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North Fork Stillaguamish

Road Treatment

Environmental Assessment

Darrington Ranger District, Mt. Baker-Snoqualmie
National Forest

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CHAPTER 1 INTRODUCTION

Background

In this particular Environmental Assessment, the Forest Service is analyzing road treatments that are based on the *North Fork Stillaguamish Watershed Analysis (North Fork Stillaguamish WSA*) (USDA Forest Service 2000) findings and recommendations, the *Forest-wide Access and Travel Management (ATM) Assessment* (USDA Forest Service1994/1995), and actual site-visits to the analysis area.

The 14.9 miles of proposed roads were primarily constructed for timber harvest activities and include local arterial roads. The *Mt. Baker-Snoqualmie National Forest Land and Resource Management Plan* as amended (*Forest Plan*[1]), greatly reduced timber harvest on National Forest System (NFS) land. Reduction of timber harvest also reduced the road maintenance funding derived from timber sale receipts. Without funding for road maintenance, these roads have fallen into disrepair causing concern about erosion and sedimentation problems.

The North Fork Stillaguamish River contains habitat for several at-risk salmonid fish species, including two federally listed threatened species. Sedimentation and changes in hydrologic function were factors specifically identified by Washington State Conservation Commission (1999) as potentially limiting to salmonid production in the North Fork Stillaguamish River. The effects that a road network can have upon streams by altering the hydrology of the site and contributing sediment is referenced in the *North Fork Stillaguamish Watershed Analysis (North Fork Stillaguamish WSA*) (USDA Forest Service 2000).

The *North Fork Stillaguamish WSA* (USDA Forest Service 2000[2]) has identified Crevice Creek and the South Branch North Fork Stillaguamish River as an area of high concern for erosion and sedimentation from National Forest System Lands. Within the mainstem of the North Fork Stillaguamish River, sedimentation of spawning areas has resulted in low survivability of eggs to emergence, and has also caused a downstream shift in chinook spawning densities. Perkins and Collins (1997[3]) found that of the slides delivering sediment to stream channels, 61percent occurred in the North Fork Stillaguamish, with Deer Creek, Upper North Fork and Higgins Ridge areas accounting for the most landslide sediment delivered to streams. Washington State Water Quality standards classify the North Fork Stillaguamish River above Squire Creek and tributaries on NFS lands as Class AA, extraordinary.

The *North Fork Stillaguamish WSA* Interdisciplinary Team (IDT) was charged with providing recommendations to improve the health of the watershed based upon their analysis findings. Among those recommendations, they indicated that various road treatments within the North Fork Stillaguamish drainage would help improve overall watershed health.

Structure

The Ranger District has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four parts:

- *Introduction:* The section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Comparison of Alternatives, including the Proposed Action:* This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Affected Environment:* This analysis is organized by natural resource area. Within each section, the affected environment is described first, followed by the effects of the No Action Alternative that provides a baseline for evaluation and comparison of the other alternatives that follow.
- *Environmental Consequences:* This section is also organized by resource area. Within each section, the environmental consequences of implementing the proposed action and other alternatives are described including the short term, long term and cumulative effects to the natural resources.
- *Agencies and Persons Consulted:* This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the environmental assessment.
- Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Darrington Ranger District Office in Darrington, Washington.

Proposed Action

The Darrington Ranger District proposes to implement a variety of road treatments on thirteen roads (14.9 miles) in the North Fork Stillaguamish watershed in order to balance administrative and recreational access with concerns for aquatic and wildlife resources.

Eleven roads would be put into a "storage" status, which is synonymous with the *ATM Assessment's* Maintenance Level 1 (ML1). (See definitions on Page 3) Treatments would include allowing the road to brush in, removing culverts, installing closure berms, installing crossdrains, and constructing waterbars.

The remaining two roads included in this project would be treated in two ways, one would be fully decommissioned, and the other would be reduced to ML1 for two miles, and then decommissioned for the last 0.5 mile. Each of the thirteen roads would be treated individually according to the degree of effort required to achieve the proposed maintenance level.

Since the project area is mostly within the matrix portion of the Finney Adaptive Management Area, roads were proposed for storage versus closure, in order to maintain options for vegetation management.

Current road maintenance funding is far below what it would take to maintain the existing road system.

The proposal is designed to:

- Protect aquatic and wildlife resources with closure of the roads while they are not needed, yet still provide for future access for pre-commercial thinning and potential commercial thinning by retaining the road system in storage;
- Reduce the risk of catastrophic failures where the lack of maintenance has aggravated already deteriorated road conditions;
- Maintain a basic and future level of access to the area for administrative use and recreational use;
- Reduce the size of the open road system, moving toward a level that the Forest Service has the funding to maintain;
- Improve water quality and aquatic habitat by reducing open road densities that exceed recommended levels (ROD 1994) for watershed health;
- Reduce road mileage in LSR, so as to provide additional security and connectivity of habitat for wildlife species;
- Reduce road densities to levels recommended for human-sensitive wildlife species;
- Reduce spread of noxious weed infestation that is transported by vehicles using these roads; and
- Address the findings and recommendations of the North Fork Stillaguamish WSA. (USDA Forest Service March 2000[4]).

Definitions

Methods of treatment are designed to best fit the condition of each road and would use the most cost-efficient method. Actual treatment may include a combination of the following:

No treatment to roads, that have grown in naturally and pose a low or no risk of sedimentation or landslides;

Removal of unstable sidecast and fill materials to reduce the risk of mass failures;

Removal of culverts and excavation of the road fill to restore natural drainage;

Removal of fill over culverts that are left in place, to provide relief drainage across the road and slope.

