construction, though the construction would be in compliance with all Riparian Reserve Standards and Guidelines. Approximately 0.3 acre of Late-Successional Reserve/Late-Successional Old Growth, or 1.3 percent of the total area within the proposed construction limits on NFS lands (approximately 20 acres), would be impacted during construction. The preferred alternative would likely be neutral in terms of creation and maintenance of Late-Successional Reserve/Late-Successional Old Growth. Approximately 1 acre, or 4.2 percent, of the total area within the proposed construction limits on NFS lands, of Scenic Viewshed (MA 2A) allocations would be impacted. The project would not change the amount of road within the Tier 2 Key Watershed. The preferred alternative would require 1.8 acres of easement transfer on NFS lands in addition to the current roadway to accommodate road widening based on current construction limits. The acquisition along NFS lands would be minimal and would occur in thin strips along the existing Middle Fork Road.

The preferred alternative would be compatible with and a permitted use under all land use designations described above. With respect to guidelines and values of specific land uses, the preferred alternative would improve fish passage and drainage in accordance with Aquatic Conservation Strategy objectives and would maintain the quality of the proposed ORVs of the Middle Fork Snoqualmie River. Scenic viewshed and scenic quality would be affected in the short term during construction and for approximately 3 years after construction until vegetation becomes reestablished. While short-term construction impacts on access would occur under the

preferred alternative, an improved roadway would enable easier access to recreational opportunities on NFS lands, the major land use of the area.

Cumulative Effects

The preferred alternative would result in improved public safety; reduced road maintenance costs; better cooperation with King County to achieve consistency in road design, operation, and maintenance necessary to achieve Aquatic Conservation Strategy objectives; enlarging undersized culverts; and restoration of currently blocked fish passage on NFS land. When added to other past, present, or foreseeable projects with like effects (Middle Fork ATM Plan, Middle Fork Road Emergency Relief for Federally Owned Roads [ERFO] Repairs, Road 56 ERFO and Fish Passage Repairs MP 12.8-17.0, Annual Road Maintenance, and Granite Creek Road Decommissioning and Road to Trail), they would cumulatively contribute toward the National Forest better meeting the goals, objectives, and standards and guidelines in the MBS LRMP, as amended.

4.2.2 Social Environment

The social environment includes the local transportation infrastructure and volume, the local economy in the project area, and the community character. Community character includes the attitudes, beliefs, and values of the local citizens.

4.2.2.1 Traffic

Affected Environment

Existing traffic volumes along Middle Fork Road were recorded at five sites between June and July 2001, during fall 2003, and spring and summer 2004. These traffic volumes were then averaged to determine a weekly ADT for the entire year that could then be used to project future traffic volumes. Future traffic volumes for 2011 were estimated by applying the annual growth rate for King County based on census data and an additional rate for the potential induced traffic from an improved road. Existing speeds vary depending on the condition of the roadway. When the road has been recently graded, the posted speed can be driven. As noted in the purpose and need, when the gravel surfacing has deteriorated and is full of potholes and washboarding in sections, drivers often drive below the posted speed limit and weave back and forth on the roadway in an effort to avoid potholes and prevent wear on and damage to their vehicles.

Environmental Consequences

No Action Alternative

Estimated traffic volumes along the project corridor are projected to increase above present levels of 258 ADT by 1.1 percent per year to 347 ADT by 2031 under the no action alternative (an increase of 24 percent). This predicted increase is attributable to an 11 percent regional growth rate in King County from 2000 to 2010 (U.S. Census Bureau 2011). Other contributing factors to the expected increase in traffic include the addition of parking facilities at the Mailbox Peak Trailhead, use of the Middle Fork Campground, and several truck trips per day from a private rock quarry in the lower portion of the project area.

As traffic volumes increase in response to regional population growth and increased recreational use of Middle Fork Road and the surrounding National Forest, state, and King County lands, the existing traffic-related problems would be exacerbated. These problems include dust and erosion impacts, deterioration of the road surface, and operational and safety problems.

Preferred Alternative

Traffic volumes under the preferred alternative are expected to increase up to 371 ADT by 2031 at the beginning of the project area (an increase of 33 percent from 2011 and a 9 percent increase over the no build alternative, which would have a 2031 expected ADT of 347). This predicted increase is based on the same projected increase in traffic as the no action alternative, plus an increase in vehicle trips based on the potential appeal of a new paved roadway, for a total of 1.5 percent annual traffic growth rate. The preferred alternative would result in an increase in ADT of approximately 9 percent over the no action alternative, though the reconstructed roadway would be better able to accommodate two-way traffic on the roadway, stand up to current and future traffic volumes, and increase operational safety of the route to the traveling public. An ADT increase of 9 percent in 2031 translates to an additional 21 vehicles on the road over the course of one day, an increase that is not expected to be appreciable over the traffic increase projected under the no action alternative.

The speed limit on Middle Fork Road would remain at its current posted speed of 35 mph. A paved surface, lacking potholes and washboarding, would allow for a consistent driving experience throughout the area and would prevent the need for drivers to occupy the entire roadway while avoiding deteriorated roadway sections.

Cumulative Effects

The increase in projected traffic expected under the improvements to Middle Fork Road resulting from implementation of the preferred alternative, combined with the Middle Fork Campground, the impending Mailbox Peak Trailhead project, and the Pratt River Trail, would result in a cumulative increase in traffic of approximately 33 percent by 2031, which would equal 9 percent over the no action alternative increase of 24 percent. As noted above, this increase is not expected to be appreciable over the no action alternative.

Mitigation

A concern raised by some during the public scoping process was that a paved roadway would increase speeding through the area. While speeding is ultimately a factor that can only a vehicle driver can control, the project would include several mitigating design features to try to discourage speeding. These would include posting additional reflective speed limit signs throughout the project area and placing warning signs on curves and areas of congestion from popular recreation sites. In addition, areas where the roadway width would be 18 feet would likely introduce some traffic calming due to the narrowed roadway. Additional measures for reducing speeding, such as placement of rumble strips at locations, would continue to be examined during development of the preferred alternative, subject to acceptance by King County, the responsible maintaining agency of the road.

4.2.2.2 Local Economy

Affected Environment

Within the project area, two businesses could be affected by the proposed project: Goldmyer Hot Springs (a non-profit organization located on Middle Fork Road, but beyond the limits of the project area) and GH Rock Products quarry (a rock quarry operated by Crown Lakes, LLC, located up Bessemer Road near the middle of the project area). Goldmyer Hot Springs attracts visitors year-round. Access to Goldmyer Hot Springs and the rock quarry on Bessemer Road is by Middle Fork Road. The quarry generates up to approximately two truckloads of rock a day transported off the site along Bessemer Road and Middle Fork Road, though actual traffic from the quarry occurs in cycles as stone is first gathered and processed at the site before being transported out along Middle Fork Road. In addition, several patented and unpatented mining claims exist in the Upper Middle Fork Watershed. Access to these claims is via Middle Fork Road.

Environmental Consequences

No Action Alternative

Implementation of the no action alternative would not change existing economic conditions within King County, the city of North Bend, or the project area. Access to Goldmyer Hot Springs and the rock quarry on Bessemer Road would remain unchanged and would be subject to existing road conditions.

Preferred Alternative

Construction of the preferred alternative would include a small, short-term increase in income in the North Bend area. Employment of construction staff would provide a short-term increase in business to the local economy. An increase in visitor use attributable to the improved road facility might contribute to the local North Bend economy, as visitors would spend money on local goods and services.

Short-term access to local businesses and mineral claims might be limited during construction. In the long term, however, access would improve for businesses located along or accessed by the road. Rock quarry hauling activities would only be affected by traffic delays or road closures between Bessemer Road and North Bend. Delays would be coordinated with the owners of the rock quarry so that they receive notice of delay and closure periods and could plan their operations accordingly.

Any decrease in visitors to Goldmyer Hot Springs would result from road closures and traffic delays that would occur throughout the project. During project construction, the operators of the Goldmyer Hot Springs would receive notice of proposed delays and closure periods, along with public notices, so that they could plan their operations accordingly. Access to Goldmyer Hot Springs would continue on weekends, the peak period of visitation to the site, with limited exceptions during bridge and wall construction.

Short-term impacts would occur during construction due to temporary delays and closures. Long-term access for these businesses and non-profit facilities would, however, be improved with a paved roadway.

Cumulative Effects

An increase in the number of visitors to the valley and to the city of North Bend would be likely under either alternative. Visitor use would also increase slightly because of the improved road under the preferred alternative. This increase in visitors might slightly increase spending in the area. Combined with formalized trailhead improvements and construction of the Middle Fork Campground, the preferred alternative would cumulatively present visitors with a more formalized recreational built environment as the setting along the road.

Continued operation of the rock quarry would contribute to the local economy through the sale of rock products, as well as from labor and equipment costs associated with the operation of the business. Cumulative economic impacts of the reasonably foreseeable actions, combined with either the preferred alternative or the no action alternative, would slightly improve economic conditions near the project area.

Mitigation

Access through the project area would be limited during construction of the preferred alternative. This impact would, however, be reduced to the extent possible by sequencing the work so that access could be maintained through certain areas, such as Bessemer Road and the Mine Creek area, as well as during increased use of the roadway periods, such as evenings and weekends. Potential impacts on access would be coordinated with businesses, non-profit facilities, and in-holders accessed through the project area.

4.2.2.3 Community Character

Affected Environment

The character of the community in the project area was one of the social elements identified as an issue during scoping. Community character provides members of the community with a sense of identity and belonging. During public scoping for the project, local citizens were asked to participate in a series of public open houses and to provide comments so that their perceptions regarding the community character of the project area could be understood.

Most individuals who contributed comments were visitors who use the project area for recreational purposes, including several interest-group representatives, although some local residents also attended and provided comments. The participants' descriptions of the local community character generally focused on three elements:

1. The largely unspoiled quality of the natural resources
2. The large number of recreational opportunities
3. The unsafe nature of the area due to lack of police patrol

Public comments indicated concern that if Middle Fork Road were improved, the community character would experience negative long-term impacts through increased use and decreased aesthetic value. A common concern expressed during scoping was that the road improvements would make the area more accessible to greater numbers of people, which, in turn, might diminish the overall recreational experience.

Environmental Consequences

In the case of rural recreational areas, impacts on community character can be described in terms of expected changes in the levels and types of uses occurring within the project area. One way of assessing how a project might affect a recreationalist's perception of the area is to forecast traffic volumes. Traffic volumes generally mimic the amount of use in a particular area, which influences an individual's perception of a place. Another method of assessing changes in community character is to identify changes to the visual environment. Visual impacts are discussed more fully in Section 4.2.8, Visual Quality.

Some potential impacts, such as increased traffic leading to more littering or vandalism, depend on a variety of factors, not just improvements made to the road. Such factors include, but are not limited to, local zoning ordinances, budgets, local and federal land management policies, and the effectiveness of local law enforcement. While the extent these factors would affect future community character is unknown, they would not be affected by either the no action or preferred alternative.

No Action Alternative

No direct effects on community character would result from implementation of the no action alternative. Existing traffic conditions (with the exception of expected regional increases) would remain, as would the existing visual conditions. The rustic and rural character of the project area in the form of the unimproved road would remain under the no action alternative. Although the no action alternative would not improve Middle Fork Road, an estimated 24 percent increase in traffic by 2031 (over 2011 estimates) is projected because of anticipated growth in the greater Seattle metropolitan area. Therefore, increased traffic would likely affect existing community character even if Middle Fork Road remained unimproved under the no action alternative.

The very slight increases in traffic noise that would occur under the no action alternative would not likely be perceptible. The degraded condition of the road would persist and would be magnified under increased traffic volumes, detrimentally affecting the response time for emergency vehicles.

Preferred Alternative

In the short term (during construction and approximately 3 years following when vegetation should be reestablished), the visual appearance of the road would change under the preferred alternative, primarily resulting from removal of vegetation. Bare disturbed earth would also be present. All disturbed areas would be revegetated, however, and the visual changes associated with the reconstructed road would likely begin to blend in with the surrounding areas following construction, as vegetation would begin to reestablish itself.

A new paved roadway would include a change in the visual experience of users from a rural gravel road to a paved and striped road surface, though the road surface would not likely be the defining feature of the visual experience. Paving the road would minimize much of the dust generated from the road surface during dry conditions. The dust then settles on adjacent roadside vegetation. A paved roadway would also provide a more comfortable driving experience compared to the existing rutted gravel road.

The equipment and work required to improve Middle Fork Road would temporarily change the typically rustic and rural nature of the roadway and would detract from the scenic beauty and serenity of the area. Users of recreational sites and facilities within up to half a mile of construction activities would likely hear construction noise. Noise levels would range from generally audible to not noticeable, depending on the construction activity being performed, the existing noise levels, and the surrounding topography.

Under the preferred alternative, the traffic volume along Middle Fork Road could increase an estimated 33 percent over current levels by 2031 (compared to a 24 percent increase under the no action alternative). Although slightly more traffic would occur along Middle Fork Road under the preferred alternative, the proposed roadway would better accommodate this projected increase compared to the no action alternative without requiring additional maintenance. Overall, the level of increased traffic is not expected to have additional impact on community character when compared with the level of increased traffic expected under the no action alternative (24 additional vehicles daily in 2031 over the no action alternative).

Noise levels within the project area would increase 1 to 3 A-weighted decibels (dBA) above the no action alternative with the anticipated increase in traffic volumes under the preferred alternative. A 1 to 2 dBA increase is not perceptible to most individuals, and a 3 dBA increase is barely perceived by the human ear. These values were obtained for a range of 5 feet to 430 feet from the road. The anticipated post-construction noise levels for the preferred alternative would not exceed 67 dBA, the level FHWA set as the criterion to implement noise reduction for recreation areas. More information is available below in Section 4.2.6, Noise.

Cumulative Effects

The preferred alternative, combined with improvements to the Middle Fork Campground, the Pratt River Trail, and the Mailbox Peak Trailhead, would likely result in slightly more use of the valley compared to the no action alternative, though the increased use would represent only an additional 24 vehicles on the road over the course of a day in 2031. Cumulatively, the projects would temporarily change the visual character of Middle Fork Road until vegetation becomes reestablished (expected within 3 years of project completion). Together, these projects would present a more formalized recreational setting, though the projects were designed in keeping with the rustic and rural background. No cumulative effects resulting from noise would be likely, as construction periods for projects would not overlap.

Mitigation

Mitigation for short-term noise impacts and for visual impacts would be implemented for the preferred alternative. Construction activities would be timed to reduce potential impacts on residences, such as no hauling through residential areas during the night. For the traveling public, work would be phased to allow access to locations. FHWA would also potentially allow access during the evenings and weekends. Tree removal would be minimized through project design to the maximum extent feasible, particularly in those areas where a tree canopy is formed over the road. Disturbed areas would be reseeded and planted with native species upon construction completion. This would minimize visual disturbance.

4.2.3 Cultural Resources

4.2.3.1 Prehistoric and Historic Properties

Historic properties are the locations of tangible, physical remains of past human activity. The properties themselves may be archaeological sites, buildings, structures, districts, objects, or landscapes. Prehistoric or Native American historic properties may include archaeological sites that represent villages, campsites, lithic scatters, resource-processing locations, petroglyphs, pictographs, hunting blinds, stone cairns, or burial locations.

Other historic properties represent the activities of Euro-Americans for the last two centuries. These remains may include buildings, structures, and sites associated with agriculture and settlement, mining, logging, and federal administration (e.g., USFS roads, trails, ranger stations, lookouts, experimental stations, and other facilities).

A cultural resource study was conducted along Middle Fork Road in compliance with the National Historic Preservation Act of 1966, as amended, the Archaeological and Historic Preservation Act of 1974, the Archaeological Resources Protection Act of 1979, and the Native American Graves Protection and Repatriation Act of 1990. The cultural resource investigation consisted of background research, a pedestrian field survey, and shovel probes. Background research included archival research, a literature review, a records search for previously recorded sites, and consultation with local officials. The pedestrian survey covered a 200-foot-wide corridor following the existing alignment of Middle Fork Road between MPs 1.5 and 12.25.

Affected Environment

Background research indicated that more than 20 cultural resource investigations had been conducted within 1 mile of the project area. Most of these occurred within the MBS and pertained to timber sales, small improvement projects, or large forest-wide or district-wide heritage resources overviews. A few surveys were conducted for projects proposed by King County and DNR.

Within the project area, five historic properties were identified, although none was found to be eligible for listing on the National Register of Historic Places (NRHP). Sites and features must meet a certain level of integrity to be eligible for NRHP listing. Brief descriptions of the cultural resources identified within or adjacent to the proposed project and the reasons why they are not eligible for NRHP listing are presented below.

Forest Service Road 5600-050

Forest Service Road 5600-050 parallels the Middle Fork Road Project Area between Bessemer Road and Middle Fork Road at MP 9.8, where it enters the project area. Road 5600-050 is a short segment (approximately 2.3 miles) of a larger road, built by the Civilian Conservation Corps (CCC) in the late 1930s (Boswell et. al. 1990). Upon completion of cultural surveys and consultation in 2010, it was determined that this segment of the larger CCC road is not eligible for listing in NRHP. During the summer of 2011, the road was decommissioned and converted to a multiuse (hiker, equestrian, and bike) trail managed by USFS.

North Bend Timber Company Railroad Grade and Features

This site is a portion of the abandoned North Bend Timber Company railroad grade. Although most of the grade has been obliterated or converted to the roadbed and alignment for the existing Middle Fork Road, several isolated features of the grade exist within the project area. Blasted rock faces and road cuts along the route can still be seen and reflect the railroad's alignment. Distinct features of the railroad grade include segments of fill and trestle pilings, though the trestle is not intact, and all rails and ties have been removed from the grade. The construction of Middle Fork Road over most of the grade has destroyed the location, setting, design, materials, feeling, and association of the railroad grade and features. Although this grade was a component of a historic logging system that played an important role in the local history of the valley, the integrity of the feature was destroyed; therefore, the site is not eligible for listing on the NRHP.

Piling Alignments

This site consists of four areas of wood pilings south of theMiddle Fork Road near MP 8.9. The pilings are in the stream channel and on the right bank of the Middle Fork Snoqualmie River in an area approximately 394 feet long and 98 feet wide within the project area. The site lacks integrity of setting, design, materials, feeling, and association. The trestle is not intact, and the remaining pilings either are under water or are perched on the riverbank. The site is not eligible for the NRHP because it lacks integrity and fails to meet any of the significance criteria.

Camp Brown

Camp Brown is located just before MP 12.0. Camp Brown encompasses approximately 3 to 4 acres. This site includes a concrete pad that may be a remnant of the cookhouse foundation. The removal or demolition of the former structures and spur lines, as well as extensive disturbance of the ground surface, have compromised the integrity of the design, setting, materials, workmanship, feeling, and association. Although Camp Brown was a component of a historic logging system that played an important role in the local history of the valley, all structures have been demolished, and the ground surface near the site has been altered, severely limiting the archaeological potential of the site. This feature lacks the integrity necessary for inclusion on the NRHP.

King County Bridge 359-D

This feature is a timber bridge with log stringers and square wooden floor beams where the Middle Fork Road spans a tributary of the Middle Fork Snoqualmie River near MP 8.4. Also known as the Lake Dorothy Overflow Bridge, the structure was built in 1962 and is maintained by King County. The bridge is 14 feet wide and approximately 25 feet long. The bridge retains integrity of location, design, setting, materials, workmanship, feeling, and association. According to the King County Road Services Division, the existing bridge retains all of its original construction material except the deck planking and seismic retrofit anchors, though the timber has substantial rot and decay to the point that the bridge has lost structural integrity.

Although the bridge retains most of the integrity of its original construction, it is not associated with significant events or a person in local or regional history, nor does its design represent a specific identifiable style. The bridge is not eligible for the NRHP because it fails to meet any of the significance criteria.

Environmental Consequences

No historic properties on the NRHP or eligible for NRHP listing are present within the project corridor. Thus, there would be no direct, indirect, or contribution to cumulative effects resulting from the implementation of either alternative.

4.2.3.2 Traditional Cultural Properties

Traditional cultural properties (TCPs) are places or resources that have traditional cultural importance to contemporary American Indians now represented by tribal governments. Of particular importance are cemeteries and isolated interments, sacred landforms, ceremonial sites, rock art, cairns, certain animal and plant resources, and locations prominent in mythology and tribal history.