Removal of road-fill over culverts left in place to provide relief drainage across the road (dipping in road surface) while retaining stream flow in natural channel, and significantly reducing potentially large volumes of sediment delivery to perennial and ephemeral streams.

Maintenance Level 1: Intermittent service roads managed as closed to vehicular traffic. They are kept in storage until the next project access need; the closure period must exceed one year.

Closed Road: A road which remains part of the transportation system but motorized use has been eliminated, prohibited, or restricted during all or certain times of the year.

Road Decommissioning Treatment - Removal of stream crossing culverts and all other culverts. Cross ditch at all but low risk hillslope depressions. Pull all sidecast fills and

place the material on inboard side of road surface leaving ditchline open to provide cutbank drainage. Seed and mulch exposed soils around stream crossings and other culvert removal sites.

Road Decommissioning Treatment: Removal of stream crossing culverts and all other culverts. Cross ditch at all but low risk hillslope depressions. Pull all sidecast fills and place the material against stable cutslopes. Outslope the road prism where the ditch is filled by pullback material. Seed and mulch exposed soils around stream crossings and other culvert removal sites.

Allow to Brush Shut (ABS): Short local roads with a low risk rating or medium or high-risk spurs that have been treated. (Field verification would determine that no additional treatment is needed and remove the road from the transportation system. Road closure devices or entrance treatments may be used since these roads would no longer be maintained for vehicle use).

Road Obliteration - Full physical site restoration that attempts to re-contour slopes with the intent to completely remove the road from the landscape and restoring the drainage patterns back as close to natural conditions as possible.

Convert Road to Trail - - Remove stream crossing culverts and all other culverts. Cross ditch at all but low risk hillslope depressions. A trailbed of four to five feet would be maintained. Outslope the road prism where the ditch is filled by drainage and pullback material. Seed and mulch exposed soils around stream crossings and other culvert removal sites.

Figure 1-1 An example of where a 24-inch culvert once crossed the road, but blew out during a high water event. Photo by Bill Ross

Figure 1-2 Vicinity Map

Figure 1-3 Project Area Map

Purpose and Need for Action

This action responds to the goals and objectives outlined in the *Mt. Baker-Snoqualmie National Forest Land and Resource Management Plan*, (see Relationship to Forest Plan And Other Analysis section). The action also supports the findings and recommendations of the *North Fork Stillaguamish WSA*.

The objectives of this proposed action are to:

- Manage the road system in this analysis area, best protect and/or restore key resource values;
- Reduce the size of the road system toward a level that the Forest Service has the funding to maintain over time; and
- Maintain a basic level of access to the area.
- Restore the ecological health of the watersheds and aquatic ecosystems;
- Improve water quality;
- Maintain and improving the quality of fisheries habitat;
- Increase the quantity and quality of wildlife core habitat/corridors; and
- Maintain a balance of recreation and cultural opportunities, including access to dispersed recreation, and cultural sites.
- Maintain access to Adaptive Management Areas and Matrix (MA 17), for future timber management.

Project Scope

The Interdisciplinary team's (IDT) goal included examining the local roads and segments Upper North Fork Stillaguamish River that where highlighted as an aquatic concern in the North Fork Stillaguamish River watershed analysis. The team was directed to analyze road management both in the short and long-term with the realization that the Finney Adaptive Management Area Plan was not yet completed, and the project area contained portions of both Late Successional Reserve, and Matrix land allocations. The areas of focus were the roads in the Crevice Creek and South Branch North Fork drainages off Rd. 28.

Signs were posted along road systems in 2001 to alert users that a portion of those roads could be closed in the future. The signs also invite public comment. (USDA, White Paper 1996[5])

Decision Framework

Given the purpose and need, the deciding official reviews the proposed action and the other alternatives in order to make the following decisions:

Should the roads maintenance level objectives identified in the Access and Travel Management Plan be implemented or adjusted to a different level, to what extent?

What are the effects of changing the road maintenance levels, and which alternative is beneficial or carries the least impact to natural resources?

Is the proposal consistent with the standards, guidelines, goals, and objectives of the Forest Plan and other laws and regulations?

Relationship to the Forest Plan and Other Analysis

The ***Mt. Baker-Snoqualmie National Forest Plan*** as amended, provides specific management direction for the NFS lands, which includes the North Fork Stillaguamish Watershed, includes meeting Late-Successional Reserve, and Riparian Reserve Standards and Guidelines, as well as the Aquatic Conservation Strategy, and expectations for timber harvest from Matrix Lands.

The North Fork Stillaguamish River is within a Tier 1 Key watershed, which means additional management requirements must be met. The land within this project area is allocated to Land Management Areas (MA)—some designations are from the 1990 *Forest Plan* and others from the *ROD* (USDA, USDI 1994[6]).

Forest Plan Land Allocations, Standards and Guidelines, Goals, and Objectives

Late-Successional Reserves Late Successional Old Growth (LSR/LSOG): The main objective for these reserves, in combination with other land allocations and standards and guidelines, is to maintain a functional late-successional and old-growth forest ecosystem as habitat for late-successional and old-growth related species.

Adaptive Management Area (AMA): Landscape units designated to encourage the development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives. The emphasis for the Finney AMA is restoration of late-successional and riparian habitat components. The Finney AMA is allocated as 87 percent LSR and 13 percent Matrix.

Forest-wide Late Successional Reserve Assessment *(2001)* The objective of this assessment is to determine how well the portions of the LSR network within the Mt. Baker-Snoqualmie National Forest is functioning, and if any management strategies are necessary to sustain the network or the individual LSRs. Portions of the LSRs currently contain significant expanses of young forest regenerated following timber harvest, which may require many years for the development of a functional, interactive, late-successional forest ecosystem.