Affected Environment

The Snoqualmie and Tulalip Tribes were contacted to inquire about information and concerns they might have pertaining to cultural resources and/or TCPs in or near the project area. Additional communications confirmed that the tribes have no specific concerns for the project.

Environmental Consequences

Neither the preferred alternative nor the no action alternative would have any direct, indirect, or contribution to cumulative effects on Native American sites, because there are no known historic or prehistoric Native American sites or TCPs within the project area. Rights reserved by Native Americans in the treaties would be unchanged. Access to areas where rights are exercised would also remain unchanged under the preferred alternative.

Mitigation

If any archaeological, cultural, or historic resources are inadvertently discovered during construction, project activities in those areas would be halted, and the USFS archaeologist, the Washington State Department of Archaeology and Historic Preservation, and appropriate tribes would be contacted and consulted, as applicable, in regard to disposition of the resource in accordance with applicable laws and regulations.

4.2.4 Section 4(f)/6(f) Resources

The intent of Section 4(f) of the Department of Transportation Act of 1966 (49 United States Code 303 § 4(f)) is to avoid historic properties eligible for or listed on the NRHP, publicly owned recreational areas, public parks, and wildlife and waterfowl refuges. If avoidance is not possible, then a Section 4(f) evaluation must demonstrate that (1) there is no feasible and prudent alternative to the use of the Section 4(f) resource and (2) the project includes all possible planning to minimize harm to any Section 4(f) resource.

Section 6(f) of the Land and Water Conservation Fund Act applies to conversion of outdoor recreation property acquired or developed with grant assistance from the Interagency Committee for Outdoor Recreation. Section 6(f) of this Act prohibits the conversion of property acquired or developed with these grants to a non-recreational purpose without the approval of the Department of the Interior's National Park Service. Section 6(f) directs the Department of the

Interior to ensure that replacement land is of equal value, location, and usefulness. The Secretary of the Interior must approve any conversion of property acquired or developed with assistance under this Act for other than public, outdoor recreation use.

Affected Environment

There are no historical properties eligible for or listed on the NRHP within the project area. Thus, there would be no direct, indirect, or cumulative effects on historic resources and, therefore, no use under Section 4(f).

Five recreational resources within the project area are eligible as Section 4(f) properties. The respective agency with jurisdiction (i.e., USFS, DNR, or King County) has determined that these resources are significant for purposes of Section 4(f). The Middle Fork Campground is one resource, two resources are hiking trails (Mailbox Peak Trailhead and Middle Fork Trailhead), and two resources are access points to the Middle Fork Snoqualmie River for recreational boaters (the Mine Creek site and the Russian Butte View river access point).

The Mine Creek site is the only property within the project study area that qualifies as a Section 6(f) property. This site is publicly owned by the state of Washington and is leased to the Interagency Commission for Outdoor Recreation. The Interagency Commission for Outdoor Recreation used money from the Land and Water Conservation Fund to acquire this property and develop it for recreational purposes; therefore, this property qualifies as a Section 6(f) property.

Environmental Consequences

Use of these recreational resources is defined according to 23 Code of Federal Regulations (CFR) 774.17, and it occurs when a 4(f) site is permanently incorporated into a transportation facility, is used for temporary occupancy, or when constructive use of the resource causes permanent adverse impacts. Neither the no action nor preferred alternatives would incorporate any 4(f) recreational resource within the transportation facility.

Access to recreational resources would be maintained at times during the project, particularly during high use periods such as weekends. Neither the no action nor the preferred alternative would result in a use of a 4(f) resource as defined at 23 CFR 774.17. The Mine Creek 6(f) property would not be converted to a non-recreational use as a result of the no action or preferred alternatives. Therefore, there are no Section 6(f) concerns.

4.2.5 Recreational Resources

Maintaining access to recreational opportunities within the valley, including during construction, was an issue identified during scoping because the Middle Fork Road is an important access corridor for recreational users of the project area and surrounding lands. The area is one of the closest access points to the MBS from the Seattle metropolitan area; because of its proximity and ease of access from I-90, it receives more use than other areas on the MBS. Recreational use occurs throughout the valley from the city of North Bend to the headwaters of the Middle Fork Snoqualmie River and adjacent drainages. Formal and informal trails connect Middle Fork Road to destinations throughout the Alpine Lakes Wilderness (USFS 1998). Recreational activities enjoyed in the project area include hiking, mountain biking, fishing, camping, kayaking,

picnicking, sightseeing, wildlife viewing, equestrian use, mineral collection, and pleasure driving (USFS 1998).

Affected Environment

Recreation sites within the project area include day use, river use, and camping. These activities are described below.

Day Use

Wildlife viewing and recreational driving (sightseeing) are two important recreational uses of this area (USFS 1998). The valley supports a diversity of wildlife. The scenic nature of the project area and its proximity to an urban area make the project area a popular destination for wildlife viewing and enjoying nature.

Two formal trailheads open for hiking are located within the project area: the Mailbox Peak Trailhead and the Middle Fork Trailhead. The Mailbox Peak Trail (located at the beginning of the project area) and the Middle Fork Trail (located near the end of the project area), as well as the CCC Trail (accessed from Middle Fork Road, Middle Fork Trailhead, and the Middle Fork Campground), provide opportunities for hiking, horseback riding, and mountain biking. Other trails that provide hiking, horseback riding, and mountain biking opportunities can also be reached from the project area. Individuals who transport horses by trailer have raised concerns over the poor condition of Middle Fork Road. The road also provides access to recreational rock-climbing areas found past the project area.

The actual roadway is used for snowshoeing and cross-country skiing when conditions permit, though the road is not plowed, and it tends to get icy several miles below the point where the snow would be considered good for these recreational pursuits. Thus, public recreation in the project area is generally limited from November through April.

Designated and non-designated pullout areas exist along the project area, and recreational users park in these areas, as well as along Middle Fork Road (Figure 4-2). Parking demand currently exceeds parking availability at some locations within the project area.

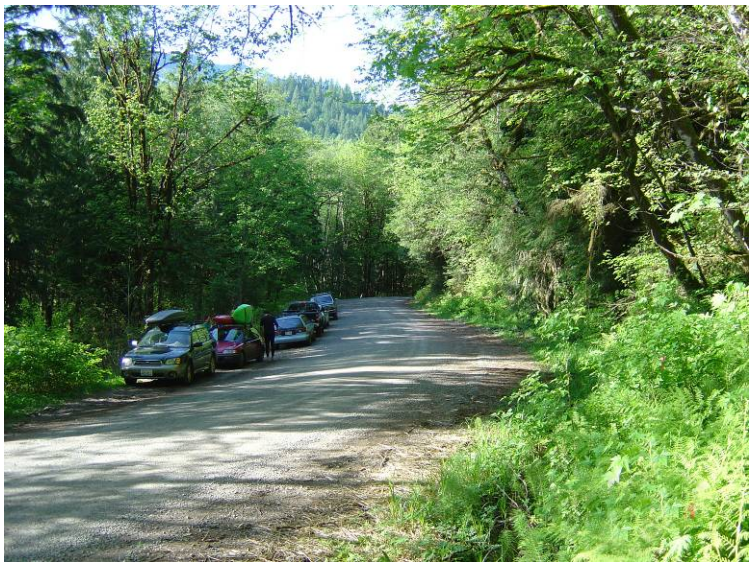

Figure 4-2. Informal parking adjacent to the road

River Use

Kayakers and other boaters also use the Middle Fork Snoqualmie River extensively (Figure 4-3). The boating community uses numerous formal and informal river access points within the project area, particularly in the Mine Creek day-use area.

Figure 4-3. Kayaker on the Middle Fork Snoqualmie River

Camping

State and county lands within the project area (MP 2.7 to MP 8.5) are open for day-use recreation activities only. Camping is not allowed on these lands. Dispersed camping is allowed on NFS lands (MP 8.5 to MP 12.4). USFS also manages a 45-unit, developed campground (Middle Fork Campground). This campground is located at the end of the Middle Fork Road Project Area. From approximately Labor Day to Veteran's Day, most dispersed campsites and camping units within the Middle Fork Campground are occupied on weekends (Friday to Sunday). Overnight stays also occur at Goldmyer Hot Springs, a popular destination that receives hundreds of visitors annually. Visitors park at the Middle Fork or Dingford Creek Trailheads and hike or bike into the site.

Environmental Consequences

No Action Alternative

The demand for day use, river use, camping, and recreational opportunities is projected to increase in Washington State (USFS 1998) and would be expected to increase under the no action alternative. Kayaking and fly-fishing in the lower reaches of the Middle Fork Snoqualmie River appear to be increasing (USFS 1998). Access to recreation sites along the corridor would continue to be affected by the poor condition of the roadway experienced between infrequent maintenance activities. Dust would continue to be experienced along the roadway during dry months. Additionally, dispersed use along riparian areas would continue, contributing to loss of vegetation, soil compaction, and soil erosion in these areas (USFS 1998). Parking demand would be expected to continue to exceed available spaces in areas, and informal parking would continue to impinge into the traveled roadway.

Preferred Alternative

The preferred alternative would improve access to all recreation opportunities along the Middle Fork Road, though access would temporarily be disrupted during construction. Access during construction might be restricted to weekends and would be limited to portions of the project area.

For this analysis, increases in recreational activities would likely be directly proportional to increased traffic volume. A growth rate of 1.5 percent per year was used to calculate the projected traffic volume increases for the preferred alternative. In 2031, this value would represent an approximately 9 percent increase in traffic (and recreational use) over the no action alternative.

A slight increase in recreational users in the area would have a minor detrimental impact on the recreational experience for some users (particularly those seeking serenity, quiet, and tranquility), though the increase under the preferred alternative would be limited to an additional 24 vehicles a day in 2031 over the no action alternative.

Recreational users would benefit from easier access due to improved road conditions associated with the preferred alternative. Comments received during public meetings indicated people wanted to use the area for recreation, but often felt inhibited by the poor condition of the road within the project area.

The preferred alternative would provide a uniform paved surface that would require less maintenance, could be driven safely at the posted speed limit, and would present less potential for wear on vehicles. The preferred alternative would also decrease the potential response time for emergency personnel to respond to calls in the area.

Access may be closed to areas of unauthorized dispersed use (informal parking, off-road vehicles) that are detrimentally impacting resources, such as in riparian areas, to protect the resources from further damage. Access may be limited by constructing natural barriers that blend into the area to prevent vehicular access and camping at these locations. Locations where the access has to be limited would be determined by USFS, King County, and DNR.

Parking and/or pullout improvements are outside of the scope of this project. Existing areas where parking demand exceeds available spaces would continue. However, existing pullout areas would be preserved where practical, when space is available so that the parking areas would not impinge into the roadway, and when existing use would not detrimentally impact resources.

Cumulative Effects

The area of potential cumulative effects for recreational users includes lands accessed by the portion of Middle Fork Road located within the project area. Improvement of Middle Fork Road would result in improved access to recreational opportunities enhanced under the Middle Fork ATM Plan (USFS 2005a). While parking areas are not likely to be expanded outside the roadway template, or to be created as part of the preferred alternative, additional parking opportunities along Middle Fork Road were provided at the Middle Fork Trailhead, and they are anticipated under proposed improvements at the Dingford Creek, Mailbox Peak, and Granite Creek Trailheads. Overall, the preferred alternative, when combined with other prior and planned projects, would have a positive impact on recreational resources.

Mitigation

Methods to reduce impacts on recreation resulting from the preferred alternative would be included during construction. Examples include allowing access to locations by phasing work, limiting work to particular areas, and potentially allowing access during evenings and weekends, the peak time for many recreation activities. Periodic full closures would likely occur, however, to facilitate timely construction.

The current plan would be to open the road for public access on weekends, though this may be restricted at times. Closures in portions of the project area could sometimes occur when the road could not be safely opened to public traffic or in areas where traffic would delay completion of work, such as proposed blasting sites. A public involvement plan would be developed to distribute information on the timing and locations of closures. The public would receive timely updates through a readily accessible site.

4.2.6 Noise

The purpose of this section is to document potential noise impacts that may occur within the project area because of the alternatives. Detailed information pertaining to the characteristics of sound is in the Middle Fork Snoqualmie River Road (Forest Highway 29) Noise Technical Report, which is incorporated into this EA by reference.

The FHWA Noise Abatement Criteria specify exterior noise levels for various land activity categories. For receptors where serenity and quiet are of extraordinary importance, the noise criterion is 57 dBA (the commonly used measurement for environmental noise). For residences, parks, schools, churches, and similar areas, known as class B activities, the noise criterion is 67 dBA. For other developed lands, the noise criterion is 72 dBA. A noise impact occurs if the magnitude of sound energy approaches or exceeds the FHWA Noise Abatement Criteria, or if the source substantially increases existing levels. For the Middle Fork Road project area, the noise criterion is 67 dBA because it is a recreation area.

The Washington State Department of Transportation developed a traffic noise policy based on the FHWA policy. FHWA has approved the WSDOT policy for use on state and federal projects within Washington State. The WSDOT policy considers a noise impact to occur if predicted noise levels approach within 1 dBA of the noise abatement criteria. Thus, if a noise level were 66 dBA or higher, it would approach or exceed the FHWA noise abatement criterion of 67 dBA for class B activities. A substantial increase is defined as future traffic noise levels increasing by 10 dBA above existing environmental sound levels as the result of a project.

Affected Environment

Noise analyses were based on the maximum ADT recorded at all traffic count sites. Within the project area, current noise levels resulting from traffic on the existing roadway are approximately 61 dBA close to the roadway and 48 dBA 100 feet from the roadway.

Environmental Consequences

The analysis methods used to predict future noise levels were based on FHWA's Traffic Noise Model Version 2.5 (FHWA 2004). Traffic Noise Model Version 2.5 is a computer model used to predict traffic noise levels at discrete points by considering interactions between different noise sources and the effects of topographical features on the noise level. The model was run without using any noise reductions that would be expected due to the surrounding terrain and vegetation; therefore, the model results are conservative in that they likely overestimate the potential impact.

No Action Alternative

Given the projected traffic increases under both alternatives, future noise levels under both alternatives would increase by 1 to 3 dBAs, which is not perceptible to most people. There are no long-term direct, indirect, or cumulative effects on noise expected under the no action alternative because the increase in noise is either imperceptible or barely perceptible to the human ear.

Preferred Alternative

As noted above, given the projected traffic increases under both alternatives, future noise levels would be expected to increase by 1 to 3 dBAs, levels that are not perceptible to most people. Therefore, no long-term direct, indirect, or cumulative effects on noise would be expected under the preferred alternative, because the increase in noise would either be imperceptible or barely perceptible to the human ear.

Implementation of the preferred alternative would temporarily (for approximately 2 years) result in construction noise in the project area. Noise levels during construction may be bothersome to nearby residences when occurring near the beginning of the project. Construction usually would

include clearing, cut and fill activities, limited blasting and pile-driving, importing fill, paving, and removing old road materials. Construction noise would be temporary and intermittent, occurring during a several-month construction period at various locations in the project area. Construction noise would not likely impact recreational activities, as there would be no access within areas of active construction where noise would be generated. At times, noise might extend outside an area of active construction, but this would be intermittent and largely limited to pile driving and blasting activities. No nighttime construction hauling would occur through the couplet area.

The maximum noise levels of construction equipment under the preferred alternative would range from 69 to 110 dBA at 50 feet from the roadway. Construction noise would decrease at a rate of 6 dBA per doubling of distance from the source. Since various pieces of equipment would be turned off, idling, or operating at less than full power at any given time, and because construction machinery would typically be used to complete short-term tasks at a given location, average daytime noise levels would be less than the maximum noise levels.

Cumulative Effects

As no other projects would occur within the area of noise impacts during the construction period, and given that no long-term increase in noise would be perceptible, no cumulative effects from noise would occur.

Mitigation

No hauling would occur during nighttime (10:00 p.m. to 6:00 a.m.) hours through residential areas along Middle Fork Road. Any construction activities that could potentially be heard in occupied residences along Middle Fork Road would be limited to daytime hours.

4.2.7 Air Quality

The EPA has issued National Ambient Air Quality Standards (NAAQS) for six pollutants of concern (e.g., ozone, carbon monoxide, particulate matter (PM_{10}), sulfur dioxide, nitrogen dioxide, and lead). Areas that exceed these standards are called non-attainment areas; the EPA requires special measures to bring these areas into compliance. King County (including the city of North Bend and the project area) is a federally designated attainment area for all criteria pollutants of concern. This means that it complies with the NAAQS and does not require special programs to maintain compliance. The Washington Administrative Code incorporates all NAAQS directly with the exception of sulfur dioxide and nitrogen dioxide. Washington has adopted a more stringent state standard for these two pollutants than the federal standard.

Air pollutants of concern for highway projects are carbon monoxide, nitrogen oxides, and volatile organic compounds. PM_{10} can be of concern in dry or dusty areas where PM_{10} concentrations are approaching the NAAQS. Volatile organic compounds and nitrogen oxides react with sunlight to produce ozone, a pollutant of concern associated with urban areas. Ozone is currently not a pollutant of concern for the Middle Fork Road project area, because the project is in a non-urban area with no history of ozone problems. However, USFS has predicted that ozone levels could increase in the project area as ozone levels continue to rise in the urbanized Puget Sound region (USFS 1998).

Affected Environment

Existing air quality conditions in the project area are well within limits set by the federal government, and the project area is located outside of EPA-designated nonattainment areas. Vehicle emissions from traffic on Middle Fork Road are well below emission standards for this land classification and do not pose a threat to wildlife populations, vegetation, or human populations along the road corridor.

Dust along the road corridor is a problem during the dry season. Vehicle traffic on the gravel and dirt road surface produces fugitive dust in the air, which may drift off the site. This dust can diminish the scenic vistas in the area, and many consider it a hindrance to recreational experiences when driving, walking, bicycling, or horseback riding on the road.

Environmental Consequences

The ADT volume comparisons indicated that slight increases in volatile organic compounds, ozone, and nitrogen oxide emissions would likely occur due to increases in traffic volume. However, the expected differences in emissions between the no action alternative and the preferred alternative would be small given that the projected ADT would vary by 24 vehicles in 2031.

No Action Alternative

Under the no action alternative, the road surface would not be improved. Levels of fugitive dust would continue to increase as traffic volumes increase, especially during the summer months.

Preferred Alternative

Under the preferred alternative, direct impacts from construction would result in temporary, localized increases in air pollutants and fugitive dust from the operation of construction equipment. These would be limited mainly to fugitive dust emissions, but effects would also include local increases in PM_{10} concentrations from equipment and heavy truck emissions.

The current gravel surfaces would be paved with asphalt, eliminating dust generated from the roadway and improving air quality surrounding the Middle Fork Road area. Under the preferred alternative, the ADT in 2031 would increase approximately 9 percent more than if the no action alternative were selected. This increase in local traffic caused by implementation of the preferred alternative would result in a minor increase of typical automotive air pollutants because of the expected increase in traffic volumes. However, the level of increase in emissions would not likely result in nonattainment of any of the criteria air pollutants at the airshed level.

Cumulative Effects

Implementation of the preferred alternative would lead to decreases in the fugitive dust levels within the project area. Fugitive dust levels within the project area would remain the same or worsen with selection of the no action alternative as traffic increased.

The expected increase in traffic in the project area resulting from implementation of the preferred alternative would, when considered cumulatively with improvements to trailhead, lead to slight increases in vehicle emissions in the valley. Under the no action alternative, there traffic would increase due to continued growth within King County. Based on the relatively low projected

traffic volumes under either alternative, however, along with other past, present, and reasonably foreseeable future actions, cumulative effects on air quality would be unlikely lead to non-attainment of any of the criteria air pollutants at the airshed level.

Mitigation

Dust control practices (e.g., water applied to construction areas and hauling routes) would be used during construction to reduce temporary air quality impact levels associated with dust during construction of the preferred alternative.

4.2.8 Visual Quality

A potential decline in visual quality was one of the concerns raised during scoping. A visual analysis was conducted to identify potential impacts on visual quality. The visual analysis consisted of examining the view from the road and off the road using FHWA visual design criteria. The visual design criteria are the elements that make up the visual character of the corridor. The visual design criteria for this analysis included road visibility, scenic quality, and landscape sensitivity. The scenic quality of the area is based on contrasting landforms, color, and texture of surrounding landscape. The landscape sensitivity is the capacity of the landscape to accept change.

Affected Environment

The vegetation present in the roadway corridor is predominantly a high overhead canopy that creates a tunnel effect in some sections of the roadway. Open views of the surrounding mountains are generally limited from the roadway during the summer to several of the wider areas of the road and the bridge over the Middle Fork Snoqualmie River. In the winter, the lack of leaves on deciduous trees allows better views of the surrounding areas. Views of the Middle Fork Snoqualmie River are likewise limited by vegetation during the summer. In areas where Middle Fork Road passes close to the river, however, people often stop to enjoy the views of the Middle Fork Snoqualmie River (Figure 4-4). The presence of strong visual elements within the landscape, including the mountains, rock outcrops, and the river, sets the majority of the project corridor in a moderate to high rating for scenic quality.

The road surface is mostly dirt and gravel, with the exception of the paved area up to the Mailbox Peak Trailhead, which is striped as a single-lane road. The current rural appearance of the road reflects the surrounding forested landscape. The passage of vehicles over the dirt and gravel surface during the dry season often releases thick clouds of dust, which would temporarily impair visual quality for users of the road. The dust often forms a thick coating on the vegetation surrounding the road, which detracts from the appearance of the foreground.

Figure 4-4. Scenic view of the valley from near Middle Fork Road

Viewer groups include those with a view from the road and those with a view of the road. Viewer groups with a view from the road include all people traveling along the roadway. Viewer groups with a view of the road include recreational users who may venture away from the road to hike or ride on trails, boat the Middle Fork Snoqualmie River, sightsee, hunt, and fish, as well as residents living near the beginning of the project area.

The USFS has VQOs that have been defined for each Land Use Allocation Unit previously described in Section 4.2.1.4, Federal Land (USFS and BLM 1994). The VQOs for the land-use categories present within the project area include the following:

- MA 2A, Retention (human activities are not evident to the casual forest visitor), as evident from Middle Fork Road
- MA 5A, Partial Retention (human activity may be evident, but must remain subordinate to the characteristic landscape, with necessary modification for structural facilities acceptable), as evident from the Middle Fork Snoqualmie River

These VQOs are currently being met on USFS-managed land within the project area.

Environmental Consequences

No Action Alternative

The no action alternative would not change the existing visual conditions along the roadway. Views of the river and the surrounding mountains would continue to be limited to a few locations along the road. The closed tree canopy over much of the road would remain, as would the shrubby vegetation along the edges of the road.

Dust created by traffic passing over the gravel and dirt road surface would continue to affect visibility at times during the dry season, and it would continue to alter the appearance of vegetation near the road. The applicable VQOs on lands managed by USFS would continue to be met.

Preferred Alternative

VQOs would be met on all lands within the project area, and the reconstructed Middle Fork Road would blend with the natural form, line, color, and texture. Cut and fill slopes would be revegetated, and any stockpile sites would be rehabilitated and revegetated.

Direct impacts on the visual quality of the project area from construction would include the temporary presence of construction equipment. Additionally, the removal of vegetation and the presence of bare, disturbed earth would also occur. All disturbed areas would be re-graded and revegetated. The visual changes associated with the reconstructed road would likely blend in with the surrounding areas following construction completion, as vegetation would soon begin to reestablish itself.

Indirect effects from the presence and use of a paved roadway would include a change in the visual experience of users from a rural dirt road to a paved and striped road surface and a more open area adjacent to the road. Paving the road would minimize much of the dust that settles on adjacent roadside vegetation as it is generated from the road surface during dry conditions. In some places, the tree canopy currently over the road would be removed. The character of the existing roadway would change from a gravel road to a paved road with the creation of a 20-foot-wide paved road section. A curb and gutter section would be installed in some places. Guardrails would be placed in some areas. Views of the surrounding mountains and landscape may improve with removal of the tree canopy in some locations, though the tree canopy would likely grow back over the road due to growth conditions present in this area.

Views of the project area from the Middle Fork Snoqualmie River would be noticeable during and immediately following construction, though measures would be implemented to blend the proposed improvements with the surrounding area. The preferred alternative would be consistent with the recommended recreation designation of the river. Cut and fill slopes would be noticeable following construction, although they would be revegetated with native seed at project completion. Within a few years, the cut and fill slopes would look similar to the surrounding areas. Retaining walls and guardrail would possibly be used in some locations to reduce the amount of cut and fill slopes required, or to prevent the roadway from encroaching into wetlands or floodplains. In these areas, the retaining walls and guardrail would appear different from the surrounding vegetated areas. Measures such as staining or use of weathering steel would, however, be used to help blend these structures with the natural surroundings.

Cumulative Effects

As the implementation of the preferred alternative would remain consistent with VQOs for the area, there would be no contribution to any visual quality cumulative effects within the valley. Proposed improvements by DNR and USFS to trails and trailheads (Mailbox Peak, Granite Creek, Dingford Creek, and Lower Pratt River) would likely blend with the environment and would present a more formalized recreational scene for visitors to the area.

Mitigation

Mitigation for visual impacts would focus on minimizing changes to the visual landscape and retaining as much of the character of the existing road as would be practical. Mitigation measures would include restoring disturbed areas and revegetating these areas with native plant species. Changes to visual resources would also be minimized by limiting the construction footprint to the smallest possible area and keeping the cut and fill sections contained to the greatest possible extent. In areas that contribute to the visual appearance of the existing road, such as the over-arching tree canopy, special construction techniques would be considered to minimize vegetation removal and fill placement, such as a narrower 18-foot width for the road. Retaining walls used in select locations to reduce impacts would be designed to blend with the forest and adjacent natural materials. Blasting would be conducted to leave a fractured face that would imitate a natural appearance.

4.2.9 Water Resources

Water quality and protection of water resources were identified as issues during scoping. This section describes existing water resource conditions, and it documents potential impacts on existing water resources and water quality. Water resources evaluated in this section include surface water (streams and rivers), riparian areas, floodplains, and groundwater. Road construction projects can affect surface water resources by altering stream channel morphology, changing hydrological conditions, increasing pollutant discharge, and removing or altering riparian vegetation (Noss 1995, EPA 2003). The creation of additional impervious surface area changes surface water runoff patterns and amounts, and may increase pollutant loading of streams (Noss 1995, EPA 2003).

4.2.9.1 Surface Waters

Affected Environment

The project is located in the Middle Fork Snoqualmie River watershed within the Snohomish River basin. The headwaters of the Middle Fork Snoqualmie River watershed are located in the Chain Lakes region. The three main tributaries of the Middle Fork Snoqualmie River are Dingford Creek (entering the mainstem of the Middle Fork at river mile 70.3, the Taylor River (river mile 65), and the Pratt River (river mile 61.1). River elevations of the mainstem of the Middle Fork Snoqualmie River vary from 5,500 feet at the headwaters at Chain Lakes to 410 feet at the mouth near North Bend.

The project alignment parallels the Middle Fork Snoqualmie River (Figure 4-5) and crosses the river once at approximately MP 5.6. The project area is located downstream of the confluence of the Middle Fork Snoqualmie River and the Taylor River. Four primary tributaries to the Middle Fork are located within the project area: Pratt River, Stream 0688, Rainy Creek, and Granite Creek (see Figure 1-1). All four streams join the Middle Fork on the south bank. The existing road and proposed alignment do not cross any of these major tributaries. Middle Fork Road crosses 21 perennial and 30 intermittent unnamed tributaries within the project area.

The Middle Fork Snoqualmie River is a Class AA (extraordinary) water body (Washington Department of Ecology [DOE] 2004). Therefore, the most restrictive water quality standards apply to the Middle Fork Snoqualmie River and its tributaries.

Figure 4-5. Middle Fork Snoqualmie River and Middle Fork Road

The Middle Fork Snoqualmie River was listed on the 1996 303(d) list of threatened and impaired water bodies for temperature (DOE 1996). DOE did not list the Middle Fork Snoqualmie River on the 1998 303(d) list of threatened and impaired water bodies (DOE 1998), although limited sampling indicated several examples of temperature exceeding the water quality criterion of 61 degrees Fahrenheit (16 degrees Celsius). Being listed for temperature only does not necessarily indicate that all other water quality variables in the Middle Fork Snoqualmie River or its tributaries meet standards; rather, the listing means that no data have been presented to DOE demonstrating that standards are not being met. Because so little sampling has been conducted, the status of water quality throughout most of the project area is largely unknown.

Currently, the amount of impervious surface within the Middle Fork Snoqualmie River watershed is low, reflecting the relatively low road density and extensive forest cover. As such, the impacts existing roads have on current peak and base flows are minimal.

Because Middle Fork Road is gravel and dirt, it contributes fine sediments to the Middle Fork Snoqualmie River. The road parallels the river at times, and runoff from the road is captured in ditches and tributaries that enter the river**.** Undersized culverts on some of the tributaries cause backwatering and overtopping of the road during high flows in some places, causing scour and erosion of the road prism.

Tributaries to the Middle Fork Snoqualmie River in the project area range from steep, high-energy, rock-and boulder-dominated streams in steeper areas, to low-gradient, meandering, and silty streams in the valley bottom areas. The steeper streams are subject to high-velocity flows and, in some cases, debris torrents that periodically wash out culverts and bridges. The

lower gradient streams also periodically overtop the road surface in some places, although the damage to the roadway in these areas is not as catastrophic as the high-velocity flows.

Many of the culverts on both high-and low-gradient streams are undersized. This causes backwatering above the culvert (resulting in deposition) and high-velocity flows below the culvert (resulting in scour). Field observations and review of available data indicate that, in most areas away from the road prism, stream channels appear to be properly functioning.

Environmental Consequences

The potential for stream alteration, altered channel morphology, changes in hydrological conditions, pollutant discharge, or alteration of riparian vegetation under the no action and preferred alternatives were analyzed during this EA. Analysis included assessing road construction activities, culvert and bridge replacement, changes in impervious surfaces, and acres of fill or removal of existing waters of the United States.

No Action Alternative

Implementation of the no action alternative would not result in any temporary or permanent impacts on surface waters in the project area. Sediment would continue to be introduced from the existing gravel and dirt road surface into surface waters, including the Middle Fork Snoqualmie River and its tributaries. Undersize culverts at some stream crossings would continue to have an adverse effect on stream channel morphology by constricting flows and causing scour. Unusually large storm events would continue to cause road washouts at these undersized culverts, sheet flow over the road surface, and road prism erosion, all of which result in pulses of sediments being delivered to the Middle Fork Snoqualmie River and its tributaries.

Development of the road system in the Middle Fork Snoqualmie River watershed over the last 60 years has resulted in an open road density of approximately 0.91 mile of road per square mile for all ownerships (USFS 1998). The 26.2 acres of impervious surface Middle Fork Road currently represents within the Middle Fork Snoqualmie River watershed is negligible when compared to the thousands of acres of forested lands. The 26.2 acres would continue to have little effect on the overall surface water hydrology of the Middle Fork Snoqualmie River and its smaller tributaries.

Preferred Alternative

Implementation of the preferred alternative would reduce erosion and sediment conditions from the road surface by improving drainage and removing the sediment source from the dirt and gravel road surface. In addition, many undersized culverts would be replaced. The replacement of undersized culverts would reduce the risk of culvert failure, thus improving the integrity of the road in these locations. Additionally, properly sized culverts would reduce the potential for scour at outlets and upstream flooding.

Temporary impacts on surface waters resulting from construction, primarily from the placement of temporary stream diversions, would be expected within approximately 10 feet along the stream beyond each end of the new culvert (for a total of 20 feet). Permanent impacts would include placement of riprap and pipes within channels. Permanent impacts were calculated as the amount of existing open channel placed in a culvert and were derived by multiplying the bankfull stream

width by the expected increase in culvert length at each stream. Approximately 0.1 acre of surface waters and 1.2 acres of wetlands would be permanently impacted as a result of the preferred alternative.

As noted within Section 4.2.1.4, Federal Land, approximately 20 acres of designated Riparian Reserve on NFS lands would be impacted. In addition, the project would impact approximately 23 acres of state and county lands that would be defined as Riparian Reserve on NFS lands (though these areas include more than 21 acres of existing roadway within Riparian Reserve). Disturbance to designated Riparian Reserve vegetation outside the existing roadway would total approximately 25 acres over the 10 miles of construction limits, which would result in an average of approximately 10 feet on either side of the existing roadway. Much of this vegetation has regrown on existing cut and fill slopes adjacent to the existing roadway, as would be expected following construction. Given the short average distance to disturbance of vegetation from the roadway, as well as revegetation of the area, no detectable change to water temperature would likely occur as a result of disturbance of riparian vegetation. Therefore, the preferred alternative would not be expected to contribute to 303(d) listing of the Middle Fork Snoqualmie River for temperature.

Construction activities could result in temporary increases in the amount of sediment introduced into surface waters. Standard erosion and sediment control practices and BMPs would be implemented to limit the potential for temporary increases in sediment delivery.

Installing appropriately sized culverts would reduce backwatering and the resultant floodwater from overtopping the road. This would reduce road prism erosion and resulting maintenance needs, as well as reducing scouring on the downstream end of undersized culverts (resulting from constriction of the flows within the culvert). The new culverts would also facilitate improved sediment transport and natural bedload movement, thereby minimizing sediment deposits upstream of the culvert.

The preferred alternative would not increase the road density within the watershed. Increasing the area of impervious surface within a watershed can increase peak stream flows, decrease base stream flows, and increase the amount of pollutants discharged to streams. The preferred alternative would not create any new impervious surface as the existing graveled roadway is so compacted that it acts as impervious surface, and there would be a slight reduction (approximately 1.6 acres) in the roadway surface area.

Changes in peak or base stream flows are not anticipated as stormwater would be routed though drainage ditches to upland areas to facilitate infiltration and to provide treatment of stormwater runoff when feasible. Stormwater runoff to streams would be reduced by seeding disturbed areas (cut slopes) and implementation of standard BMPs for erosion and sediment control during construction. BMPs would include gravel berms, silt fences, and straw waddles, etc.

4.2.9.2 Floodplains

In most cases, the floodplain is a broad, level surface along a stream channel. The floodplain conveys and temporarily stores water during storm events. Roadway construction within floodplains has the potential to change flood patterns within a watershed. Filling and compaction due to grading activities within floodplains reduce the volume of water capable of being stored during flood events, which can increase flood elevations and contribute to additional flooding. Construction within floodplains also changes flow patterns and directions. Undersized culverts or other structures placed within floodplains can cause backwatering, resulting in larger areas being flooded upstream and dewatering of floodplains downstream of the undersized culvert.

Affected Environment

Floodplains within the project area are associated with the Middle Fork Snoqualmie River and some of the larger tributaries that dissect the project area. Project engineers identified 14 areas along the existing alignment where the project was located near, or crossed over, a floodplain area.

Environmental Consequences

Loss of floodplain vegetation and filling of floodplains due to grading activities were identified. These areas were measured by mapping the observed floodplain boundaries on the alignment maps and calculating the areas intersected by each alternative.

No Action Alternative

No direct, indirect, or cumulative effects resulting from the no action alternative would occur. Implementation of the no action alternative would not result in the additional filling or alteration of floodplains within the project area. Streams crossed by the road that flow through undersized culverts would continue to create scour and depositional patterns that limit floodplain function.

Preferred Alternative

Potential impacts on floodplains and flood storage are related to the amount of new construction, vegetation removal, or fill placed within the floodplain. Implementation of the preferred alternative would place fill material and remove existing vegetation within one floodplain location. Vegetation would be cleared, and fill material would be temporarily placed in the floodplain at stream crossings at MPs 6.0, 8.4, and 10.6. A 19-foot-wide concrete box culvert would replace the existing bridge at MP 6.0. New bridges would be reconstructed to replace existing bridges at MPs 8.4 and 10.6. A temporary detour bridge may also be placed within the floodplain adjacent to the existing bridge at MP 8.4 to accommodate traffic during construction. Implementation of the preferred alternative might require replacement of up to 44 stream and ditch relief culverts (many of which are undersized) in the floodplains of mostly smaller streams.

Fill material can reduce the capacity of the floodplain to store and convey water during storm events. The preferred alternative would better fall in compliance with Executive Order (EO) 11988 regarding floodplains because floodplain connectivity would be improved, and fill material within the floodplain would be reduced. Culvert replacement would improve overall floodplain connectivity by improving water storage and water conveyance capacity. Remaining floodplain

locations would be avoided, because retaining walls would be used to prevent fill materials from encroaching into them.

4.2.9.3 Wetlands and Other Waters of the United States

Affected Environment

Wetlands and other waters of the United States (streams, rivers, and associated waters under the jurisdiction of the U.S. Army Corps of Engineers [USACE]) were identified within the project corridor to establish a baseline for comparing potential resource effects from the alternatives. Wetland and other waters located west of the USFS boundary were delineated in 1999 (Herrera 1999). The remaining areas within the MBS were delineated in 2001 and were verified in 2003 and 2011.

The wetland delineations followed the technical guidelines outlined in the Washington State Wetlands Identification and Delineation Manual (DOE 1997) and the 1987 Corps Manual (USACE, 1987) and its 2010 Regional Supplement (USACE, 2010). Wetlands and other waters of the U.S. boundary mapping provided in the wetland delineation reports were used to assess potential impacts on wetland and aquatic resources.

There are 99 wetlands present within the project corridor, totaling approximately 4 acres. Including the Middle Fork Snoqualmie River, 57 intermittent or perennial aquatic resources are located within the project area, totaling approximately 17 acres.

All wetlands within the project area were evaluated according to the guidelines set forth in the Washington State Wetlands Rating System for Western Washington. This system classifies wetlands into one of four hierarchical categories (Category I (1) being the highest and Category IV (4) being the lowest) based on physical attributes such as wetland and buffer size, irreplaceable ecological functions, hydrologic connectivity, plant species diversity and cover, disturbance, habitat features, and the number of wetland classes present. Of the 33.6 acres of total wetlands located in the project corridor, 33 percent are in Category I (1), 24 percent are in Category II (2), and 43 percent are in Category III (3). No Category IV (4) wetlands were identified.

Environmental Consequences

No Action Alternative

Implementation of the no action alternative would not result in any loss of wetlands or aquatic resources, because there would be no change to the existing road alignment. The no action alternative would not alter runoff rates and sediment transport to adjacent streams resulting from the existing unpaved road. Storm events, routine roadway grading, culvert maintenance, and related maintenance activities would continue to result in minor runoff and sediment transport to the existing wetlands and water resources. Undersized culverts and inadequate drainage would continue to restrict hydrologic connectivity in areas.

Preferred Alternative

The footprint of the preferred alternative was compared to the location of the mapped wetlands and aquatic resources to calculate the extent of permanent loss of wetlands. Total avoidance of all wetland and aquatic resources by the preferred alternative would not be practicable based on the

number, location, and size of wetland and aquatic resources within the project area. The preferred alternative would result in the permanent loss of approximately 1.2 acres of wetlands and approximately 0.1 acre of aquatic resources through the placement of fill material. Permanent loss of wetlands and aquatic resources would result from road widening, slight alignment adjustments, elevation adjustments, culvert and bridge replacements, and related activities associated with the proposed roadway improvement, all of which would require placement of some fill material within delineated wetlands. In accordance with EO 11990, with considerations for economic, environmental, and other factors, all practicable measures to minimize harm to wetlands would be taken. Where practicable, impacts on wetland and aquatic resource areas would be avoided by shifting the alignment or by using retaining walls to minimize the amount of fill material deposited in wetlands.

Fill material in adjacent upland or wetland areas might slightly alter existing surface and subsurface hydrology patterns. Alteration of drainage patterns would occur during construction and might result in short-term changes in habitat quality, exposure and shading, infiltration rates, and water storage capacity, as well as soil compaction.

Aquatic resource conditions in the project area would improve under the preferred alternative due to replacing existing undersized culverts with larger culverts that would pass flood flows and also allow for fish passage, where needed. The preferred alternative would also reduce the amount of sediment and roadway aggregate entering aquatic resources by paving the roadway surface.

Temporary impacts on wetlands and aquatic resources, such as vegetation removal or equipment operation, would occur to facilitate construction of the preferred alternative. Areas of temporary impact would be reduced to the minimum amount needed to facilitate construction, and these areas would be rehabilitated and revegetated before completion. Vegetation would likely be reestablished approximately 3 years after construction.

4.2.9.4 Riparian Areas

Affected Environment

Existing Riparian Reserve mapping for the entire project area was used to determine the potential for impacts on riparian areas. Within the project corridor, approximately 174 acres (73 percent) of land are defined as Riparian Reserves. Riparian vegetation is critical to proper functioning of stream systems through control of bank erosion and sedimentation, water quality maintenance, flood control, and as large woody debris sources. Riparian areas also provide habitat for many species of wildlife.