The Forest-wide LSR Assessment identifies LSR history, vegetation conditions, late-successional associated species, and their locations, historical and current land uses, fire management plan, criteria for developing appropriate treatments, and in which area under those criteria, proposed implementation schedule, and proposed monitoring and evaluation components. It does not preclude any forest management activities. Proposed activities inconsistent with this assessment could be pursued, but would necessitate a more detailed analysis and review (USDA 2001[7])

The North Fork Stillaguamish watershed is located in LSR 802, which is unique because it is not contiguous with other NFS land and is at least four miles from neighboring LSRs. It includes nearly all Designed Conservation Area and the Finney AMA. (LSR Assessment pp 8-9, 34)

Land Management Areas may be overlapping with more than one MA, with each having its own set of standards and guidelines, which apply to the same land. Simply stated, the standards and guidelines that provide the most resource projection, are the dominating set of standards and guidelines. The land allocations within this project area are briefly described below. For a more detailed description of land allocations and standards and guidelines associated with them, refer to the *Forest Plan* and the *ROD*.

This proposed action would be consistent with Late Successional Reserve Standards and Guidelines and all other Standards and Guidelines that apply (USDA Forest

Service, 2001[8]). It would also correspond with the *Draft Finney Adaptive Management Area Plan* (USDA Forest Service, in press[9]) and contribute to or have a neutral effect on the attainment of the Aquatic Conservation Strategy objectives, also found in the *ROD*.

Aquatic Conservation Strategy (ACS): Developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them. The intent of the strategy is to protect salmon and steelhead habitat on federal lands managed by the Forest Service and the Bureau of Land Management. Specific objectives of the Aquatic Conservation Strategy are listed in the *Forest Plan* (B-11). The Forest Plan describes watershed restoration as an integral part of a program to aid recovery of fish habitat, riparian habitat, and water quality. An important component of a watershed restoration program is control and prevention of road-related runoff and sediment production.

Riparian Reserves: This allocation, a major component of the Aquatic Conservation Strategy, includes areas along all streams, wetlands, ponds, lakes and unstable or potentially unstable areas. Riparian Reserves overlay all other management areas, and the Riparian Reserve standards and guidelines apply wherever Riparian Reserves occur, including Late-Successional Reserves.

Matrix (MA 17): This management area consists of lands outside the other designated land allocations in the Forest Plan (ROD p C-39). Most timber harvest and other silvicultural activities would be conducted in that portion of the matrix with suitable forest lands, according to standards and guidelines. Most scheduled timber harvest (that contributes to probable sale quantity (PSQ) and not taking place in Adaptive Management Areas) takes place in the Matrix. The matrix includes non-forested areas, and forested areas that are technically unsuitable for timber production and therefore does not contribute to the PSQ. Access to Matrix would generally be by road.

Other Documents

Watershed Analysis Findings: The analysis area is the North Fork Stillaguamish Tier 1 Key Watershed, which is discussed in the *North Fork Stillaguamish WSA*. The Crevice Creek and South Branch North Fork Stillaguamish are part of the North Fork Stillaguamish Watershed. These documents are available for review at the Darrington Ranger District Office in Darrington, Washington.

The *North Fork Stillaguamish WSA* includes recommendations for the watershed, the following WSA recommendations are pertinent to this project:

- Manage the transportation system;
- Maintain and enhance LSR habitat;
- Maintain and enhance instream habitat; and
- Implement Inventory and Effectiveness Monitoring.

The WSA team also identified critical objectives of action and opportunities that will improve watershed health, which includes implementing a variety of road management treatments, and an opportunity to adjust road density to provide additional security acres for wildlife, and implement watershed restoration effectiveness monitoring. (WSA Page 5-19 to 5-20, Table 5-1).

Open road densities in the analysis area range from 2.45 to 4.5 miles/mile^2. The Forestwide ATM or watershed analyses recommend working to reduce open road densities to less than 2miles/2 miles^2 to provide for some species, which are sensitive

to human disturbance. Road closures in lower-elevation habitat within the western hemlock zone would most benefit ungulates by decreasing legal and illegal hunting pressures when animals are in winter range, creating a corridor of low disturbance, and increasing security habitat.

These documents provide a landscape level or ecosystem perspective with some findings and recommendations that give the context for road management within the watershed (See *North Fork Stillaguamish WSA*, Chapter 5, Key Findings and Recommendations).

Mt. Baker-Snoqualmie Forest-Wide Access and Travel Management (ATM) Process: The *ATM Assessment,* which was prepared by the Forest Service in 1994/95, identified road segments within this proposal for decommissioning. The assessment was an informal (not a detailed environmental analysis) evaluation of the Forest Transportation System. One of its objectives was to identify roads no longer needed for forest or recreation management that could be removed from the Forest Transportation System.

Public Involvement

The proposal was provided to the public and other agencies for comment during scoping.

On May 10, 2002 letters requesting public involvement, were sent to the Samish, Sauk Suiattle, Stillaguamish, Tulalip, and the Upper Skagit Tribes. In addition, 483 letters were mailed out on May 15, 2002 to groups and individuals.

In response, one organization responded with comments. Northwest Ecosystem Alliance wrote a letter which favored road decommissioning as a means to improving long-term watershed health. The organization was further interested in how the project would meet the objectives of the ACQ and LSR. They were also interested in defining the road treatment and how roads were prioritized for treatment. (see *Issues* section), the interdisciplinary team developed a list of issues to address.

Issues

The Forest Service separated the issues into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council for Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" A list of both significant and non-significant issues and reasons regarding their categorization as non-significant may be found in below.