Removal of riparian vegetation might increase delivery of pollutants and increase stream temperatures. The loss of designated riparian areas might also negatively affect flood control by increasing the rate and volume of runoff flowing into waterways. Removal of large trees in designated riparian areas reduces the availability of large woody debris, which helps promote channel-forming processes and provides cover and habitat for many aquatic organisms.

Environmental Consequences

No Action Alternative

No direct, indirect, or cumulative effects on riparian areas are expected under the selection of the no action alternative. Existing undersized culverts would continue to hinder floodplain connectivity and fish passage within riparian areas. Unauthorized dispersed use would continue to cause detrimental impacts on riparian areas.

Preferred Alternative

Permanent impacts for the preferred alternative were calculated by overlaying the preferred alternative's construction limits on existing Riparian Reserves. Approximately 74 percent of the 45.6 acres of area to be disturbed within the construction limits consist of Riparian Reserves, including approximately 21 acres composed of existing roadway. Implementation of the preferred alternative would impact approximately 48 acres of Riparian Reserve. Vegetation removal would be limited to strips along the existing road alignment. The vegetation removal would not alter the existing character, composition, or function of any designated riparian habitat areas crossed because only a small amount of vegetation, averaging less than 10 feet on either side of the existing roadway, would be removed in each of the designated riparian management areas. The amount affected would not be expected to have a measurable impact on runoff rates.

4.2.9.5 Groundwater

Affected Environment

Groundwater can be affected by road projects through pollution, increases in impervious surface areas, and direct disturbance of shallow aquifers. The Middle Fork Road often passes through areas of standing water throughout the year, suggesting that groundwater levels in these areas may be relatively shallow.

Environmental Consequences

No Action Alternative

Implementation of the no action alternative would not result in any direct, indirect, or cumulative effects on existing groundwater conditions.

Preferred Alternative

The preferred alternative is not anticipated to affect groundwater resources in the project area, because it would not impact the capacity for groundwater to recharge, nor would it result in additional withdrawals or diversions of groundwater resources. Localized trenching and excavations may occur during installation of suitable embankment, surface storm drains, or utilities along some parts of the proposed road. However, these excavations would be temporary, would occur within the existing roadway embankment, or would be shallow enough so that hydrological changes to groundwater resources would not be anticipated.

Cumulative Effects on Water Resources

Implementation of the Bessemer Road Decommissioning, the Middle Fork ATM Plan (USFS 2005a), and DNR and USFS Granite Creek Road Decommissioning and Road to Trail

Projects would result in a reduction of approximately 40 miles of road in the Middle Fork Snoqualmie River watershed, which would increase the capacity of floodplains to store and convey water during storm events. This reduction, combined with implementation of the preferred alternative (reconstruction and paving of approximately 9.7 miles), would cumulatively reduce the potential for road sediment to enter aquatic systems. The design of the preferred alternative, including enhancements such as more culverts to disperse runoff, would help restore the floodplain function that has been lost due to past road construction and culvert installations, as well as helping to restore hydrologic connectivity of the floodplain, wetlands, and streams. Implementation of the preferred alternative would result in replacement of three bridges (two new bridges and one large culvert) and replacement of undersized culverts so that they would pass 100-year flows and associated debris. These improvements, in association with culvert removals conducted through road decommissioning, would result in a small incremental benefit for floodplain connectivity within the valley.

Recent and impending construction of the Pratt River Trail, Mailbox Peak Trailhead, and Granite Creek Trail and Trailhead within the valley would also result in a minor loss of riparian habitat. Decommissioning of roads has allowed or would enable natural revegetation of previously disturbed riparian areas.

Mitigation for Water Resource Impacts

To facilitate construction while minimizing potential turbidity and sedimentation, in-water work, such as that needed for culvert and bridge replacements, would be targeted to occur within periods of low streamflow (generally mid-July to mid-October). Stream diversions and/or cofferdams would be used to isolate in-water work areas. A dewatering and diversion plan would be established to ensure inclusion of appropriate measures to minimize impacts, and the plan would be tailored to on-site conditions at the time of construction.

Appropriate sediment and erosion control BMPs would be put into place before construction would begin, and they would be maintained in working order throughout construction. Erosion controls would remain in place until vegetation became reestablished. Appropriate BMPs and preventative measures for handling hazardous materials, such as placement of refueling facilities and proper storage and handling, would be utilized throughout construction.

Drainage ditches that currently allow flow directly into waterways would be routed to upland areas where feasible. The rerouting would enable infiltration and filtering before flow would reach the waterways. Trees and other riparian vegetation would be restored by using native plants or seeds in areas disturbed by construction activities. Measures to control unauthorized dispersed use that is detrimentally impacting riparian areas, such as off-road vehicles and illegal garbage dumping, would be implemented at areas identified by King County, USFS, and DNR during further design of the preferred alternative.

Permanent wetland impacts would be offset by compensatory mitigation. Mitigation would likely include a combination of on-site and off-site options, including but not limited to wetland creation, enhancement, restoration or rehabilitation, or use of a federally approved In-Lieu Fee Program or wetland mitigation bank, in compliance with federal, state and local wetland mitigation rules. Areas temporarily impacted by vegetation would be rehabilitated and

revegetated. Specific wetland mitigation would be determined during the final design and would be agreed to with USACE through the 404 process.

4.2.10 Soils and Geology

Affected Environment

The valley is located on the western slopes of the Cascade Range atop the Snoqualmie Batholith, which was emplaced by volcanic intrusion. Glacial deposits, in conjunction with erosion and redeposition by river process, have had the most dominant influence within the project corridor. The progressive downcutting of the Middle Fork Snoqualmie River through glacial deposits produced series of terraces visible near the beginning of the project. Terrace deposits include some substantial layers of lacustrine silt/clay, coarse-grained outwash, and silt or sand capping in places due to alluvial reworking and overbank deposition. In some areas along the corridor, underlying metasedimentary rocks are exposed. These metasedimentary rocks range from argillite to greywacke of the middle Eocene to the Late Cretaceous Age.

Soils along the project corridor range from poorly drained hydric soils to excessively drained loamy fine sand, with the dominant soil type being sandy loam. Nearly all soils are covered with varying depths of decomposed organic material.

Environmental Consequences

No Action Alternative

As the no action alternative would not result in changes to existing soils and rock formations adjacent to the existing road, there would be no impacts on soils and geology.

Preferred Alternative

The preferred alternative would require disturbance to existing soils in places and to geology adjacent to the existing road. In areas where the road is currently narrow, impacts on existing soils and geology would occur due to widening outside the existing roadway. Erosion of exposed cut slopes would be possible during and after construction until vegetation becomes reestablished, though the preferred alternative would incorporate BMPS to minimize this risk.

Blasting of existing rock slopes would potentially be required at up to five locations (approximate MPs 3.80, 4.64, 4.84, 6.88, and 9.99) under the preferred alternative to accommodate the roadway width within existing narrow roadway sections and to install rockfall catchment ditches. Rock cuts would generally be 30 feet or less in height, with the exception of the cut at MP 4.84, which would vary considerably from 30 to 80 feet in height. Rock catchment ditches would be 6 to 8 feet wide (as measured from the edge of the pavement to the bottom of the rock slope), with the exception being at the higher rock cut (MP 4.84), where the rockfall catchment ditch would vary from 8 to 15 feet due to the height. Rock cuts would be completed in a manner that would attempt to mimic natural rock faces.

Cumulative Effects

As no projects would occur simultaneous to the preferred alternative, and all preceding projects would likely be properly stabilized, no cumulative effects to soils and geology would be expected.

Mitigation

The combined area of clearing and grubbing (ground disturbance) would be limited by project specifications designed to reduce the amount of exposed soil potentially subject to erosion. Appropriate sediment and erosion control BMPs would be established before starting construction. The BMPs would be maintained in working order throughout the construction period and until vegetation becomes reestablished.

Topsoil would be conserved, stockpiled, and replaced onto disturbed slopes to preserve existing native seed bank within the topsoil and enhance revegetation success. All cut slopes, including rockfall catchment ditches, but excluding rock faces, would be mulched and reseeded following construction. Woody debris might be mulched on site, or other mulch, compost, and erosion control methods would be used to protect seeded areas. The MBS-approved, non-native seed mix might be used to provide temporary ground cover to prevent erosion during construction.

4.2.11 Vegetation

4.2.11.1 Vegetation Communities

Affected Environment

Plant associations within the project area generally fall into one of four groups, as defined by Henderson et al. (1992). These groups include the Western hemlock/sword fern-Oregon grape and the Western hemlock/sword fern-foamflower associations in upland areas, as well as the Western hemlock/devil's club-lady fern and Western hemlock/skunk cabbage associations in riparian and wet areas.

Vegetation community composition and structure within 100 feet of the edge of the existing roadway was mapped according to the structural classification scheme in Johnson and O'Neil (2001). This classification scheme is based on the dominant vegetation types present and the physical characteristics of the stand. Eleven different forest types were identified based on differences in species composition, average size of dominant trees, and degree of canopy closure.

Environmental Consequences

Direct impacts can be described as follows:

1. Temporary impacts in which vegetation may be removed to facilitate construction, but would then be allowed and encouraged to regenerate via native planting and seeding
2. Permanent impacts in which vegetation would be removed and replaced with pavement

No temporary impacts would be likely under the no action alternative. The extent of temporary impacts from the preferred alternative was calculated as the area of each vegetation community removed between the clearing limits and the roadway. Clearing vegetation beyond the existing roadway is considered a temporary impact, as vegetation in this zone would be encouraged to

regenerate following construction. Topsoil would be preserved and replaced on disturbed areas, and these areas would be revegetated with native seed, though the species that recolonized these areas might slightly differ from the surrounding undisturbed areas due to localized changes caused by the new underlying cut and fill slopes.

The reclaimed area was calculated by determining the area of existing roadway that would be removed as part of creating a consistent 20-foot-wide roadway and as part of slight alignment shifts. These areas would be recontoured and revegetated as part of the preferred alternative.

Indirect impacts on vegetation would include local changes in vegetation composition resulting from tree removal and the presence of the road (due to changes in light and precipitation) and the potential introduction of noxious weed species that could out-compete native vegetation. Measures to prevent noxious weeds would be implemented as part of the proposed project, such as use of certified weed-free materials and cleaning of all vehicles before entering the job site.

No Action Alternative

The total area of the existing road, measured from edge-to-edge of the graveled area, is 25.6 acres. This is the existing baseline condition for estimating permanent vegetation removal under the action alternatives. The no action alternative would not involve any road construction; therefore, it would not result in any temporary or permanent impacts on vegetation.

Preferred Alternative

The preferred alternative would result in permanent removal of approximately 2.5 acres of vegetation. Temporary clearing of vegetation to facilitate project construction would total approximately 33 acres. The extent of vegetation removal would be limited to thin strips along each side of the project area. Approximately 3.5 acres of existing roadway would be reclaimed as part of the preferred alternative. The long-term effect would be a net 1-acre gain for vegetation along the project.

Indirect impacts from construction and operation of the preferred alternative may include an increased risk of noxious weed introduction and establishment. Steps to prevent noxious weed introduction and establishment would be taken.

Cumulative Effects

Cumulative effects of the preferred alternative, combined with present and reasonably foreseeable trailhead improvement projects, would result in short-term disturbance of vegetation while disturbed areas were constructed and as vegetation reestablished itself.

4.2.11.2 Sensitive and Survey and Manage Species

After consulting with USFS staff, it was determined that surveys would be required for 7 vascular plant species, 1 species of fungi, 12 species of lichens, and 2 species of bryophytes. Surveys for these species were conducted because of their potential to occur within the project area and their sensitive designation with USFS. These 22 species are known or suspected to occur within the MBS. Of the 22 species, only one (Methuselah's beard) was located within the project area. Although not found during field surveys, large round-leaved orchid is presumed present because of known locations.

Qualified biologists surveyed 3.3 miles of road and adjacent areas on USFS lands. Surveys on USFS lands were conducted using an "intuitive controlled survey" methodology due to the size of the project area (Whiteaker et. al. 1998).

Affected Environment

The USFS pre-field review documented an occurrence of the lichen species Methuselah's beard, along with four occurrences of large round-leaved orchid in the eastern part of the project area. Rare plant surveys conducted on the USFS portion of the proposed project indicated a nearly continuous population of Methuselah's beard, which was located along both sides of the road. The population of Methuselah's beard is especially apparent where the road is immediately adjacent to the Middle Fork Snoqualmie River. Large round-leaved orchid was not located during these surveys. However, due to its known presence in the eastern part of the project area, it is presumed to be present.

Methuselah's beard is widespread and is locally abundant on the MBS, especially north of Stevens Pass (USFS 2003). In the USFS portion of the project area, the population consists of two segments that, when taken together, are approximately 2.8 miles long and are found in multi-age, mid-successional, mixed coniferous/deciduous forest. Project botanists estimated that approximately 25 percent of the habitat along the project area within the identified population boundaries was occupied.

On the MBS, large round-leaved orchid occurs primarily in mesic climatic areas, at low to mid elevations, on moderate slopes, and on sites that are neither very dry nor very wet. Large round-leaved orchid generally spanned an elevation band of approximately 1,200 feet. Large round-leaved orchid was reported from approximately 70 sites on the MBS (Lesher et al., 1998). Within the project area, there is one recorded population near the edge and three populations just outside of the project corridor.

The project area was surveyed for state and federally listed threatened and endangered plant species. No state or federally listed plant species were located within the project area.

Environmental Consequences

No Action Alternative

Increased visitors may lead to minor increased vegetation disturbance. The no action alternative would have negligible direct, indirect, or cumulative effects on the one USFS Sensitive Species, Methuselah's beard, found along the project area, or on the large round-leaved orchid, which is known to be present within the project area.

Preferred Alternative

The preferred alternative would remove approximately 1.9 acres of Methuselah's beard-occupied habitat through limited clearing of roadside vegetation to make way for construction equipment. Direct effects on the Methuselah's beard would be anticipated as a result of the preferred alternative, but 1.9 acres represents approximately 25 percent of the species' presence within the proposed project corridor, and the loss would likely be insignificant within the greater population present within the MBS where the species is widespread and abundant. Therefore, the preferred alternative would not lead to a cumulative loss of Methusaleh's beard viability, nor would it create significant trends toward federal listing.

There would be no impacts on the known populations of the large round-leaved orchid under the preferred alternative. This is because known locations are located outside the disturbance area for the proposed project.

Cumulative Effects

There are no cumulative effects expected on USFS Region 6 Sensitive and Survey and Manage Species. While there are direct effects on Methusaleh's beard because of the preferred alternative, the effects would be minor. The species is widespread and abundant, and most of the projects within the valley, such as road decommissioning and reconstruction associated with other past, present, or foreseeable projects in the Middle Fork Snoqualmie watershed, have not or would not impact existing populations of Methusaleh's beard.

4.2.11.3 Noxious Weeds

Federal and Washington State laws have designated certain plant species as noxious weeds. Noxious weeds are invasive plant species that are highly destructive, competitive, and difficult to control. Noxious weeds are typically found in disturbed areas such as roadsides, gravel pits, and clearcuts. Once noxious weeds are established in disturbed areas, they often spread into surrounding areas. Noxious weeds have many detrimental environmental effects, including reductions in the diversity of native plant and animal species.

Affected Environment

Past disturbances in the project area favored the establishment of some weed species. These species occur along the existing road, and ongoing uses of the project area, such as operation of vehicles along dirt roads, continue to contribute to their spread.

Information on the presence of noxious weed species and other weeds has been collected during the plant surveys conducted for the project. Information has also come from ongoing efforts by USFS, DNR, King County, and Mountain Sound Greenway Trust.

Environmental Consequences

Disturbance is a major factor favoring noxious weed invasions. After disturbance, bare land is often invaded by non-native species. Seeds may be blown in, transported in by animals or water, or introduced inadvertently on clothing, equipment, or vehicles used for construction or by maintenance workers. In addition, roads can contribute to the spread of noxious weeds by forming a corridor for weed and weed seed dispersal. Land uses in the project corridor, such as road building, off-road vehicle use, and clearing of vegetation by recreational users, can also favor establishment and spread of noxious weed species.

No Action Alternative

No additional clearing is associated with the no action alternative. Existing infestations would remain, and treatment would continue at the discretion of King County and USFS. The spread of noxious weeds through disturbance of existing vegetation communities would continue to occur during routine maintenance. The no action alternative would not result in additional introductions of noxious weeds from construction equipment, but noxious weeds might continue to be introduced via existing mechanisms.

Preferred Alternative

Implementation of the preferred alternative would involve ground disturbance and would increase the potential for the introduction and spread of noxious weeds. The preferred alternative would require the use of construction equipment, which might lead to the introduction of noxious weeds. The road would be realigned through existing vegetated areas, which would temporarily increase the chances for noxious weed colonization and spread. The measures to mitigate this risk that would be implemented as part of the proposed action, including pre-treatment of weed infested areas, use of weed-free certified materials, and washing of construction equipment before its entry into the project area, would likely effectively eliminate the preferred alternative's potential for introduction and spread of noxious weeds.

Disturbed areas would be mulched and reseeded with native plant species. The slightly higher number of daily vehicles (24 additional vehicles at the beginning of the project and 17 near the end) expected under the preferred alternative compared to the no action alternative would not likely have a measurable effect on the introduction and spread of noxious weeds within the project area.

Cumulative Effects

No expected cumulative increase in the introduction and spread of noxious weeds within the valley would occur as a result of either alternative in combination with past, present, and reasonably foreseeable future projects. Existing mechanisms of introduction and spread would continue, and any future construction projects would likely include measures to prevent the introduction and spread of noxious weeds in association with the project.

Implementation of the preferred alternative would require treatment of existing noxious-weed infestations. This, combined with the decommissioning of roads resulting from implementation of the Middle Fork ATM Plan (USFS 2005a), could result in a cumulative reduction in the amount and spread of noxious weeds within the valley.

Mitigation for Vegetation

Efforts to minimize temporary vegetation removal associated with the proposed action would include limbing trees, rather than entirely removing them, where practicable, leaving the roots of trees that have to be removed in place to provide soil stability and to allow for regeneration for capable species, and minimizing disturbance to surrounding vegetation. Topsoil would be conserved, stockpiled, and replaced onto disturbed slopes to preserve the existing native seed bank within the topsoil and to enhance revegetation success.

All disturbed areas would be seeded/and or planted with native species. A revegetation plan would be developed to determine species to be used by locations, such as in upland areas and wetland areas. An approved non-native sterile seed mix might be used to provide temporary ground cover to prevent erosion during construction. As appropriate, mulch, tackifier, or other erosion control method would be used to protect seeded areas.

If any previously undiscovered Endangered Species Act (ESA) or other Region 6 Sensitive or Survey and Manage vascular plants, bryophytes, lichens, or fungi are discovered before or during

project implementation, work would be halted until a USFS botanist could be consulted, and necessary mitigation measures were enacted.

The measures to mitigate the risk of introduction and spread of noxious weeds associated with the preferred alternative would include identification of and pretreatment of weed-infested areas, the requirement that all materials be certified weed-free, and the washing of construction equipment before its entry into the project area. In addition, disturbed areas would be mulched and reseeded with native plant species.

4.2.12 Wildlife

4.2.12.1 General Wildlife

The analysis of impacts on wildlife is based on a modification of the focal species approach presented in Gaines et al. (2003). This approach was chosen because it allows potential effects of the different alternatives to be compared, and it is similar to the focal-species approach recommended for ecological monitoring under USFS planning regulations (36 CFR 219). In this type of analysis, wildlife species are placed into functional groups. Functional groups are composed of animals with similar life histories. The impacts from construction and operation of a project on the functional group are then assessed. Because functional groups include numerous species, analyses were further refined by selecting representative (or focal) species within each group.

Affected Environment

Five functional wildlife species groups were identified to represent the diversity of species within the project. Twenty-two focal species were then selected to represent the functional groups (Table 4-1). To estimate impacts on other wildlife species with the potential to occur within the project area, these species were assigned to one of the five functional groups.

Table 4-1. Functional Groups and Focal Species

Functional Group	Focal Species	Presence in Project Area
Wide-ranging carnivores	Grizzly bear, gray wolf, wolverine, Canada lynx	Transient, no resident individuals documented
Ungulates	Columbian black-tailed deer, elk	Year-round resident
Late-successional forest associated species	Northern spotted owl, marbled murrelet, Northern goshawk, brown creeper, American marten, Northern flying squirrel, Larch Mountain salamander, Vaux's swift	Year-round resident, breeding-season resident
Riparian and wetland associated species	Harlequin duck, tailed frog, warbling vireo, American beaver	Year-round resident, breeding-season resident
Primary cavity excavators	Pileated woodpecker, red-breasted sapsucker	Year-round resident, breeding-season resident

Environmental Consequences

A literature review targeting the focal species identified seven potential effects of the proposed project on wildlife (Table 4-2). Roads would affect functional groups and focal species in a number of ways; thus, the literature review was also used to examine the potential vulnerability of groups and species to different road effects (Table 4-3).

Table 4-2. Potential Effects of Roads on Wildlife

Road Effect	Description of Effect	Potential Consequences of Effect
Direct mortality	Mortality from collisions with vehicles or construction equipment (indirect and direct effects)	Increased mortality, decreased population growth rate, increased risk of local extinction, population fragmentation if mortality prevents successful crossing
Indirect mortality	Mortality from increased contact with humans (euthanasia, hunting, poaching) as facilitated by road access (indirect effect)	Increased mortality, decreased population growth rate, increased risk of local extinction, population fragmentation if mortality prevents successful crossing
Barrier to movement	Interference with dispersal, seasonal migration, or movement within a home range (indirect effect)	Population fragmentation, decreased survival or reproductive success if access to seasonally important resources is limited (e.g., winter range for deer and elk)
Indirect loss of habitat	Loss of the use of habitat near road due to behavioral avoidance of road-associated disturbances (indirect effect)	Lower species richness in the project area, decreased regional carrying capacity and, thus, potential for population declines, extirpation of habitat-specialists relying on habitat with limited distribution
Direct loss of habitat	Removal of habitat within footprint of road, including maintained ROW (direct effect)	Lower species richness in the project area, decreased regional carrying capacity and thus potential for population declines, extirpation of habitat-specialists relying on habitat with limited distribution
Habitat degradation	Reduced habitat quality due to effects associated with road (e.g., a wider road clearing changes microclimatic conditions in adjacent forest) (indirect effect)	Reduced reproductive success and reduced survival caused by habitat degradation potentially leading to population declines and local extinction
Physiological response	Physiological effects of stress (e.g., increase in stress-related hormones) due to road-associated disturbance (indirect effect)	Decreased growth, survival, and reproduction

Table 4-3. Potential Vulnerability of Functional Groups and Focal Species to Road Effects

Road Effect	Functional Groups Affected	Focal Species Affected
Direct mortality	Wide-ranging carnivores, ungulates, Late Successional-forest associated, riparian and wetland associated	Grizzly bear, gray wolf, wolverine, Colombian black-tailed deer, elk, Northern spotted owl, American marten, Larch Mountain salamander, tailed frog, beaver
Indirect mortality	Wide-ranging carnivores, ungulates	Grizzly bear, gray wolf, wolverine, Colombian black-tailed deer, elk
Barrier to movement	Wide-ranging carnivores, ungulates, Late Successional Forest-associated, riparian and wetland associated	Grizzly bear, gray wolf, wolverine, Colombian black-tailed deer, elk, American marten, Larch Mountain salamander, Cascades frog, tailed frog
Indirect loss of habitat	Wide-ranging carnivores, ungulates, Late Successional Forest-associated	Grizzly bear, gray wolf, wolverine, Northern spotted owl, marbled murrelet, American marten
Direct loss of habitat	All	All
Habitat degradation	Late Successional Forest-associated, riparian and wetland associated	Northern spotted owl, Larch Mountain salamander, brown creeper, Cascades frog, tailed frog, warbling vireo
Physiological response	Wide-ranging carnivores, ungulates, Late Successional Forest-associated	Grizzly bear, gray wolf, wolverine, Colombian black-tailed deer, elk, Northern spotted owl

Among the functional groups, wide-ranging carnivores would be most at risk of being affected by roads because of their large home ranges, high mobility, and sensitivity to human activity. Late successional forest associated species would also be vulnerable due to their specialized habitat requirements and sensitivity to disturbance. Riparian and wetland associated species and primary cavity excavators would not be as vulnerable to the road effects likely resulting from the proposed project.

Wide-Ranging Carnivores

The wide-ranging carnivore group includes mid-sized and large forest carnivores with large home ranges and high dispersal capabilities. The risk of collision is thought to increase as average speed and traffic volume increases (Joyce and Mahoney 2001). The 35-mph design speed for the preferred alternative would remain the same as the existing posted speed limit for the route and would be below the speed thought to pose a substantial risk to large, mobile animals (Gunther et al. 2000, Bertwistle 2003). Traffic volume would increase to an ADT of 347 under the no action alternative and 371 under the preferred alternative, which is well below the traffic volume at which road crossings become dangerous for most carnivores (2,000 vehicles per day; Reudiger 2000). Thus, no change in direct mortality is expected under either the no action or the preferred alternative.

The existing road corridor provides humans with access to potential habitat for all of the wide-ranging carnivores, and this would not change under the preferred alternative, though the

access would improve. Access poses a risk to wide-ranging carnivores, because it allows people access for poaching and/or illegal shooting.

Although roads can act as barriers to movement for all of the wide-ranging carnivores (Mech et al. 1995, Gibeau and Heuer 1996, Forman et al. 2003), predicted ADT under both the no action and the preferred alternative would be well below the level at which roads are thought to present a barrier to movement of large carnivores. For example, Chruszcz et al. (2003) found that roads with an ADT of 2,000 to 3,000 had little effect on the movement of grizzly bears. Similarly, Ruediger (2000) proposed that most forest carnivores would have little difficulty safely crossing roads with an ADT of less than 2,000 vehicles.

The grizzly bear, gray wolf, and wolverine all avoid roads to some degree and, thus, experience an indirect loss of habitat in areas surrounding roads (Mech et al. 1988, Powell and Zielinski 1994, Banci 1994, Carroll et al. 2001, Gaines et al. 2003, Rowland et al. 2003). For wide-ranging carnivores, traffic noise and the sight of passing vehicles, both of which may increase the perception of risk, are likely important factors in triggering an avoidance response (e.g., Forman and Alexander 1998, Creel et al. 2002). For grizzly bears, this avoidance zone can extend more than 1,640 feet from an open road (Kasworm and Manley 1990). For this analysis, it is assumed that other wide-ranging carnivores respond similarly to grizzly bears.

Because the proposed project occurs within an existing road corridor, areas within 1,640 feet of the existing alignment centerline are likely not suitable as habitat for wide-ranging carnivores. Increases in traffic volume and consequent increases in traffic noise under the preferred alternative would not likely increase the avoidance zone; thus, no indirect habitat (including construction) loss for wide-ranging carnivores would likely occur. Wide-ranging carnivores avoid areas around open roads. Thus, neither the no action alternative nor the preferred alternative would lead to a loss of core habitat.

Gray wolves respond to stimuli associated with motorized vehicles by increasing production of stress hormones (Creel et al. 2002). Similar studies have yet to be conducted for other wide-ranging carnivores, but it is reasonable to assume that grizzly bear and wolverine respond to road-associated disturbances with an increase in levels of stress hormones. Chronically elevated levels of stress hormones can impair reproduction, growth, and immune function (Sapolosky 1992).

Because the project area serves only as dispersal habitat for wide-ranging carnivores, their use of the area would likely be transient. Thus, chronic increases in stress levels due to road-associated disturbances would not likely occur under either the no action or the preferred alternative.

Ungulates

Focal species considered in this analysis were Columbian black-tailed deer (a subspecies of black-tailed deer occurring west of the Cascade crest and south of British Columbia, Canada) and elk, the two most common ungulate species in the project area. Mountain goat are not present within the project area.

Mortality from collisions with vehicles is common in most ungulate populations. The frequency of traffic deaths is related to traffic volume (Romin and Bissonnette 1996) and perhaps average vehicle speed, although the latter relationship is not well documented (Knapp 2003). ADT is predicted to increase at a rate of approximately 1.1 percent per year under the no action

alternative and 1.5 percent under the preferred alternative, but is not expected to approach the level at which ungulates have difficulty safely crossing roads (Alexander et al. 2005).

By facilitating access to ungulate habitat, roads can increase mortality due to hunting and poaching (Hayes et al. 2002). Because the proposed project takes place within an existing road corridor, road density would not change under either alternative. Thus, no increase would be likely in mortality of ungulates as an indirect consequence of the access provided by the road.

Roads only become barriers to the movement of ungulates at relatively high traffic levels (generally above 5,000 ADT; Alexander et al. 2005). At moderate levels of ADT, such as that projected along Middle Fork Road, road corridors remain relatively permeable to ungulates. Traffic levels under either alternative are not expected to reach levels at which the road would begin to pose a barrier to movement of ungulates.

Elk and Columbian black-tailed deer avoid roads, trails, and other areas with concentrated human use (Gaines et al. 2003). Ward (1976) found that elk generally stayed at least 1,312 feet from open roads, while Perry and Overly (1977) reported a displacement distance of 2,624 feet for Columbian black-tailed deer. Potential sources of disturbance, including traffic noise and the sight of passing vehicles, would not likely change at these distances under either of the alternatives. No indirect loss of habitat would result under either of the alternatives. However, temporary disturbance of this focal group might occur during construction under the preferred alternative due to construction equipment, vegetation clearing, and noise.

Elk and Columbian black-tailed deer use the project area primarily during the winter, summering at higher elevations in the Pratt, Taylor, and Quartz Creek drainages (USFS 2002). All vegetation types within the project corridor are considered potential wintering habitat for deer and elk; therefore, potential impacts are calculated as the total area of vegetation removed. Approximately 3 acres of potential wintering habitat would be permanently lost, 4 acres reclaimed, and 33 acres temporarily lost under the preferred alternative. The loss of potential wintering habitat would not likely have a measurable effect on ungulate populations, as any vegetation removal would occur in a relatively thin strip along the length of the alignment, all of which would fall within the current zone of road avoidance, as discussed above.

Elk increase production of stress hormones in response to traffic (Millspaugh et al. 2001), and Columbian black-tailed deer likely have the same response. Levels of traffic noise and visibility of passing vehicles would not likely change beyond the existing zone of road avoidance under either alternative. Thus, no changes in stress levels are expected.

Late Successional Forest Associated Species

As a group, these species require forest stands with complex vertical structure, a closed canopy, and a relatively cool and moist microclimate. Some species in this group also require downed logs or large snags. Focal species considered in this analysis were northern spotted owl, marbled murrelet, northern goshawk, brown creeper, American marten, northern flying squirrel, salamanders, and Vaux's swift.

The late successional forest focal species vary greatly in their susceptibility to mortality associated with construction and operation of roads. Larch Mountain salamanders are slow moving and may occur beneath woody debris or rocks on the forest floor. They are likely the only focal species vulnerable to direct mortality from road construction and operation. Salamanders

are also susceptible to road kill, and even small increases in traffic volume can produce substantial increases in mortality of amphibians attempting to cross roads (Carr and Fahrig 2001, Hels and Buchwald 2001, Mazerolle 2004). Surveys within the project area did not detect any Larch Mountain salamanders (see Section 4.2.12.3, Sensitive and Survey and Manage Wildlife Species).

American marten avoid areas around roads (Robitaille and Aubry 2000), but may not experience roads as barriers to movement until ADT exceeds 2,000 (Ruediger 2000). Traffic volumes projected under the no action or preferred alternative are not expected to reach this threshold.

Late-successional forest focal species exhibit two general patterns of response to road-related disturbances. First, northern spotted owl and marbled murrelet are sensitive to loud and sudden noises, as from blasting with explosives or pile-driving (USFWS 2003). During the breeding season, loud noises may cause adults to stop feeding visits or temporarily abandon their nests, leaving eggs and young exposed to predators and unprotected from adverse weather. Neither species is known to currently breed within the project area, so indirect loss of habitat resulting from disturbances associated with construction would not be expected. Neither species is especially sensitive to traffic noise (USFWS 2003). Thus, should the project area eventually be used as breeding habitat, negative effects of elevated traffic noise would be unlikely under the no action or preferred action alternative.

American marten show patterns of road avoidance similar to wide-ranging carnivores and tend to be less abundant or active around roads (Robitaille and Aubry 2000). However, as with wide-ranging carnivores, it is assumed that American marten already avoid the project area due to the existing road. Thus, additional indirect habitat loss would be unlikely under the preferred alternative.

Some mature conifer forested areas are located within the project area. These areas provide potential habitat for late-successional, forest-associated species. Species in this group would be most affected by the loss of large trees and snags that occur within the proposed clearing limits (USFS 1993). The removal of large trees and snags would result in a loss of potential breeding and roosting sites for many species associated with mature forest stands.

Removal of overstory trees within the proposed clearing limits of the preferred alternative would lead to slightly increased solar radiation, resulting in slightly warmer and drier microclimate in areas of mature forest adjacent to clearing areas, though this change would not likely be measurable. All vegetation clearing would take place adjacent to the existing road alignment.

Species inhabiting areas next to the existing road likely experience an edge effect resulting from the presence of the road. Vegetation removal for the preferred alternative would not likely change the current microclimate along the road edge. No additional habitat degradation would be likely under the no action alternative, with the possible exception of ongoing maintenance activities such as removal of hazard trees.

Northern spotted owls can tolerate exposure to low-intensity human sound without an increase in stress hormones (Tempel and Guttierez 2003). The primary source of low-intensity sound associated with the proposed project would be traffic noise, which would not likely increase appreciably over the no action alternative. Thus, assuming that other species associated with late-successional forests respond in a similar fashion, operation of Middle Fork Road under the

preferred alternative would not likely increase stress. For most species in this focal group, the effects of construction noise are unknown, but stress responses would be likely for northern spotted owl and marbled murrelet, given the documented responses of these species to sudden, loud noises (USFWS 2002). However, neither species currently breeds within the project area.

Riparian and Wetland Associated Species

This functional group consists of species that depend on riparian and wetland habitats. Species in this group have lifestyles ranging from partially aquatic to completely terrestrial. Focal species considered in the analysis were Harlequin duck, tailed frog, warbling vireo, and American beaver.

Most riparian and wetland associated species within the project area stay close to these areas, and roadkill would not likely be a substantial source of mortality under either alternative. Riparian and wetland birds occasionally collide with vehicles, but traffic volume and traffic speeds projected under the preferred alternative would be below levels expected to pose a substantial risk to riparian and wetland birds.

For some riparian and wetland associated species, especially amphibians, roads can pose a barrier to movement, because crossing attempts are rarely successful. However, this form of habitat fragmentation is most problematic when roads separate breeding and wintering habitats (e.g., Jackson 1996). None of the amphibians expected to occur within the project area is known to undertake seasonal movements that would require crossing the road corridor (Nussbaum et al. 1983). Therefore, the preferred alternative would not likely have a substantial effect on amphibian movement patterns. Traffic volumes would not likely pose a substantial barrier to the movement of more mobile riparian and wetland animals, such as birds or mammals.

There would be no loss of habitat under the no action alternative. The removal of habitat under the preferred alternative, although not extensive, would likely lead to a reduction in population size for some riparian-and wetland-associated species. Direct loss of habitat might be offset for some species by improvements in habitat quality under the preferred alternative. The preferred alternative would permanently affect approximately 1.1 acres of wetland and would affect approximately 33.9 acres of Riparian Reserve habitat.

Runoff from the existing Middle Fork Road introduces sediment into surrounding wetlands and waters. This might diminish habitat quality for some wetland and riparian associated species, such as tailed frog (Welsh and Ollivier 1998). Temporary disturbance of this focal group might be expected during construction of the preferred alternative due to construction equipment, vegetation clearing, and noise. Long-term the preferred alternative would have beneficial effects through sediment load reductions expected from improvements to drainages that prevent erosion.

Primary Cavity Excavators

This functional group consists of species that create cavities within trees and snags for some part of their life cycles, usually for nesting. Focal species considered in the analysis were pileated woodpecker and red-breasted sapsucker.

Up to approximately five large snags, greater than 20 inches in diameter at breast height, that provide potential or current habitat for primary cavity excavators would be removed under the preferred alternative. Temporary disturbance of this focal group might be expected during

construction of the preferred alternative due to construction equipment, vegetation clearing, and noise.

Cumulative Effects

Cumulative effects of the preferred alternative, when combined with present and reasonably foreseeable trailhead improvement projects, would result in short-term disturbance of potential habitat adjacent to the roadway until vegetation reestablished itself. As no projects would occur simultaneously in time, no additional cumulative effects would likely result from construction.

4.2.12.2 Threatened and Endangered Wildlife Species

Five federally listed threatened and endangered wildlife species that may potentially occur in the project vicinity were identified (Table 4-4). A discussion of potential effects on these species is provided below. Endangered species are protected under ESA and are considered in immediate threat of extinction. Threatened species are likely to become endangered unless conditions change. Candidate species are those considered in danger, but for which the threat is not immediate. USFWS has designated critical habitat for marbled murrelet and northern spotted owl within the project area.

Table 4-4. Federally Listed Species that May Occur in the Project Area

Species	Federal Status	State Status
Northern spotted owl	Threatened	Endangered
Marbled murrelet	Threatened	Threatened
Canada lynx	Threatened	Threatened
Gray wolf	Endangered	Endangered
Grizzly bear	Threatened	Endangered

Northern Spotted Owl (Threatened)

Northern spotted owls inhabit mid-seral to older coniferous and mixed coniferous and deciduous forests from northern California to southern British Columbia. Northern spotted owls are occasionally found in younger forests or forests dominated by broad-leaved species (Glenn et al. 2004), especially those that contain remnants of earlier old-growth stands (Thomas et al. 1990). Northern spotted owl foraging and roosting habitat during the non-breeding season is generally similar to habitat used during the breeding season, although younger forests that retain some old-growth characteristics may be used (Herter et al. 2002). Northern spotted owls may use a variety of habitats during dispersal, including habitats unsuitable for breeding (Miller 1989).

Most of the project area is suitable dispersal habitat, and designated critical habitat is adjacent to the project area for the final 3 miles. Therefore, surveys were conducted during the 2004 breeding season (March to September) to determine whether northern spotted owls were present within the project area. No northern spotted owls were detected during the surveys. FHWA, USFS, and USFWS conducted an interagency field visit in February 2012 and verified that no suitable nesting structure is available adjacent to the road.

Approximately 3 miles of the project alignment crosses through designated critical habitat for northern spotted owls on NFS Lands (Figure 4-6). Approximately 0.15 acre of vegetation

removal (0.07 acre permanent, 0.07 acre temporary) and 0.06 acre of existing roadway would be reclaimed and revegetated in northern spotted owl designated critical habitat under the preferred alternative, resulting in a long-term net loss of 0.01 acre of vegetation within critical habitat. No suitable nesting structure is present within this area of vegetation. As some of the critical habitat that could be affected by the project contains suitable foraging and dispersal habitat, spotted owls would likely avoid the area during construction activities, though this is expected to have insignificant effects on foraging and dispersing spotted owls within the area. Therefore, the preferred alternative may affect, but is not likely to adversely affect, designated spotted owl critical habitat.

Harassment can lead northern spotted owls to flush from the nest, abort a feeding, or postpone a feeding (USFWS 2003). Given the lack of suitable nesting structure within the action area, potential injury to northern spotted owls is not expected and is, therefore, discountable. Although historical data and past project-specific surveys indicated lack of presence of northern spotted owl within the action area, the validity period for the surveys has expired, and spotted owls may now be present.

Suitable spotted owl foraging and dispersal habitat is adjacent to the project area, and noise associated with the preferred alternative may cause spotted owls to avoid the area during construction activities, though these activities are expected to have an insignificant effect on foraging and dispersing spotted owls within the action area. Therefore, the preferred alternative may affect, but is not likely to adversely affect, northern spotted owl. FHWA consulted with USFWS during the development of a preferred alternative and received USFWS concurrence on these determinations of effect on northern spotted owl and its designated critical habitat, should the preferred alternative be selected.

Marbled Murrelet (Threatened)

Marbled murrelets are small seabirds of the Pacific Ocean, ranging from southern Alaska to central California. During the breeding season, marbled murrelets forage in coastal waters, but they build nests as far as 40 miles inland in old-growth forest stands (Ralph et al. 1995). Two sites in the upper reaches of the Middle Fork Snoqualmie River watershed have been documented in the past as occupied by marbled murrelets, although no suitable habitat exists within the project area, and historic information has not shown any nest in the area (USFS 1998). Most of the old-growth forest has been removed in the lower and middle reaches of the valley. Adult marbled murrelets have been rarely observed using the Middle Fork Snoqualmie River as a travel corridor when flying between the ocean and the nest with food for their offspring (Sonny Paz, USFS biologist, pers. comm.). During an interagency field review of the project area between FHWS, USFS, and USFWS in February 2012, it was determined that no suitable habitat exists adjacent to the road alignment.