Significant Issues

1. Hydrology, Aquatic Habitat, and Water Quality

Existing and future unstable soils and landslide hazard risks, and the effects on fish and their habitat. Effects on fish habitat is usually linked to water quality conditions where this project's focus is mainly sediment delivery into fish bearing streams. ***Indicators:*** ATM Assessment's recommendations, Road surveys, watershed analysis

findings and recommendations, Finney AMA project plans, current field visits, and GIS information.

2. Determining Current and Future Road Access Needs For Forest Service Administration in the Finney AMA (ATM Maintenance Levels).

Road access is maintained for management options of NFS lands.

Indicator: Assessment of road needs by Forest Service for management. Assessment includes review of the areas and acres of National Forest with future activities planned that are facilitated by road access.

Indicator: Field visits to the roads, and consultation and evaluation with Forest Service engineers. Current ATM Maintenance Levels and Objectives.

Future means of reasonable and equitable access is necessary to access matrix areas for future pre-commercial thinning and commercial thinning.

Indicators: Number of acres of mapped MA17 land allocations

Numbers of acres planned thinning in or adjacent to the project area.

Cost to benefit of decommissioning treatment versus timber stand pre-commercial and commercial thinning

Stand thinning, priorities for thinning, and enhancement and projected acceleration toward LSR and old growth characteristics.

3. Sensitive Species, Survey and Manage Plant Species, and Noxious Weeds

Prevention of noxious weed spread by contractor's equipment.

Indicator: Comparison of weed sites post-treatment with currently known sites.

Avoid impacts to known survey and manage location.

Indicator: Post-treatment site visit, number of sites with noxious weeds.

4. Wildlife

Provide security habitat and connectivity of habitat for wildlife species

Indicators: Acres of core habitat – areas one-third mile from open road system.

Miles of open road system.

Acres of suitable habitat impacted by noise disturbance

Non Significant Issues:

1. Public Access

Public Use/Recreational Use, are there scenic vistas, trails, fishing, dispersed camping, and berry picking areas that may be a public concern.

Indicator: There would be no significant change in public use because the road access would not change (become more accessible or less accessible) because of the proposed treatments.

2. Fire and Fuels

Eliminating open roads would decrease ease of access for fire control to the project area. It would also decrease the chances of human caused fire. Indicator: This is a non-significant issue due to the projections that these are limited days (20 days per year) that have conditions that would support large fire growth if a start were to occur.

Figure 1-4 Photo by Bill Ross. Road 2860, currently undrivable, with an ATM rating of "high-risk". The arrow is pointing at fractures within the overgrown vegetation.. The proposed treatment for this road is to install 49 cross-drains, removes 13 culverts, and pull back 170 feet of roadbed. Reinforce closure berm at intersection for storage/ decommissioning.

CHAPTER 2 ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Introduction

This chapter describes and compares the two alternatives considered for this project. This section also presents the alternatives in comparative form, displaying the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative.

Process Used to Formulate the Alternatives

District resource specialists, (ID Team) using the District Ranger's specific direction to narrow the scope of actions, developed the Proposed Action. This direction is found within the Project Initiation Letter, which is signed by District Ranger Terry Skorheim. The scoping process produced concerns from one interested organization. The IDT reviewed each comment and identified key issues. The Significant Issues (described in Chapter 1) were used in combination with the purpose and need to formulate alternatives, design criteria, and monitoring plans.

The No Action Alternative is required (40 CFR 1502.14d) and may be used as a baseline to compare the action alternatives, although it does not meet the purpose and need for action. No action is defined as no change from current management. Current projects and activities would continue, however, the stated purpose and need described in Chapter 1 would not be achieved.

All proposed actions would meet existing laws, regulations, and policies. All known threatened, endangered, or sensitive plant or animal species would be protected from adverse impacts. Wetlands would not be adversely impacted. Cultural resources would be protected in accordance with the National Historic Preservation Act, Executive Order 11593, and other legislation and policy.

Alternative A—14.9 Roads Would Be Maintained At Current Road Maintenance Levels, With Available Funding. (No Action)

The No Action alternative, if implemented, would continue the status quo for the 13 roads or segments of roads analyzed in this EA. Road treatments wouldn't be consistent with the findings and recommendations of the North Fork Stillaguamish WSA. (USDA Forest Service March 2000[10]). Forest Managers would rely on natural processes to contribute to restoration of the watershed.

The risk of catastrophic failures, lack of maintenance, and deteriorated road conditions would be an ongoing concern. Limited access to the area would exist for some roads, but would eventually deteriorate as trees grow in the roads becoming undriveable.

As the roads continue to be neglected, the road maintenance requirements would become more extensive, and thereby more costly due to increase of work needed to restore them to current maintenance levels.

Road densities would continue to exceed the MBS Forest Plan recommended levels for road densities (USDA Forest Service 1994[11]). Without additional road maintenance funding, there is the potential for non-maintained roads to jeopardizing watershed

health. As trees grow in on non-maintained roads, and canopy closes, habitat connectivity for some wildlife species will improve.

Road density levels recommended for human-sensitive wildlife species would not be met. Noxious weed infestation that is transported by vehicles using these roads would continue on the drivable roads.

Alternative B—The Forest Service Would Implement Various Road Treatments To 14.9 Miles Of Roads (The Proposed Action)

Alternative B, if implemented, would include treating 12.6 miles of local roads in the Crevice Creek subwatershed and 2.3 miles of road in the South Branch North Fork Stillaguamish subwatershed.

This alternative, if implemented, would change the road maintenance level on approximately 5.6 miles of three roads that currently are mostly brushed in and not drivable, but are listed as open to high clearance vehicles (ML2). These roads would be in storage or closed to vehicle access (ML1). This alternative also identifies approximately 1.5 miles of road that would no longer be needed and would be decommissioned (.5 miles of Road #2850 and one mile of Road #2860).