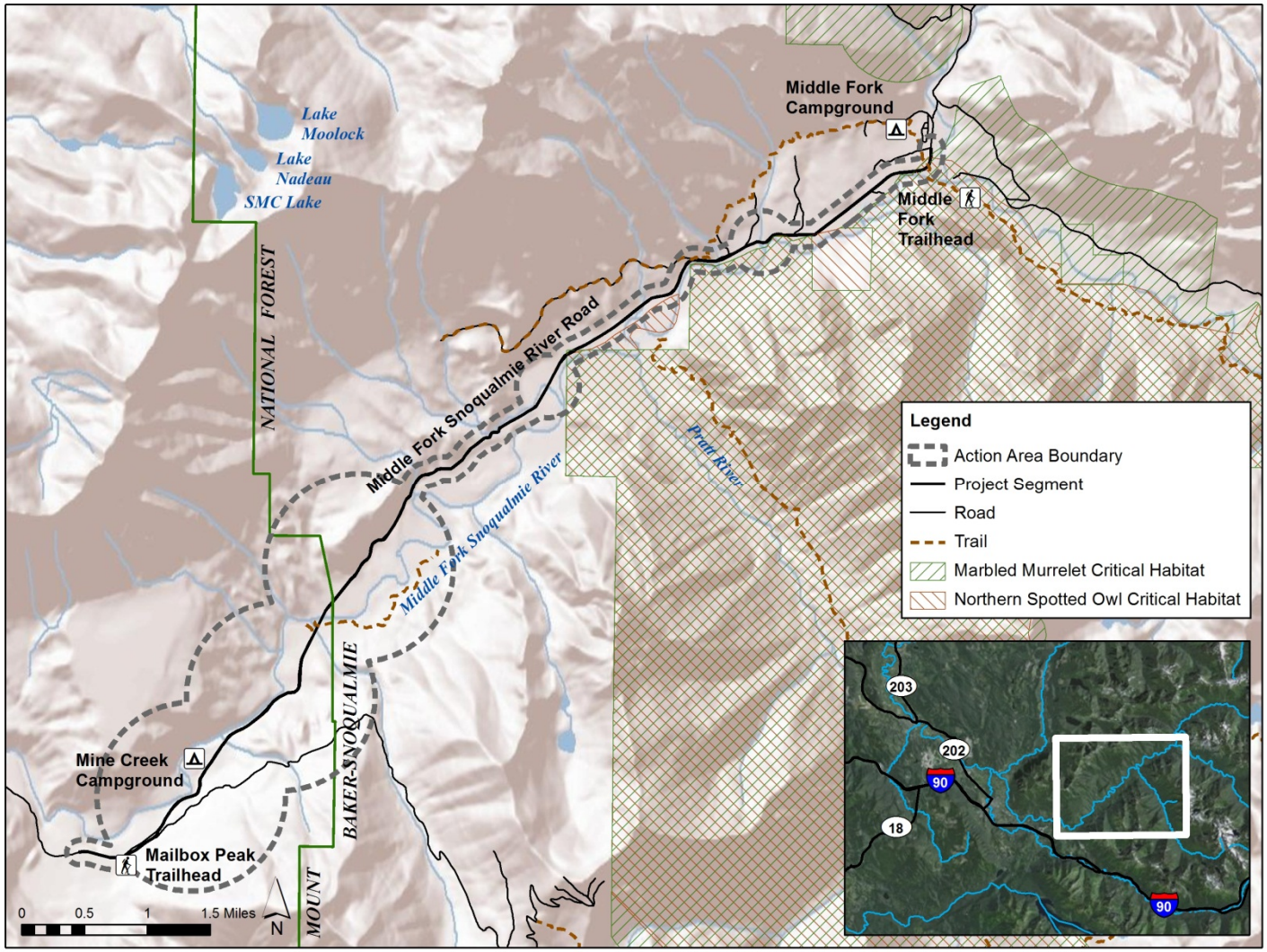

Figure 4-6. Marbled murrelet and northern spotted owl critical habitat map.

Habitat removal has been identified as a primary threat to marbled murrelet (61 Fed. Reg. 26257). Approximately 3 miles of the proposed project alignment is adjacent to designated critical habitat. Under the preferred alternative, 0.23 acre of vegetation would be removed (0.11 acre permanent, 0.12 temporary) and 0.06 acre of existing roadway would be reclaimed and revegetated. However, since no suitable marbled murrelet habitat exists within the clearing limits, there would be no effect on marbled murrelet associated with habitat loss.

All of the vegetation that would be temporarily removed is located along the road edge and does not contain the primary constituent elements necessary to support marbled murrelet nesting in the designated critical habitat. During the February 2012 field review of the project area between FHWS, USFS, and USFWS, some potential low-quality murrelet nesting habitat exists approximately 105 feet from the edge of the roadway at MP 8.6 to MP 8.73. FHWA has agreed to limit clearing operations within this area to outside the nesting season for marbled murrelet to avoid potential impacts. The net 0.05 acre of vegetation incorporated into the road structure constitutes an insignificant impact to critical habitat. Therefore, the preferred alternative may affect, but is not likely to adversely affect, designated marbled murrelet critical habitat.

Considering the very small amount of vegetation that would be removed within a narrow strip, the lack of suitable habitat that would be removed, the proximity of the existing road, impacts on marbled murrelet are expected to be discountable. Therefore, it has been determined that the proposed action may affect, but is not likely to adversely affect, marbled murrelet. FHWA consulted with USFWS during the development of a preferred alternative and received USFWS concurrence on these determinations of effect on marbled murrelet and its designated critical habitat.

Canada Lynx (Threatened)

Canada lynx occur throughout the high-elevation forests of north-central and northeastern Washington, but probably have never established resident populations west of the Cascades (Stinson 2000). Observations of Canada lynx west of the Cascades are few and scattered and are thought to represent transient individuals dispersing during the low phase of the snowshoe hare (their primary prey) population cycle (Stinson 2000). Canada lynx have never been observed within the Middle Fork Snoqualmie River watershed, and the closest potential lynx habitat is greater than 17 miles from the project area (USFS 2002). Potential dispersal habitat may exist along the crest of the Cascades in the upper reaches of the watershed, but the proposed project would have no effect on these travel corridors. In addition, according to the Canada lynx Conservation Agreement between USFS and USFWS, the southern portion of the MBS is considered unoccupied by Canada lynx (USFS and USFWS 2006). Thus, the proposed project would not impact the Canada lynx.

Gray Wolf (Endangered)

Historically, gray wolves were widespread throughout the Northern Hemisphere and occupied nearly all environments except for true deserts (Mech 1970). Important elements of gray wolf habitat include limited human disturbance and an abundance of large ungulates (Mladenoff et al. 1999). Road density within the Middle Fork Snoqualmie River watershed is 0.91 mile per square mile, just below the upper threshold assumed to limit reproductive success for gray wolves. Furthermore, the abundance of large prey appears marginal for supporting a reproductive wolf

pack (USFS 1998). Generally, reproductive wolf packs require prey densities of approximately 10 deer per square mile, and current densities of large ungulates in and around the project area are not sufficient to support resident gray wolves (USFS 1998, USFS 2002). Ungulate population declines are predicted to continue on the MBS as forest stands age, and amounts of forage decline.

Given the current absence of resident gray wolves within the Middle Fork Snoqualmie River watershed, any direct impacts of the proposed project would be limited to effects on dispersal habitat. None of the alternatives would affect the availability or quality of habitat, as areas within 0.3 mile of an open road, motorized trail, or high-use trail are not considered suitable habitat for gray wolves on the MBS (USFS 1998, USFS 2002). As gray wolves are not within the proposed project area, there would be no impact on this species.

Grizzly Bear (Threatened)

Grizzly bears once occurred throughout much of western North America, but currently are restricted to six areas: the North Cascade mountains of Washington, the Selkirk mountain range of Idaho and northeastern Washington, the Cabinet-Yaak region of northwestern Montana, the Selway-Bitteroot mountains of Idaho and far western Montana, the Northern Continental Divide ecosystem of north-central Montana, and the Yellowstone ecosystem (USFWS 1993). There are no confirmed sightings of grizzly bears within the Middle Fork Snoqualmie River watershed. However, the watershed lies within the North Cascades Grizzly Bear Recovery Zone (USFWS 1997).

As an interim management strategy designed to protect future options for grizzly bear recovery, the MBS has adopted a policy that prevents the net loss of core grizzly bear habitat (i.e., habitat greater than 0.3 mile from an open road, high-use trail, or motorized trail). As the preferred alternative would occur within an existing and heavily used road corridor, none of the alternatives would result in the loss of any core grizzly bear habitat. Since grizzly bears are not within the proposed project area, the preferred alternative would have no impact on grizzly bears.

Cumulative Effects on Threatened and Endangered Wildlife Species

Due to a lack of measurable direct or indirect effects from the Middle Fork River Road Project, there would be no contribution to cumulative effects for Canada lynx, gray wolf, and grizzly bear. There would be minor impacts on northern spotted owl, marbled murrelet, and their respective critical habitat, as described above. Given the small amount of critical habitat impacted within the valley and a lack of present and reasonably foreseeable future projects that would negatively impact the species or their critical habitats, no cumulative effects would be anticipated because of the preferred alternative. Therefore, the preferred alternative would not prohibit recovery of the northern spotted owl and marbled murrelet based on habitat considerations.

4.2.12.3 Sensitive and Survey and Manage Wildlife Species

Four sensitive species that may potentially occur in the project vicinity were identified for the proposed project area (fisher, wolverine, Oregon spotted frog, and bald eagle). In addition, there are also many neotropical migratory birds present within the project area. These species are discussed below. Necessary surveys were also completed for Survey and Manage wildlife species potentially present in the project area: the Van Dyke's salamander, Larch Mountain salamander,

and Puget Oregonian. No Survey and Manage wildlife species were found within the project area; therefore, neither alternative would have any impact on Survey and Manage species.

Fisher

Fisher are on the USFS sensitive species list and also on the USFWS candidate species list as potentially warranting listing under ESA. Fisher once inhabited forests throughout northern North America, ranging as far north as Hudson Bay and as far south as the southern Appalachians and the coastal mountains of California (Powell and Zielinski 1994). In the western Cascades of the Pacific Northwest, fishers are associated with low-to mid-elevation, Late-successional conifer forests (reviewed in Powell and Zielinski 1994), although they also use riparian areas for foraging, travel, and rest sites (Lewis and Stinson 1998).

There are no documented occurrences of fishers in the project area, although two confirmed sightings, in 1990 and 1995, occurred several miles outside the project area. The project area likely includes some suitable habitat; however, resident populations of fisher have not been discovered in Washington despite extensive surveys (Lewis and Stinson 1998). Washington is not believed to support a viable population of fishers at present (Lewis and Stinson 1998). Thus, any use of the project area by fishers would reflect transitory use by dispersing individuals. Neither alternative would result in conditions that would hinder the movement of individuals through the project area, nor would they permanently alter habitat conditions in such a way as to limit the future recovery of this species in the project area.

North American Wolverine

Wolverine appear on the USFS sensitive species list and the USFWS candidate species list. Currently, wolverines appear to be distributed in two regions in the lower 48 states: the northern Cascades in Washington, and the northern Rocky Mountains in Idaho, Montana, and Wyoming (USFWS 2011). There are no documented occurrences of wolverines in or near the project area. The closest unconfirmed sighting occurred on the Skykomish Ranger Distict in 1982. A wildlife camera also photographed a wolverine south of Glacier Peak on the Skykomish Ranger District as part of an ongoing wildlife study begun in 2008 (Defenders of Wildlife 2011). Neither alternative would have an impact on the North American wolverine based on the lack of documented occurrences in or near the project area.

Oregon Spotted Frog

Oregon spotted frog are listed as a USFS sensitive species and a USFWS candidate species. There are no documented occurrences of Oregon spotted frog in or near the project area. The last known sighting of the Oregon spotted frog in Washington was in 1968 (Nussbaum et. al. 1983). It is unlikely that the project area supports Oregon spotted frogs; consequently, no surveys or habitat analyses were conducted. Neither alternative would have an impact on the Oregon spotted frog based on the lack of documented occurrences in or near the project area.

Bald Eagle

Bald eagles are on the USFS sensitive species list and the Washington State “Species of Concern” list. Bald eagles generally nest in multi-storied forest stands with at least some old-growth components (Anthony et al. 1982). Nests may be reused for multiple years (USFWS 1986) and

are usually placed in the largest tree within a stand (Anthony et al. 1982). On wintering grounds, bald eagles often congregate in large numbers at communal roosting areas. Communal roosts are typically found in uneven-age forest stands, often with an old-growth component, that are close to an abundant food resource (e.g., anadromous fish runs or concentrations of wintering waterfowl) (Anthony et al. 1982).

Pockets of mature forest that could provide nesting and roosting habitat for bald eagles occur along the Middle Fork Snoqualmie River. However, the Middle Fork Snoqualmie River lacks anadromous fish and is, thus, unlikely to support either nesting or large concentrations of wintering bald eagles. Only 10 sightings (8 adults, 2 juveniles) exist within the Snoqualmie River Watershed (USFS 1998). Nesting has never been recorded in the project area, and no communal roosts are known to exist within the project area or the Middle Fork Snoqualmie River watershed. No impact would likely occur on bald eagle or wintering or breeding habitat from either alternative.

Neotropical Migratory Birds

Neotropical migratory birds are those bird species that breed in North America and migrate to the neotropics for the winter. All migratory birds are protected under the Migratory Bird Treaty Act, and federal agencies were directed to assess the effects of federal projects on neotropical migratory birds by EO 13186. As a group, neotropical migratory birds use nearly every terrestrial habitat. For example, within the project area, warbling vireos nest and forage in riparian trees, Vaux's swift are aerial foragers that nest in tree cavities in late-successional forest, and orange-crowned warblers build nests on the ground in shrubby areas and old clearcuts.

The no action alternative would have no additional effect on habitat for neotropical migratory birds beyond existing and ongoing ROW maintenance. No indirect effects are anticipated under the no action alternative.

Because neotropical migratory birds are nearly ubiquitous in their distribution, any project that involves vegetation clearing may have an effect on a localized population within an area. The preferred alternative would potentially affect neotropical migratory birds by removing potential nesting and foraging habitat. However this impact would be minor as only a small amount of vegetation would be removed, the removal would be temporary, and vegetation clearing would either be limited to the period outside of the breeding season for neotropical migratory birds (March 15 to September 1) or vegetation would be surveyed before clearing to ensure that no active nests would be disturbed.

Birds, including neotropical birds, can be affected by the presence of roads. Use of available habitat near roads tends to be lower than expected, a phenomenon attributed to disturbance from traffic noise (Reijnen et al. 1995). However, roads with an ADT lower than 8,000 do not have a detectable effect on habitat use by birds (Forman et al. 2002). Although traffic volume and traffic noise are predicted to increase slightly within the project area under the preferred alternative, it is not expected to produce traffic volumes or noise levels that reach the threshold at which measurable impacts on bird populations arise. Construction noise may lead to avoidance of potential habitat adjacent to the road, though this impact would be temporary, would be limited to the construction period, and would not likely have a measureable effect.

Cumulative Effects on Special Status Wildlife Species

Due to a lack of measurable direct or indirect effects from the Middle Fork River Road Project, there would be no cumulative contribution of effects for the fisher, wolverine, Oregon spotted frog, and bald eagle. There are no other past, present, or foreseeable projects within the area expected to occur simultaneously with the Middle Fork Road Project that might contribute noise during construction or appreciably impact habitat within the valley. Therefore, there would be no contribution to cumulative effects for neotropical migratory birds.

Mitigation for Wildlife

During the nesting period for marbled murrelet between April 1 and September 23, no clearing activities would occur between MP 8.6 and MP 8.73 to avoid potential impacts on possible low-quality murrelet nesting habitat adjacent to the road in this area. Large downed wood would be retained on site where feasible.

To avoid any direct mortality of eggs or nestlings, vegetation clearing would either be limited to the period outside of the breeding season for neotropical migratory birds (March 15 to September 1), or vegetation would be surveyed before clearing to ensure that no active nests would be disturbed.

4.2.13 Fisheries

Affected Environment

Both native and introduced fish species are present within the Middle Fork Snoqualmie River drainage. The following fish species are all listed as potentially present within the greater Snoqualmie River Drainage. They include the following federally listed threatened species: Puget Sound Chinook salmon, Coastal-Puget Sound bull trout, and Puget Sound steelhead; and the following USFS Sensitive species: Puget Sound/Strait of Georgia Coho salmon, Baker River (Skagit) sockeye salmon, and Puget Sound-coastal cutthroat trout. Forest Service Management Indicator Species for the area include pink salmon, chum salmon, rainbow trout, and cutthroat trout. Aquatic surveys within the proposed project area have documented resident populations of cutthroat trout, rainbow trout, eastern brook trout, mountain whitefish, and various species of sculpin (USFS 1998).

Snoqualmie Falls is present on the mainstem of the Snoqualmie River, approximately 11 miles downstream of the project area, and the falls block all access by anadromous fish. Bull trout are not present within the Middle Fork Snoqualmie River drainage, also likely due to the presence of Snoqualmie Falls downstream. Accordingly, there are no federally listed threatened or endangered fish species, or USFS Sensitive fish species, in the project area. Cutthroat and rainbow trout populations are likely native to the Middle Fork Snoqualmie River drainage, although both species have been stocked in the watershed in the past. The eastern brook trout population was also introduced. Whitefish and sculpin populations are also native to the river system (USFS 2002).

The Middle Fork Snoqualmie River contains potential habitat for fish species detected during past survey efforts. With the exception of the Middle Fork Snoqualmie River, all streams, ditches, cross-drains, and wetlands the project corridor crosses were examined to determine if suitable fish

habitat existed. Five culverts were identified as fish passage barriers precluding access to potential habitat.

Environmental Consequences

No Action Alternative

Selection of the no action alternative would maintain existing fish habitat conditions. Five identified culverts would continue to present barriers to fish passage. Undersized culverts would continue to affect stream and floodplain function and would continue to be at risk of catastrophic failure, which could lead to large sediment inputs and fish habitat modification.

Preferred Alternative

Construction of the preferred alternative would result in increased potential for erosion, sedimentation, and turbidity during construction activities, particularly for culvert and bridge installations; however, any impacts on fish resulting from these activities would be temporary (occurring during construction) and would be localized to the immediate area of construction. BMPs would be implemented throughout construction to minimize this potential.

Paving the road would reduce current road surface erosion, which would reduce the amount of sediments entering streams and the Middle Fork Snoqualmie River. Though the amount of sediment would be minor, this reduction would prevent potential degradation of potential fish habitat. Through the addition of ditch-relief culverts, stormwater would be dispersed to upland areas for infiltration and treatment where practicable. Stream function would be improved by eliminating undersized culverts that contribute to altered stream function through channel constriction and backwatering. Six stream crossings would be improved to provide for fish passage. Some riparian trees would be removed, which could locally increase solar radiation to some streams, causing minor increases in stream temperature. These localized increases would be temporary, as revegetation and natural vegetation growth would restore most of the existing stream shading function. Overall, the preferred alternative would likely improve long-term water quality, stream function, and fish passage, which would improve fish habitat conditions.

Potential project impacts might occur within the immediate vicinity of stream crossings during construction. While BMPs would be used to reduce potential turbidity and sedimentation of streams during construction, bridge and culvert replacements might cause short-term habitat degradation and avoidance in the immediate vicinity due to temporary turbidity and noise resulting from construction activities, though a long-term beneficial effect would be likely with the improvement and restoration of fish-passage at stream crossings.

The preferred alternative might affect two USFS Management Indicator Species, rainbow and cutthroat trout, due to temporary impact during construction, though the long-term impact would improve fish-passage in the area. Thus, the proposed project would not likely contribute to a trend towards federal listing or cause a loss of viability for population or species for either rainbow trout or cutthroat trout.

As noted above, fish species present within the Middle Fork Snoqualmie River drainage are limited to native and introduced resident fish species. Snoqualmie Falls, which is on the mainstem of the Snoqualmie River approximately 10 miles downstream of the project area, blocks all

access to anadromous fish, including all the salmon species listed above, as well as bull trout. Snoqualmie Falls is downstream of any anticipated effects from the proposed action. Therefore, the preferred alternative would have no effect on all three federally listed fish species, would have no impact on all three USFS Sensitive fish species, and would have no impact on two Management Indicator Species, pink and chum salmon.