Roads or sections or roads being treated were determined by recommendations by resource specialists. The intention of this alternative would be protection and/or restoration of key resource values by using the best means of road treatment for each individual road. The treatments would consider issues brought forth during the scoping period (Page 10). Mitigation measures or design criteria would minimize or avoid resource impacts or to meet management requirements.

- Maintain basic access to the analysis area for future management needs;
- Adjust maintenance levels to a compliment the available funding.
- Meet and comply with the goals, objectives, standards and guidelines of the Forest Plan, as amended; and
- Monitor and record the results of road treatment.

Table 2-1Alternative B, Current Road Conditions, And Proposed Road Treatment

Road Number	Maint. Level	Objective Level	Length, miles	Aquatic Risk Rating	Risk Score	Field-verified Risk, Condition, and Comments	Alternative B Treatment, Rationale And Resulting Road Maintenance Level
2800-018 Dog	1	1	1.1	High	39	Low risk; drivable for ¾ mi	Maintenance Level 1, Objective Level 1 for silvicultural needs. Install 19 cross-drains and remove 11 culverts. Reinforce closure berm at intersection for Storage.
2800-017 Echo	1	1	0.9	Moderate	20	Low risk; not currently drivable	Maintenance Level 1, Objective Level 1 for silvicultural needs. Install 10 cross-drains and remove 7 culverts. Reinforce closure berm at intersection for Storage condition.
2800-019 Leave Crevice	1	0	0.7	Moderate	24	Low risk; not currently drivable	Maintenance Level 1, Objective Level 0, Potential for decommissioning. Install 31 cross-drains and remove one culvert at end of road. Reinforce closure berm at intersection for Storage/ decommissioning.
2800-020 AbleSpur	1	0	0.5	Moderate	24	Low risk; not currently drivable	Maintenance Level 1, Objective Level 0, Potential for decommissioning. Install 7 cross-drains and remove 4 culverts. Reinforce closure berm at intersection for Storage/ decommissioning.
2830 Sunburst	2	1	1.2	Low	6	Low risk; drivable for ½ mi	Maintenance Level 2, Objective Level 1 for silvicultural needs. Remove 1 culvert. Reinforce closure berm at intersection for Storage.
2832	1	0	0.3	Low	7	Low risk; not currently drivable	Maintenance Level 1, Objective Level 0, Potential for decommissioning. The road has one culvert that poses no environmental threat. Reinforce closure berm at intersection for Storage/ decommissioning.
2840-011 (28400011)	1	1	1.2	Moderate	18	Low risk; not currently drivable	Maintenance Level 1, Objective Level 1 for silvicultural needs. Install 6 cross-drains and remove 3 culverts. Reinforce closure berm at intersection for Storage.
2841 Bravo	2	1	1.9	High	45	High risk; not currently drivable	Maintenance Level 2, Objective Level 1 for silvicultural and fire access needs. Install 24 cross-drains, remove 8 culverts and pull back 140 feet of unstable road. Reinforce closure berm at intersection for Storage condition
2849	1	0	1.6	Moderate	22	Moderate risk; drivable for 500'	Maintenance Level 1, Objective Level 0, Potential for decommissioning. Some existing waterbars; culverts have already been pulled within first 800'. Create better road closure berm around 50 feet in and Storage/ decommissioning.
2850 East Crevice	2	0	2.5	High	36	High risk; drivable for 2000' to unsafe bridge	Maintenance Level 2, Objective Level 0, Potential for decommissioning. Install 37 cross-drains, remove 24 culverts, remove one bridge, and pull back 131 feet of roadbed. Reinforce closure berm at intersection for Storage/ decommissioning. **Storage approx 2 miles, Decommission last ~0.5mi**.
2851 Lower East Crevice	1	0	1.0	Moderate	24	Moderate risk; not currently drivable	Maintenance Level 1, Objective Level 0, Potential for decommissioning. Install 3 cross-drains. Reinforce closure berm at intersection for Storage/ decommissioning.
2860 South	1	0	1.5	High	34	High risk; not currently drivable	Maintenance Level 1, Objective Level 0, Potential for decommissioning. Install 49 cross-drains, remove 13 culverts, and pull back 170 feet of roadbed. Reinforce closure berm at intersection for Storage/ decommissioning.
2871	1	0	0.5	Low	11	Low risk; not currently drivable	Maintenance Level 1, Objective Level 0, Potential for decommissioning. Install 3 cross-drains, and remove 2 culverts. Reinforce closure berm at intersection for Storage/ decommissioning.

Alternative Considered, But Eliminated From Detailed Analysis

The IDT developed general themes that would best meet the significant issues, and purpose and need of this action. These themes were the framework of each alternative. The IDT and supporting resource specialists examined the following Alternative to the Proposed Action. After consideration of issues and management needs, the IDT determined that it did not meet the purpose and need of the proposed action by providing future access to the Matrix (MA17) and AMA Land Allocation for natural resource management.

If considered and implemented, this alternative would have include decommissioning all roads, and removing them from the Forest Transportation System, and eliminating vehicle access. Decommissioning would have included removing some of the culverts and fills, waterbar installation, and sidecast removal. Heavy equipment would have been used to place materials (filling or backfilling) for insloping/outsloping and waterbar installation.

Timber stands in the project area are nearing the age for pre-commercial and commercial thinning. The Late-Successional Reserve Assessment recommends developing late successional and old growth characteristics by using silvicultural treatments. In some cases, silvicultural treatments can accelerate forest development into multi-layered stands with large trees as well as creating understory vegetation, diverse plant and animal species, and diverse forest structures to sustain or enhance a diversity of plants and animal species.

The LSRA recommends increasing old growth patch size and reducing old growth edges with early and mid successional stand in the North Fork Stillaguamish River Watershed. It further recommends increasing the rate of development of old growth characteristics in early and mid successional stands with large patches of mid successional stands in this area. Special emphasis should also be given to improving habitat conditions for marten immigration into this particular LSR. (USDA Forest Service 2001[12])

The project area includes the Finney Adaptive Management Area, which is 87 percent Late-Successional Reserve and thirteen percent Matrix Land Allocation (MA17).

There are 1,030 acres of stands that are optimal to pre-commercial thin within the next decade or two. Complete decommissioning Roads 2800-017, 2800-18, 2800-020, 2830, 2832, 2840-011, 2840, 2849, 2850, 2851, 2860, 2871would preclude this opportunity by eliminating a cost-effective means to access the timber stands.

Within the next few decades, there are opportunities to commercially thin 570 acres of timber in these land allocations. Decommissioning roads 2800-017, 2800-18, 2800-020, 2830, 2832, 2840-011, 2840, 2849, 2850, 2851, 2860, 2871, would not be complementary to this future opportunity.

However, by reducing the road to various storage levels (see Table 2-1) the road would be in a condition that would allow for access in the future for commercial thinning. Road construction is often included as part of the commercial timber sale contract package; these roads could possibly be “rebuilt” to offset the need for new road construction, however, the total need is not known at this time.

Mitigation Common to Action Alternatives

In response to public comments and issues concerning the proposal, mitigation measures were developed to ease some of the potential resource impacts the various

alternatives may cause. The mitigation measures may be applied to any of the action alternatives.

Any road treatment activities would take place after August 6th to provide minimal noise disturbance to marbled murrelet and northern spotted owl.

A 100-foot buffer would be constructed around the site Survey and Manage fungus *Spathularia flavida* to maintain the species, as well as its habitat.

If any previously undiscovered Sensitive or Survey and Manage plant species is found before or during project implementation, work in that area will cease until the District Botanist has been consulted.

Best Management Practices for the prevention of noxious weeds will be included in contracts for the action alternatives. These Practices include washing equipment before and after leaving sites, using non-invasive seed mixes that are weed seed-free, and using weed seed-free-mulches.

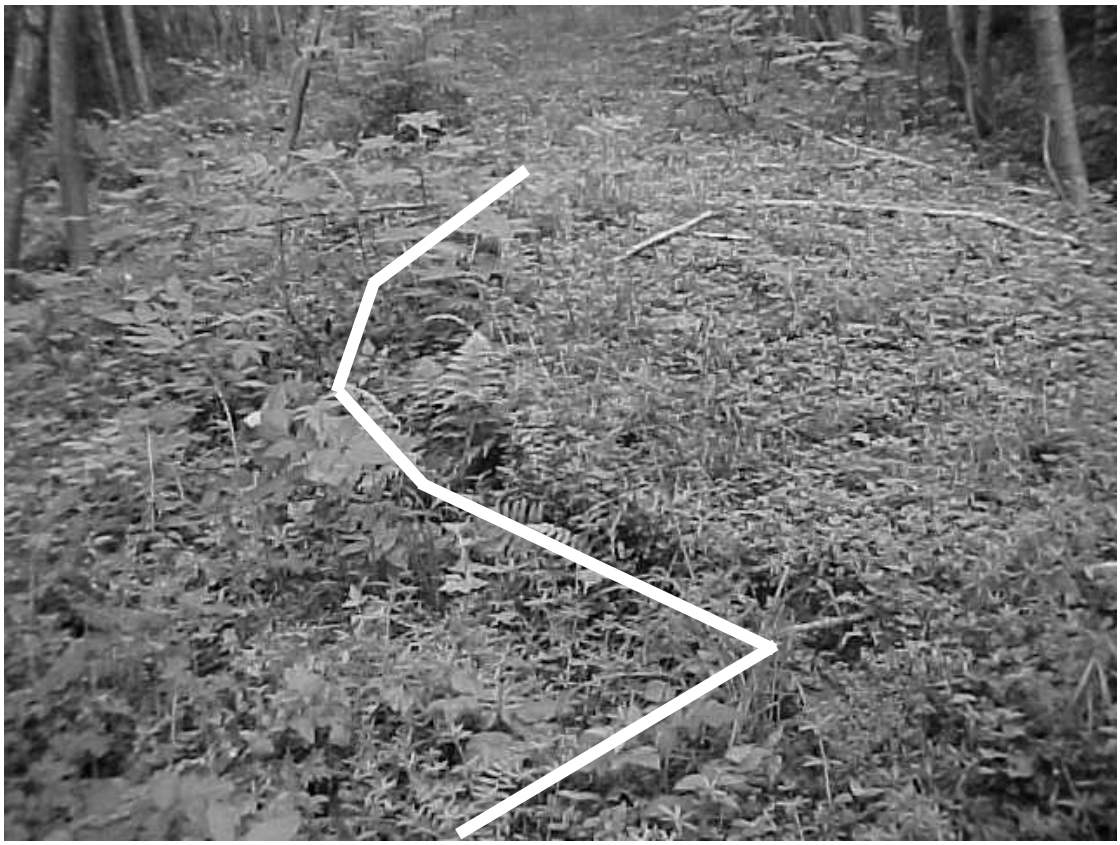

Figure 2-1 Road #2860, Road fracture and vegetation filling in road prism. Photo by Bill Ross

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 2-2 Resource Issues Alternatives Comparison by Alternative.