Cumulative Effects

Other actions within the project area, such as the Middle Fork ATM Plan (USFS 2005a), Road 56 ERFO and Fish Passage Repair, Bessemer Road decommissioning, and proposed decommissioning of the Granite Creek Road system, when considered cumulatively, would be expected to have a slight benefit for fish habitat. Fish passage improvements through culvert replacements and removals would cumulatively increase the amount of available habitat slightly, though the increase would be so minor as to be insignificant. Road decommissioning and paving of Middle Fork Road would slightly decrease the potential for erosion and resulting sedimentation into surrounding drainages, though this reduction would likely be immeasurable.

Mitigation

To facilitate construction while minimizing potential turbidity and sedimentation, in-water work, such as that needed for culvert and bridge replacements, would be targeted to occur within periods of low streamflow (generally mid-July to mid-October). Stream diversions and cofferdams would be used to isolate in-water work areas. Trees to be felled near or within riparian areas would be felled toward the stream and left in place, unless otherwise agreed upon by the USFS fisheries biologist. Large woody material removed from a culvert inlet would be placed downstream of the culvert, unless otherwise directed by the USFS fisheries biologist.

4.2.14 Environmental Justice

The EO on Environmental Justice (EO 12898) requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects on minority and low-income populations. No residences are within the project corridor. Neither alternative would adversely affect any minority or economically disadvantaged groups. For these reasons, both alternatives satisfy the intent of the EO 12898. There would be no contribution to any cumulative effects related to environmental justice.

4.2.15 Irreversible and Irretrievable Commitment of Resources

The preferred alternative would require a minor commitment of natural, physical, human, and fiscal resources. These would include land, earth fill, fossil fuels, aggregates, and paving material. The preferred alternative represents the narrowest roadway width and smallest impact acceptable. Therefore, it would represent the smallest commitment of resources of a feasible build alternative.

The conversion of private land to public ROWs or easements for construction of the preferred alternative is considered an irreversible commitment during the period that the land is used for a transportation facility. If a greater need arose for use of the land or if the highway facility were no longer needed, however, then land could be converted to another use.

Land within a roadway prism and inside the existing disturbed area is considered removed from the resource base for plants and animals. The action alternatives for this project would require a minimal amount of additional ROW. Most of the land that would be disturbed under the preferred alternative would be within an area already committed as a roadway and would allow for an approximately 1.6-acre reduction in roadway surface.

The use of the earth fill, fossil fuels, aggregates, and paving material are generally not retrievable. These resources are not in short supply, and their use would not have an adverse effect upon the continued availability of these resources. Any construction would also require a substantial one-time expenditure of funds that would not be retrievable.

The commitment of these resources would be based on the principle that residents in the immediate area and the greater Puget Sound region would benefit by the improved quality of Middle Fork Road. These benefits would consist of improved safety and accessibility to recreational activities, shortened response time by emergency vehicles, and improved air and water quality, which are anticipated to outweigh the commitment of these resources.

4.2.16 Permits and Approvals Required

Several federal, state, and county laws and administrative procedures may apply to the proposed project. This section briefly describes these laws and procedures and their applicability to the proposed project.

4.2.16.1 The Clean Water Act

The Clean Water Act (CWA) regulates discharges into waters of the United States. Several sections of the CWA apply to the project as further described.

Section 401

Section 401 of the CWA requires that states certify compliance of federal permits and licenses with state water quality requirements. A federal permit to conduct an activity that results in discharges into waters of the United States is issued only after the affected state certifies that existing water quality standards would not be violated if the permit were issued. DOE typically reviews each federal permit for compliance with state water quality standards.

Section 402

In Washington, EPA issues a general permit authorizing federal facilities to discharge stormwater from construction activities disturbing land of one or more acres into waters of the United States in accordance with various set conditions. The appropriate Notice of Intent will be issued, and National Pollutant Discharge Elimination System general permit obtained, and a Stormwater Pollution Prevention Plan prepared so as to meet the requirements of this section.

Section 404

Authorization from USACE is required in accordance with the provisions of Section 404 of the CWA when there is a discharge of dredged or fill material into waters of the United States, including rivers, streams, and wetlands. This includes excavation activities that result in discharge of dredge material that could destroy or degrade waters of the United States. A 404 permit from

USACE would be required for the proposed project for the preferred alternative. See Section 4.2.9, Water Resources, for more information regarding impacts on waters of the United States.

4.2.16.2 Clean Air Act

The Clean Air Act (CAA), as revised in 1990 (PL 101-542, 42 United States Code § 7401), requires EPA and states to carry out programs intended to ensure attainment of the NAAQS. In Washington, EPA has delegated authority to DOE. Section 160 of the CAA requires the protection, preservation, or enhancement of air quality in national parks, wilderness areas, and monuments. The 1977 CAA amendments called for a list of existing areas to be protected under Section 160. These areas are called Class I areas (40 CFR 81 Subpart D). No Class I areas are located in or near the project area. Additionally, the Puget Sound airshed, which includes the project area, is in compliance for all six criteria pollutants.

4.2.16.3 Coastal Zone Management Act

The Coastal Zone Management Act set forth a national policy "to preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations." Coastal states were tasked with setting up programs that balance ecological, cultural, historic, and aesthetic values of land and water resources with economic development in coastal zones. Washington's Coastal Zone Management Program is applied through enforceable policies that outline the permissible land and water uses within the coastal zone. Those applicable to this project include the Federal CWA and the CAA described above, and Washington's Shoreline Management Act.

The Shoreline Management Act set up local programs to classify and regulate shoreline areas. For the project area, King County is responsible for operating reviews under the Shoreline Management Act. FHWA has been, and would continue, working with King County to ensure that the design of the preferred alternative, should it be selected, is consistent with the Shoreline Management Act for this area.

4.3 Cumulative Impact Analysis

This section addresses the cumulative impacts associated with the project area. A cumulative impact is an "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). A baseline condition must first be established to determine the impacts on a specific resource on a cumulative basis. This baseline includes past actions (within a specified period), added to present and reasonably foreseeable future actions that are assumed for the no action alternative. The impacts of the proposed action are then added to this baseline as the incremental impacts of the action.

This analysis was guided by the June 24, 2005, memo from the Council on Environmental Quality, *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis*. 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.

The geographic boundary used for this cumulative impacts analysis is based on the identified resources of concern and the potential impacts under the preferred alternative. The project area is located in the middle portion of the valley. The valley was the primary focus for assessing cumulative impacts. The timeframe for the analysis of cumulative impacts includes all past actions, based upon the available data concerning growth and development in the valley and surrounding community. The present to future period is to 2031, the 20-year planning horizon for this EA.

The spatial extent of the resource effects of the no action and preferred alternative was assessed to determine if the alternatives would add to, modify, or mitigate the ongoing effects of the past, current, and expected future actions. For each resource, an area of potential effect was determined. Then, it was determined if any potential, existing, or residual effects were present for the identified projects. If there was no overlap in time (e.g., no remaining effects from past projects) and in space (extent of effects), there was no cumulative effect.

4.3.1 Historical Setting

Commercial logging began in the Snoqualmie River valley in 1873, and logging activities peaked between 1905 and 1910 (Evans 1990; Hollenbeck 1987). The logging and milling operations of the North Bend Lumber Company (NBLC, reorganized in 1923 to the North Bend Timber Company, or NBTC) prompted construction of a western extension of the Milwaukee Railroad into the Snoqualmie River valley (Boswell et al. 1990).

The main railroad line of the NBLC along the Middle Fork Snoqualmie River, coinciding with most of the present alignment of Middle Fork Road, was used between 1921 and 1943. The NBTC ceased logging in the valley in 1941 (Boswell et al. 1990).

The CCC transformed many of the grades into trails and roads that provided recreational access to the central Cascade Mountains. By 1939, the CCC was converting old NBTC logging railroad grades and spurs into a main vehicular road up the Middle Fork Snoqualmie River as far as Goldmyer Hot Springs (Boswell et al 1990).

Abandonment of the valley by the NBTC marked a shift from private commercial ownership and enterprise in the early 20th century to the combination of private residential development and multipurpose public land that prevails today.

4.3.2 Description of Certain Past Actions

4.3.2.1 Past Clear Cut Timber Harvests

Past timber harvesting of lands within the Middle Fork, Taylor, and Pratt Rivers has occurred from the 1930s to the 1990s. Clear-cut harvesting of old-growth and mature forests by Weyerhaeuser and USFS has occurred, as well as by other private land owners on the lower and mid-slopes of all drainages. Past harvesting has occurred around the project area in various locations.

4.3.2.2 State and Private Land Access from Middle Fork Road

Access to state and privately owned lands in the Middle Fork Snoqualmie River watershed has changed significantly over the past 20 years. The Bessemer/CCC Road system and most private logging spur roads were open to motorized recreation access before the mid-1980s. Additionally, the Mine Creek site was open for dispersed camping. Since the mid-1980s, all state and private roads have been closed to vehicle access, and the Mine Creek site is only open for day use.

4.3.2.3 Middle Fork Snoqualmie River Watershed Access and Travel Management Plan

USFS implemented the Middle Fork ATM Plan for the Middle Fork Snoqualmie River watershed in 2005 (USFS 2005a). Major components included decommissioning approximately 30.8 miles of NFS road and converting approximately 10 miles to trail. Additionally, the action opened approximately 14 miles of trails for mountain bike use. All planned road closures have been completed except for a few miles at Quartz Creek, and all trailhead improvements have been completed except for Granite Creek. At Granite Creek, USFS is planning to improve the trailhead to install sanitation facilities and expand the capacity of the existing parking area from the current capacity of approximately 12 cars up to a maximum of 30 vehicles.

4.3.2.4 Middle Fork Campground

The Middle Fork Campground was completed and opened to campers in 2006. This campground includes approximately 45 camping sites and 0.5 mile of road to access the camp sites. The facility is located approximately 0.25 mile past the Taylor River Trailhead up Road 5600-510, near the confluence of the Taylor and Middle Fork Snoqualmie Rivers. The campground is fee-based and offers a variety of overnight and day-use experiences and amenities.

4.3.2.5 Huckleberry Land Exchange and Other Land Purchases

Completion of the Huckleberry Exchange and purchase of several small tracts of land near Gifford and Granite Lakes resulted in transfer of approximately 5,637 acres of Weyerhaeuser Company lands and other private lands within the Middle Fork Snoqualmie River watershed to USFS. USFS also acquired approximately 17 miles of logging roads that were decommissioned as part of the Middle Fork ATM Plan (USFS 2005a), as discussed above.

4.3.2.6 Lower Pratt River Trail Reconstruction and Partial Relocation Project

The project is in the process of reconstructing and relocating approximately 3.25 miles of the Lower Pratt River Trail. Specifically, approximately 1.30 miles of the original Lower Pratt River Trail will be reconstructed. To protect riparian habitat, approximately 0.95 mile of trail will be moved up and away from the Riparian Reserves and the floodplain of the Middle Fork Snoqualmie River. Approximately 1 mile of trail will be constructed on abandoned railroad grade(s) or logging truck roads. Work is scheduled for completion in 2012.

4.3.2.7 Middle Fork Road Emergency Repairs

Following storm events in late 2009 that resulted in flooding and landslides throughout the MBS, including the project area, the road was damaged and impassable at numerous locations along Middle Fork Road. Damage and drainage problems resulting from these storm events were also

repaired. Repairs on the MBS were completed from 2009 to 2010 and on state and county lands from 2009 to 2011.

4.3.2.8 Road 56 ERFO and Fish Passage Repair (MP 12.8 to 17.0) Project

Work competed in 2010 included removal of debris and repair of failed embankments, ditches, and road surface at MPs 12.8. 13.2, 14.0, and 16.1, as well as replacement of culverts at MPs 14.0, 14.1, and 17.0.

4.3.3 Reasonably Foreseeable Actions within the Project Area

Reasonably foreseeable future actions considered to potentially have a cumulative impact on this project are discussed in the following paragraphs.

4.3.3.1 Dingford Creek Trailhead

USFS is planning to improve the trailhead to install sanitation facilities and expand the capacity of the existing parking area from the current capacity of 10 to 12 cars up to a maximum of 30 vehicles.

4.3.3.2 Mailbox Peak Trail Reconstruction Project

The Mailbox Peak Reconstruction Project would construct a new trail from the existing trailhead to Mailbox Peak. The new trail would connect to the existing trail at the last half-mile. Construction is expected to begin in spring 2012.

4.3.3.3 Mailbox Peak Trailhead

DNR is planning to improve the existing Mailbox Peak Trailhead. Improvements would include parking, interpretive signs, restrooms, trailhead, and stormwater management. Funding for this project is through an FHWA grant. Construction is expected to begin in spring 2012.

4.3.3.4 Crown Lakes, LLC, Rock Quarry

Crown Lakes, LLC, proposed development of a rock quarry off Bessemer Road to mine rocks to be used for landscaping purposes. The trucks would enter Middle Fork Road near MP 7.7 and would travel down Middle Fork Road to North Bend. Permits for this project have been issued and construction is currently in progress. The permit for this project will be in effect for 30 years. Truck traffic is estimated to average several trips per day (generally weekdays) over the course of the project. These expected trips have been accounted for in the traffic forecast studies elsewhere in this document.

4.3.3.5 Granite Creek Road Decommissioning and Road to Trail Project (DNR/USFS)

The Granite Creek Road System (Road 5610 and associated spur roads) includes approximately 9.4 miles of road. The first approximately 4.5 miles is on state land managed by DNR. The DNR segment of road is drivable, but it has been closed (gated) to public motorized access for at least 15 years. DNR plans to decommission and convert this segment of road to trail the summer of 2012. The remaining 4.9 miles of road within the Granite Creek Road System are located on NFS land. None of these roads is drivable. The roads have grown in with vegetation, and they have not been maintained for almost two decades.

In cooperation with DNR, the Granite Creek Road 5610 Decommissioning and Road-to-Trail Project would decommission and remove approximately 3.9 miles of these roads from the Forest transportation system and decommission and would convert approximately 1.0 mile to trail. The DNR and USFS road-to-trail segments would become a part of Thompson Lake Trail #1009.1. DNR is investigating the potential inclusion of a formalized trailhead for this trail near the concrete bridge at MP 5.7.

4.3.3.6 Annual Routine Road Maintenance and Repair (King County and USFS)

King County and USFS annually maintain approximately 20 miles of road open to public motorized access within the Middle Fork Snoqualmie River watershed. Maintenance includes Road 56 (both inside and outside of the project area) and adjacent roads. These projects are those that have been considered in the individual sections within the Affected Resources section of this environmental assessment.

5 Summary of Mitigation Measures

The following table (Table 5-1) summarizes the mitigation measures that would be implemented with the preferred alternative. Many of the mitigation measures apply to more than one resource.

Table 5-1. Summary of Mitigation Measures

Resource	Mitigation Measures
Social, Recreation	• Traffic calming measures, such as increased signing, would be incorporated into the project. • Construction traffic accessing the project area would be restricted to the upper couplet to avoid impacts on residences along the lower couplet. • Potential impacts on access would be coordinated with businesses, non-profit facilities, and in-holdings that are accessed through the project area. • Methods to reduce impacts on recreation resulting from the preferred alternative would be included during construction. They would include allowing access to locations by phasing work, limiting work to these areas, and potentially allowing access during the evenings and weekends, the peak time for many recreation activities, though full closures are expected at times to facilitate timely construction. • A public involvement plan for distributing information for the timing and locations of closures would be developed, and timely updates would be given to the public through a readily accessible site.
Cultural Resources	• If any archaeological, cultural, or historic resources were inadvertently discovered during construction, project activities in those areas would be halted, and the USFS archaeologist, Washington State Department of Archaeology and Historic Preservation, and appropriate tribes would be contacted and consulted, as applicable, regarding disposition of the resource in accordance with applicable laws and regulations.
Noise	• No hauling would occur through residential areas along Middle Fork Road during nighttime (10:00 p.m. to 6:00 a.m.) hours. • Any construction activities that would potentially be heard by occupied residences along the Middle Fork Road would be limited to daytime hours.
Air Quality	• Dust control practices (e.g., water applied to construction areas and hauling routes) would be used during construction of the preferred alternative to reduce the level of temporary air quality impacts associated with dust.
Visual Quality	• Tree removal would be minimized through design of the project to the maximum extent feasible, particularly in those areas where a tree canopy is formed over the road. • Disturbed areas would be reseeded and planted with native species upon construction completion to minimize visual disturbance. • Retaining walls and other methods would be used in select locations to reduce impacts. They would be designed to blend with the forest and adjacent natural materials. • Blasting would be conducted to leave a face that is fractured that would imitate a natural appearance.

Table 5-1. Summary of Mitigation Measures (continued)

Resource	Mitigation Measures
Water Resources	• To facilitate construction, while minimizing potential turbidity and sedimentation, in-water work, such as that needed for culvert and bridge replacements, would be targeted to occur within periods of low streamflow (generally mid-July to mid-October). Stream diversions and/or cofferdams would be used to isolate in-water work areas. • Appropriate sediment and erosion control BMPs would be put into place before construction began and would be maintained in working order throughout the construction period and until vegetation becomes reestablished. Erosion controls would remain in place until vegetation becomes reestablished. • Appropriate riparian and wetland vegetation would be planted and/or transplanted where appropriate. • Drainage ditches that currently flow directly into waterways would be routed to upland areas where feasible to allow for infiltration and filtering before flow would enter waterways. • Measures to control unauthorized dispersed use that detrimentally impacts riparian areas, such as off-road vehicles and illegal garbage dumping, would be implemented at areas identified by USFS, King County, and DNR during further design of the preferred alternative. • Permanent wetland impacts would be offset compensatory mitigation. Mitigation options include on-site and off-site wetland creation, enhancement, restoration or rehabilitation, or use of federally approved In-Lieu Fee or wetland mitigation bank programs. Areas temporarily impacted by vegetation would be rehabilitated and revegetated. Specific wetland mitigation would be determined during the final design and would be agreed to with USACE through the 404 process. • Prior to construction, a hazardous materials spill plan would be prepared to identify actions to take in the event of a spill. This plan would incorporate preventative measures such as placement of refueling facilities and storage and handling of hazardous materials. Equipment would be checked for leaks before use every day. • Storage of hazardous materials that could accidentally enter a stream would not be permitted within 300 feet of live waters. • Any equipment used within a live waterway would be free of dirt and grease and biodegradable vegetable oils would be used as hydraulic fluid.
Soils and Geology	• The combined area of clearing and grubbing (ground disturbance) would be limited by project specifications to reduce the amount of exposed soil potentially subject to erosion. • Appropriate sediment and erosion control BMPs would be put into place before construction could begin and would be maintained in working order throughout the construction period and until vegetation becomes reestablished. • Topsoil would be conserved, stockpiled, and replaced onto disturbed slopes to preserve the existing seed bank within the topsoil and to enhance revegetation success. • Following construction, cut slopes and disturbed sites would be seeded or planted with native seed and/or plants. • Woody debris may be mulched on site, and other mulch, compost, and erosion control methods would be used to protect seeded areas. An approved non-native sterile seed mix might be used to provide temporary ground cover to prevent erosion during construction.