Issues	Alternative A No Action	Alternative B Individually Treat Roads (Preferred Alternative)
Soils and Aquatics Existing and future unstable soils and landslide, hazard risks, affecting aquatics and fish habitat	Continued risk of sedimentation associated with road failure of a scale that could impact fish populations. Potential for violation of Clean Water Act.	Minimized risk of water quality and fish habitat impacts associated with 6 miles of high risk roads. Reduced potential for CWA violation.
Precommercial Thinning. Provision for suitable, and a cost effective means of access for planned future tree thinning program.	No change in road access for planned tree thinning	1.5 miles decrease in open road-less access to approximately 300 acres of pre-commercial thin and future commercial thin.
Wildlife Resources Area in security habitat, measured in acres in BMU core acres, and miles of open/closed road.	No change in open road mileage or acres in BMU core habitat	1.5 miles decrease in open road, increase of 450 ac. of BMU core habitat.
Wildlife Resources Noise Disturbance to Threatened and Endangered (T & E) species – s. owl and m. murrelet	No noise disturbance	Seasonal restrictions for noise
Land Allocations Contribution to Forest Plan framework and standards & guidelines for land allocations such as Late Successional Reserve (LSR), Matrix, and Adaptive Management Areas (AMA).	No Change in access	Maintains all but 1.5 miles of road in storage for future management options in the Finney AMA.
NFS lands management access and travel needs. Meeting or improving ATM recommendations	Maintains current situation. Not meeting ATM recommendations at this time.	Moves 1.5 miles to ATM objective. Treats additonal 14 miles toward ATM objectives
Public /Recreational Use Elimination of scenic vistas, trails, fishing, dispersed camping, and berry picking areas.	No change in current driving areas. Roads will bush in over time.	No change in drivable access. Changes 1.5 mile of road to walking route. Will brush in over time.
Noxious weed spread from contractor's road maintenance equipment.	No treatment of noxious weed sites at this time. No spread of noxious weed from maintenance	Project equipment to be washed before arriving on site. Weed sites to be treated if found.
Vegetation disturbance to species of concern from contractor's equipment.	N/A no equipment would be onsite	Equipment will be washed, to minimize weed spread. No effect due to 100' buffer.
Fire Supression Access to the project area will decrease.	No change in current access	1.5 mile decrease in open road
Human Caused Fires Decrease the chances of human caused fires	No change in current risk from human caused fires.	Decreased risk on 1.5 miles of road from human caused fires.

CHAPTER 3 AFFECTED ENVIRONMENT

Introduction

Chapter 3 provides baseline information for understanding environmental, social, and economic impacts associated with the alternatives described in Chapter 2 and analyzed in Chapter 4, Environmental Consequences. This chapter paints a picture of the existing environment including conditions of natural, social, and economic resources that would be affected by the North Fork Stillaguamish Road Treatment alternatives. Resource issues to be discussed in detail are:

Hydrological Environment

Aquatic Environment

Wildlife Environment

Vegetation Environment

Human Use and Influence

Fire and Fuels

Proposed project activities would occur in two sixth field subwatersheds of the Upper North Fork Stillaguamish: the South Branch North Fork Stillaguamish, and Crevice Creek. Within these drainages there are 35.4 miles of National Forest System (NFS) roads.

Table 3-1 Project Area Road Miles and Density

Subwatershed	Road Length, miles	Road Density, miles/miles^2
South Branch North Fork	12.99	2.45
Crevice Creek	22.38	4.50

The construction of the upper North Fork Stillaguamish Road # 28 was initially started in the 1950s, and extending through the 1960s and 1970s. Some of the National Forest System Road 28 is built on top of old railroad grades left over from timber harvest in the 1920s. The NFS land within the subwatershed wasn't harvested until the 1950s the transportation method switched from railroads to roads. Most of its collector and local (spur) roads were built in the 1960s and 1980s to implement timber harvest. The construction method used on roads through 1977 involved sidecasting the materials cut from the bank over the road edge. Sidecast material included rocks, soil, and rootwads; much of the current road cracking is caused when this organic material decomposes, shifting the fill. Earlier road construction (before 1970) techniques included cuts and fills to maintain desired grade. Ditchline drainages were designed to accommodate ground and surface water flows. However, this gutter-like ditch often lacked cross drainages to route overflows and were susceptible to overflows during major rain events.

Roads with inadequate crossdrains to redistribute ditchline flow are in jeopardy of washing out. Accumulated flow in storm events can exceed culvert pipe capacities and result in water impoundment behind the pipes. Exacerbating the cross drainage problem, debris build up (woody or rocky material) can result in water being restricted and/or blocked at the culvert. As water backs up behind a pipe, the water takes the path of least resistance, following the road surface and spilling off the road wherever the road slope breaks. Moving water can rapidly downcut road surfaces or slopes,

increasing sediment delivery that can be detrimental to aquatic resources in the areas downstream.

Road maintenance occurs on an annual basis, but less than one-third of all roads needing maintenance can be treated due to budget constraints. In the year 2000, estimated costs of NFS roads in the Stillaguamish basin for which maintenance was deferred, totaled nearly $8.1 million.

The proposed road treatment address the National Forest System Road #28, local (spur) roads, 2800-017, -018, -19, -20, 2830, 2832, 2840-011, 2841, 2849, 2850, 2851, 2860, & 2871 needing treatment to better address potential high-risk areas (i.e., undersized or inoperative culverts, and sidecast slumping).