Table 5-1. Summary of Mitigation Measures (continued)

Resource	Mitigation Measures
Vegetation	• Efforts to minimize temporary vegetation removal associated with the proposed action would include limbing trees rather than entirely removing them where practicable, leaving the roots of trees that have to be removed in place to provide soil stability and allow for regeneration for capable species, and minimizing disturbance to surrounding vegetation. • Topsoil would be conserved, stockpiled, and replaced onto disturbed slopes to preserve existing seed bank within the topsoil and enhance revegetation success. • All disturbed areas would be seeded or planted with native vegetation appropriate for the site as soon as possible following construction. A revegetation plan would be developed to determine species to be used by location, such as in upland areas and wetland areas. • An approved non-native sterile seed mix may be used to provide temporary ground cover to prevent erosion during construction. As appropriate, mulch, tackifier, or other erosion control methods would be used to protect seeded areas. • If any previously undiscovered ESA or other Region 6 Sensitive or Survey and Manage vascular plants, bryophytes, lichens, or fungi were discovered before or during project implementation, work would be halted until a USFS botanist could be consulted, and necessary mitigation measures would be enacted. • Pretreatment of noxious weed infestations along Middle Fork Road would occur to reduce the spread of noxious weeds in association with this project. All construction equipment would be washed before first entering the project area. All materials used on the project would be certified weed-free. • All construction equipment and vehicles would be cleaned to prevent the spread of any noxious weed before moving into or out of the construction area. • All materials used in the project would be certified weed-free.
Wildlife	• Daily timing restrictions would be placed on any blasting or pile driving activities within designated critical habitat (limited to 2 hours after sunrise and 2 hours before sunset). • To avoid any direct mortality of eggs or nestlings, vegetation clearing would either be limited to the period outside of the breeding season for neotropical migratory birds (March 15 to September 1,) or vegetation would be surveyed before clearing to ensure that no active nests would be disturbed.
Fisheries	• To facilitate construction, while minimizing potential turbidity and sedimentation, in-water work, such as that needed for culvert and bridge replacements, would be targeted to occur within periods of low streamflow (generally mid-July to mid-October). Stream diversions and cofferdams would be used to isolate in-water work areas. • Trees to be felled near or within riparian areas would be felled toward the stream and would be left in place, unless otherwise agreed upon by the USFS fisheries biologist. • Large woody material removed from a culvert inlet would be placed downstream of the culvert, unless otherwise directed by the USFS fisheries biologist. • Appropriate sediment and erosion control BMPs would be put into place before construction began and would be maintained in working order throughout the construction period and until vegetation could reestablish.

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6 References

Alexander, S. M., N. M. Waters, and P. C. Paquet. 2005. Traffic volume and highway permeability for a mammalian community in the Canadian Rocky Mountains. The Canadian Geographer 49:321-331

American Association of State Highway and Transportation Officials (AASHTO). 2004. Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400).

Anthony, R. G., R. L. Knight, G. T. Allen, B. R. McClelland, and J. I. Hodges. 1982. Habitat use by nesting and roosting bald eagles in the Pacific Northwest. Transactions of the North American Wildlife and Natural Resources Conference 47: 332-342.

Banci, V. 1994. Wolverine. Pages 38-73 *in* L. F. Ruggiero, K. B. Aubry, S. W. Buskirk, L. J. Lyon, and W. J. Zielinski, editors. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States. USDA Forest Service General Technical Report RM-254.

Bertwistle, J. 2003. The effects of reduced speed zones on reducing bighorn sheep and elk collisions with vehicles on the Yellowhead Highway in Jasper National Park. Unpublished report. Parks Canada, Jasper National Park, Alberta. Available: http://www.cd.gov.ab.ca/enjoying_alberta/parks/featured/kananaskis/creilg/Slow_Down %20_Zones.pdf (Accessed September 24, 2004).

Boswell, Sharon A., Sarah K. Campbell, L.C. McConaghy, and Christian J. Miss. 1990. Pratt River Logging Camp Evaluation. Reports prepared for the Mt. Baker-Snoqualmie National Forest, Montlake Terrace, Washington.

Carr, L. W., and L. Fahrig. 2001. Effect of road traffic on two amphibian species of differing vagility. Conservation Biology 15: 1071-1078.

Carroll, C., R. F. Noss, and P. C. Paquet. 2001. Carnivores as focal species for conservation planning in the Rocky Mountain region. Ecological Applications 11:961-980.

Carter, H.R. and S.G. Sealy. 1987. Inland records of downy young and fledgling marbled murrelets in North America. Murrelet 68:58-63.

Chruszcz, B., A. P. Clevenger, K. E. Gunson, and M. L. Gibeau. 2003. Relationships among grizzly bears, highways, and habitat in the Banff-Bow Valley, Alberta, Canada. Canadian Journal of Zoology 81: 1378-1391.

Creel, S., J. E. Fox, A. Hardy, J. Sands, B. Garrott, and R. O. Peterson. 2002. Snowmobile activity and glucocorticoid stress responses in wolves and elk. Conservation Biology 16:809-814.

Defenders of Wildlife. 2011. I-90 Wildlife Camera Project. Available at : <http://www.defenders.org/take_action/wvc/projects/i90_wildlife_camera_project.php> and <http://www.conservationnw.org/slideshow/wildlife-monitoring> (Accessed September 8, 2011).

DJ&A. 2004. Traffic Analysis Technical Report for the Middle Fork Snoqualmie River Road Improvement Project.

DNR (Washington Department of Natural Resources). 1997. Final Habitat Conservation Plan. Olympia Washington.

DOE (Washington Department of Ecology).1996. Washington State Department of Ecology 303(d) List of Water Quality Limited Waterbodies. Available: http://www.ecy.wa.gov/programs/wq/303d/index.html (Accessed September 13, 2004).

DOE (Washington Department of Ecology). 1997. Washington State Wetlands Identification and Delineation Manual. Ecology Publication #96-94.

DOE (Washington Department of Ecology).1998. Washington State Department of Ecology 303(d) List of Water Quality Limited Waterbodies. Available: http://www.ecy.wa.gov/programs/wq/303d/index.html (Accessed September 13, 2004).

DOE (Washington Department of Ecology). EPA 2004. Quality Assurance Project Plan: Snoqualmie River Total Maximum Daily Load Effectiveness Evaluation. Washington State Department of Ecology Environmental Assessment Program. Olympia, Washington.

EPA. 2003. Draft Report on the Environment. Environmental Protection Agency, Washington D.C.

Evans, J.R. 1990. Little History of North Bend–Snoqualmie, Washington. SCW Publications, Seattle, Washington.

Federal Highway Administration. 2004. Federal Highway Administration Traffic Noise Model User's Guide, v2.5. Washington D.C.

Federal Register. Volume 61 No. 26256. May 24, 1996. Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for the Marbled Murrelet.

FHWA (Federal Highway Administration). Forman, R. T. T., and L. E. Alexander. 1998. Roads and their major ecological effects. Annual Review of Ecology and Systematics 29: 207-231.

Forman, R. T. T., B. Reineking, and A. M. Hersperger. 2002. Road traffic and nearby grassland bird patterns in a suburbanizing landscape. Environmental Management 29:782-800.

Forman, R. T. T., D. Sperling, J. Bissonette, A. P. Clevenger, C. D. Cutshall, V. H. Dale, L. Fahrig, R. France, C. R. Goldman, K. Heanue, J. A. Jones, F. J. Swanson, T. Turrentine, and T. C. Winter. 2003. Road ecology: science and solutions. Island Press, Washington, D.C.

Gaines, W. L., P. H. Singleton, and R. C. Ross. 2003. Assessing the cumulative effects of linear recreation routes on wildlife habitats on the Okanogan and Wenatchee National Forests. United States Department of Agriculture Forest Service General Technical Report PNW-586.

Gibeau, M. L., and K. Heuer. 1996. Effects of transportation corridors on large carnivores in the Bow River Valley. Pages 70-83 in G. L. Evink, P. Garrett, D. Zeigler, and J. Berry, editors. Trends in addressing transportation related wildlife mortality. State of Florida Department of Transportation, Environmental Management Office, Tallahassee, Florida.

Glenn, E. M., M. C. Hansen, and R. G. Anthony. 2004. Spotted owl home-range and habitat use in young forests of western Oregon. Journal of Wildlife Management 68:33-50.

Gunther, K. A., M. J. Biel, and H. L. Robinson. 2000. Influence of vehicle speed and vegetation cover-type on road-killed wildlife in Yellowstone National Park. Pages 43-52 in T. A. Messmer and B. West, editors. Wildlife and highways: seeking solutions to an ecological and socio-economic dilemma. The Wildlife Society, Bethesda, Maryland.

Hayes, S. G., D. J. Leptich, and P. Zager. 2002. Proximate factors affecting male elk hunting mortality in northern Idaho. Journal of Wildlife Management 66:491-499.

Hels, T., and E. Buchwald. 2001. The effects of road kills on amphibian populations. Biological Conservation 99:331-340.

Henderson, J.A., R.D. Lesher, D.H. Peter, and D.C. Shaw. 1992. Field guide to the forested plant associations of the Mt. Baker-Snoqualmie National Forest. Technical Paper R6-ECOL-TP-028-91. USDA Forest Service, Pacific Northwest Region.

Herrera Environmental Consultants. 1999. Middle Fork Snoqualmie River Road, King County, Washington: Conceptual Wetland Mitigation Plan Phase I Project area.

Herter, D. R., L. L. Hicks, H. C. Stabins, J. J. Millspaugh, A. J. Stabins, and L. D. Melampy. 2002. Roost site characteristics of northern spotted owls in the nonbreeding season in central Washington. Forest Science 48: 437-444.

Hollenbeck, Jan L. 1987. A Cultural Resources Overview: Prehistory, Ethnography and History, Mt. Baker-Snoqualmie National Forest. On file at the Office of Archaeology and Historic Preservation, Olympia, Washington.

Jackson, S. 1996. Underpass systems for amphibians. Pages 200-204 *in* G. L. Evink, P. Garrett, D. Zeigler, and J. Berry, editors. Trends in addressing transportation related wildlife mortality. State of Florida Department of Transportation, Environmental Management Office, Tallahassee, Florida.

Johnson, D. H., and T. A. O'Neil. 2001. Wildlife-habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, Oregon.

Joyce, T. L., and S. P. Mahoney. 2001. Spatial and temporal distributions of moose-vehicle collisions in Newfoundland. Wildlife Society Bulletin 29:281-291.

Kasworm, W. F., and T. M. Manley. 1990. Road and trail influences on grizzly bears and black bears in northwest Montana. International Conference on Bear Research and Management 8:79-84.

King County. 1999. Middle Fork Snoqualmie River Park Natural Area Site Management Plan. Prepared for King County Park System by King County Department of Construction and Facilities Management Division of Capital Planning and Development.

King County. 2007. Available online at the following website: http://www.kingcounty.gov/transportation/kcdot/Roads/EngineeringServices/RoadStandards2007.aspx

King County. 2007. 2007 Road Design and Construction Standards.

King County. 2011. King County Code, 21A.04.040. King County Zoning Code, Title 21A.

Knapp, K. K. 2003. Results of recent deer-vehicle crash information clearinghouse activities. Page 385-389 *in* C. L. Irwin, P. Garrett, and K. P. McDermott, editors. Proceedings of the 2003 International Conference on Ecology and Transportation. Center for Transportation and the Environment, North Carolina State University, Raleigh, North Carolina.

Lesher, R. D., and J. A. Henderson. 1998. Management Recommendations for Large Round-leaved Orchid *Platanthera orbiculata* (Pursh) Lindl. [syn. *Habenaria orbiculata* (Pursh) Torr.]. Unpublished manuscript.

Lewis, J. C., and D. W. Stinson. 1998. Washington State status report for the fisher. Washington Department of Fish and Wildlife, Olympia, Washington.

Mazerolle, M. J. 2004. Amphibian road mortality in response to nightly variation in traffic intensity. Herpetologica 60: 45-53.

Mech, L. D. 1970. The wolf: the ecology and behavior of an endangered species. Natural History Press, Doubleday, New York.

Mech, L. D., S. H. Fritts, and D. Wagner. 1995. Minnesota wolf dispersal to Wisconsin and Michigan. American Midland Naturalist 133: 368-370.

Mech, L. D., S. H. Fritts, G. L. Radde, and W. J. Paul. 1988. Wolf distribution and road density in Minnesota. Wildlife Society Bulletin 16:85-87.

Miller, G. S. 1989. Dispersal of juvenile northern spotted owls in western Oregon. M.S. Thesis. Oregon State University, Corvallis, Oregon.

Millspaugh, J. J., R. J. Woods, K. Hunt, K. J. Readeke, B. E. Washburn, G. C. Brundige, and S. K. Wasser. 2001. Using fecal glucocorticoids to quantify the physiological stress response of free-ranging elk. Wildlife Society Bulletin 29: 899-907.

Mladenoff, D. J., T. A. Sickley, and A. P. Wydeven. 1999. Predicting gray wolf landscape recolonization: logistic regression models vs. new field data. Ecological Applications 9:37-44.

Noss, R. 1995. The ecological effects of roads. Road Rippers Handbook, Wildlands CPR, Missoula, Montana. Available: http://www.wildlandscpr.org/resourcelibrary/reports/

ecoleffectsroads.html (Accessed February 8, 2004).

Nussbaum, R.A., E. D. Brodie, Jr., and R. M. Storm. 1983. Amphibians and reptiles of the Pacific Northwest. University Press of Idaho, Moscow, Idaho.

Paz, S. July 22, 2011. USFS wildlife biologist. Personal Communication with biologist.

Perry, C., and R. Overly. 1977. Impact of roads on big game distribution in portions of the Blue Mountains of Washington, 1972-1973. Washington Department of Game Applied Research Section, Olympia, Washington.

Powell, R. A., and W. J. Zielinski. 1994. Fisher. Pages 99-127 in L. F. Ruggiero, K. B. Aubry, S. W. Buskirk, L. J. Lyon, and W. J. Zielinski, editors. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States. USDA Forest Service General Technical Report RM-254.

Ralph, C. J., G. L. Hunt Jr., M. G. Raphael, and J. F. Piatt. 1995. Ecology and conservation of the marbled murrelet in North America: an overview. Pages 3-23 *in* C. J. Ralph, G. L. Hunt Jr., M. G. Raphael, and J. F. Piatt, editors. Ecology and conservation of the marbled murrelet. United States Department of Agriculture, Forest Service, Pacific Southwest Research Station, Albany, California.

Reijnen, R. R. Foppen, C. ter Braak, and J. Thissen. 1995. The effects of car traffic on breeding bird populations in woodland. III. Reduction of density in relation to the proximity of main roads. Journal of Applied Ecology 32:187-202.

Reudiger, B. 2000. The relationship between rare carnivores and highways: an update for year 2000. Unpublished report. Available: http://www.fs.fed.us/r1/wildlife/igbc/Linkage/ Relationships.htm (Accessed November 11, 2004).

Robitaille, J-F., and K. Aubry. 2000. Occurrence and activity of American martens (*Martes americana*) in relation to roads and other routes. Acta Theriologica 45:137-143.

Romin, L. A., and J. A. Bissonette. 1996. Deer-vehicle collisions: nationwide status of state monitoring activities and efforts. Wildlife Society Bulletin 24:276-283.

Rowland, M. M., M. J. Wisdon, D. H. Johnson, B. C. Wales, J. P, Copeland, and F. B. Edelmann. 2003. Evaluation of landscape models for wolverines in the interior Northwest, United States of America. Journal of Mammalogy 84: 92-105.

Sapolosky, R. 1992. Neuroendocrinology of the stress response. Pages 287-324 *in* J. B. Becker, S. M. Breedlove, and D. Crews, editors. Behavioral Endocrinology. MIT Press, Cambridge, Massachusetts.

Stinson, D. W. 2000. Draft Washington State recovery plan for the lynx. Washington Department of Fish and Wildlife, Wildlife Management Program, Olympia, Washington.

Tempel, D. J., and Gutierrez, R. J. 2003. Fecal corticosterone levels in California spotted owls exposed to low-intensity chainsaw sound. Wildlife Society Bulletin 31: 698-702.

Thomas, J.W., E.D. Forsman, J.B. Lint, E.C. Meslow, B.R. Noon and J. Verner. 1990. A conservation strategy for the northern spotted owl. A report by the Interagency Scientific Committee to address the conservation of the northern spotted owl. USDA Forest Service, USDI Fish and Wildlife Service, USDA Bureau of Land Management, and USDI National Park Service, Portland, Oregon.

United States Census Bureau. 2011. Available: http://quickfacts.census.gov/qfd/states/53/53033.html (Accessed June 29, 2011).

USACE. 1987. Corps of Engineers Wetlands Delineation Manual. Environmental Laboratory, U.S. Army Corps of Engineers, Waterways Experiment Station, 3909 Halls Ferry Road, Vicksburg, MS, 39180-6199 Technical Report Y-87-1.

USACE. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0) U.S. Army Engineer Research Development Center, Environmental Laboratory, U.S. Army Corp of Engineers 3909 Halls Ferry Road, Vicksburg, MS 39180-6199.

USFS (United States Forest Service). 1990. Mount Baker-Snoqualmie National Forest Land and Resource Management Plan. USDA, Forest Service, Pacific Northwest Region.

USFS (United States Forest Service). 1993. Viability assessments and management considerations for species associated with late-successional and old-growth forests of the Pacific Northwest. United States Department of Agriculture, Forest Service, National Forest System, Pacific Northwest Research Station, Portland, Oregon.

USFS (United States Forest Service). 1998. Middle Fork Snoqualmie River Watershed Analysis. USDA Forest Service. Mountlake Terrace, Washington.

USFS (United States Forest Service) 2002. Programmatic biological assessment for forest management: Mount Baker-Snoqualmie National Forest. United States. Department of Agriculture, Forest Service, Mount Baker-Snoqualmie National Forest, Mountlake Terrace, Washington.

USFS (United States Forest Service). 2003. Survey Protocols for Survey and Manage Category A & C Lichens in the Northwest Forest Plan Area. Version 2.1.

USFS (United States Forest Service). 2005a. Revised Environmental Assessment Middle Fork Snoqualmie River Watershed Access and Travel Management Plan and Forest Plan Amendment #20. USDA, Forest Service, Snoqualmie Ranger District, Mount Baker-Snoqualmie National Forest. North Bend, Oregon.

USFS. 2005b. Record of Decision for the Pacific Northwest Region Invasive Plant Program: Preventing and Managing Invasive Plants. Available at the following website: http://www.fs.fed.us/r6/invasiveplant-eis/FEIS/ROD/ROD-R6-NR-FHP-PR-02-05.pdf.

USFS (United States Forest Service) and BLM (Bureau of Land Management) 1994. Final Supplemental Environmental Impact Statement 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.

U.S. Department of Agriculture, USFS, Pacific Northwest Region and U.S. Department of the Interior, BLM.USFS and BLM. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines.

U.S. Department of Agriculture, USFS, Pacific Northwest Region and U.S. Department of the Interior, BLM. Available at the following website: http://www.reo.gov/s-m2006/2001/RODjan01.pdf.

U.S. Forest Service and U.S. Fish and Wildlife Service. 2006. Canada lynx conservation agreement. Signed October 20, 2005. Revised May 12, 2006. FS Agreement number #00-MU-11015600-013.

USFWS (United States Fish and Wildlife Service). 1986. Recovery plan for the Pacific bald eagle. United States Fish and Wildlife Service, Portland, Oregon.

USFWS (United States Fish and Wildlife Service). 1993. Grizzly bear recovery plan. United States Fish and Wildlife Service, Missoula, Montana.

USFWS (United States Fish and Wildlife Service). 2011. Endangered Species: Wolverine. Available at the following website: http://www.fws.gov/mountain-prairie/species/mammals/wolverine/ (Accessed September 8, 2011).

USFWS (United States Fish and Wildlife Service). 2002. Biological opinion of the effects of Mt. Baker-Snoqualmie National Forest Program of Activities for 2003-2007 on marbled murrelets and northern spotted owls. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Western Washington Fish and Wildlife Office, Lacey, Washington.

USFWS (United States Fish and Wildlife Service). 2003. Biological opinion and letter of concurrence for effects on bald eagles, marbled murrelets, Northern spotted owl, bull trout and designated critical habitat for marbled murrelets and Northern spotted owls from Olympic National Forest program of activities for August 5, 2003, to December 31, 2008. U.S. Department of Interior, U.S. Fish and Wildlife Service, Western Washington Fish and Wildlife Office, Lacey, Washington.

Ward, A. L. 1976. Elk behavior in relation to timber harvest operations and traffic on the Medicine Bow Range in south-central Wyoming. Pages 32-43 in S. R. Hieb, editor. Proceedings the elk-logging-roads symposium. Forestry, Wildlife, and Range Experiment Station, University of Idaho, Moscow, Idaho.

WDFW (Washington Department of Fish and Wildlife). 2012. PHS on the Web: An interactive map of WDFW priority habitats and species information for project review. Available online at the following website: http://wdfw.wa.gov/mapping/phs/.

Welsh, H. H., Jr., and L. M. Ollivier. 1998. Stream amphibians as indicators of ecosystem stress: a case study from California's redwoods. Ecological Applications 8: 1118-1132.

Whiteaker, L,J. Henderson, R. Holmes, L. Hoover, R. Lesher, J. Lipper, E Olson, L. Potash, J. Seevers, M. Stein, and N. Wogen. 1998 Survey Protocols for Survey & Manage Strategy 2 Vascular Plants Version 2.0.