Road Risk Matrix Analysis

For the *North Fork Stillaguamish Watershed Analysis* (USDA Forest Service 2000[13]), authors performed a risk rating of all roads within the analysis area. This risk matrix analysis considered assorted soils and geologic variables, slope, rain-on-snow zones, vegetative cover (snow intercept, ground cover, and root development to hold soils in place), road location and construction methods, as well as the distance to aquatic resources of concern. Additionally, a factor was assigned for consequences of failure to aquatic resources. Please refer to the watershed analysis for a detailed description of procedures. Qualitative risk (high, moderate, and low) was assigned based upon risk rating scores from this process and based upon the percentage of miles that the Forest has been able to maintain for a given year. The risk ratings have not been validated completely on the ground and are used as a tool to prioritize site surveys

The following was generated from the recently developed Roads analysis model rating roads by use of aquatic attributes (i.e., Snow Zone, Geology, History, Stream Crossings, Channel Crossings, Construction, Side Slope, Vegetation Cover, Road Stacking, and Failures) to produce a ranking and to compare with field investigation of the roads in question. The following table is the roads in the project area that are compared by ranking fields and associated miles.

Table 3-2 Road Analysis Compared to Field Examination

Road #	Road Name	Analysis Rating	Analysis Ranking	Field Ranking	Database Miles	Treatment Miles	Difference (mi)
2841000	BRAVO	45	1	4	1.9	1.0	-0.9
2800018	DOG	39	2	8	1.1	0.9	-0.2
2850000	E CREVICE	36	3	1	2.5	2.3	-0.2
2860000	SOUTH	34	4	3	1.5	1.5	0.0
2800019	LEAVE CREVICE	24	5	5	0.7	0.8	0.1
2800020	ABLE SPUR	24	6	6	0.5	0.3	-0.2
2851000	LOWER EAST CREVICE	24	7	2	1	0.8	-0.2
2849000	2849	22	8	11	1.6	1.6	0.0
2800017	ECHO	20	9	7	0.9	0.7	-0.2
2840011	2840011	18	10	10	1.2	0.9	-0.4
2871000	2871000	11	11	9	0.5	0.5	0.0
2832000	2832	7	12	13	0.3	0.4	0.1
2830000	SUNBURST	6	13	12	1.2	1.2	0.0
				Total Miles	**14.9**	**12.83**	**-2.07**

The table above shows a general correlation between the Roads Analysis Aquatic's Ratings Draft and the field investigations used to develop treatment description and design. Three roads (280019, 280020, and 2840011) resulted in the same ranking or approximately 21% of the roads in this project area matched. The difference in road distances is thought to be a result of previous road treatments eliminating some of the road, or that due to vegetative regeneration, the last portion of roads are not thought to need treatment. In two cases the road treatment was .1 mile more than the length of the road recorded in the Forest database (INFRA). This was likely a difference in on the ground measurements.

Table 3-3 shows the risk ratings for each of the proposed roads to be treated based on the initial analysis process, and updated with field verification.

Table 3-3 Project Road numbers, current and objective maintenance levels, and aquatic risk assessment and field conditions.

Road Number	Maint. Level	Objective Level	Length, miles	Aquatic Risk Rating	Risk Score	Field-verified Risk, Condition, and Comments
2800-018	1	1	1.1	High	39	Low risk; drivable for ¾ mi
2800-017	1	1	0.9	Moderate	20	Low risk; not currently drivable
2800-019	1	0	0.7	Moderate	24	Low risk; not currently drivable
2800-020	1	0	0.5	Moderate	24	Low risk; not currently drivable
2830	2	1	1.2	Low	6	Low risk; drivable for ½ mi
2832	1	0	0.3	Low	7	Low risk; not currently drivable
2840-011	1	1	1.2	Moderate	18	Low risk; not currently drivable
2841	2	1	1.9	High	45	High risk; not currently drivable
2849	1	0	1.6	Moderate	22	Moderate risk; drivable for 500’
2850	2	0	2.5	High	36	High risk; drivable for 2000’ to unsafe bridge
2851	1	0	1.0	Moderate	24	Moderate risk; not currently drivable
2860	1	0	1.5	High	34	High risk; not currently drivable
2871	1	0	0.5	Low	11	Low risk; not currently drivable

Hydrologic Environment

The upper North Fork Stillaguamish fifth field watersheds experienced very little timber harvest until the mid 1950s, at which time the road construction and logging levels contributed to a shift in the vegetative cover from older forest to early seral vegetation. By the mid 1950s, 55 percent of the lower North Fork watersheds were in younger seral vegetation with numerous logging roads from truck harvest. These shifts to early seral age class of the forest stands continue to increase to above 60 percent of the area during the 1960s. Timber harvest and road building progressively moved up stream and with over 40 percent of the Crevice Creek subwatershed harvested by the late 1970s, and almost 40 percent in the South Branch North Fork subwatersheds by the late 1980s. A display of harvest levels for the upper North Fork Stillaguamish watershed can be viewed in the *North Fork Stillaguamish WSA* (page 3-120). The watershed analysis identifies the above-mentioned subwatersheds as having moderate to high potential for unstable soil conditions within the proposed road treatment areas.

Road building frequently altered the hydrologic processes by collecting, and rerouting surface and ground water flows. Alterations in flow patterns resulted from road fills, armoring the roads with large boulder placements, and rerouting surface and subsurface flows into stream channels. Much of sediment from roads is influenced by the road location and their condition

The combination of constructed roads on mid to lower slopes with pockets of unstable soils, set the stage for potential mass wasting events to be delivered to Crevice Creek and/or the South Branch North Fork drainage. Highly unstable S8 soils (see 1990 *Forest Plan*, p III-5 and Glossary p 35) lie directly below Road #2860, making the road susceptible to potential failure. Road failure materials that reach active transport type channels are a concern for the potential of being carried into

channels that support resident fish and transported to lower, slower moving reaches of the North Fork Stillaguamish where anadromous fish habitat and rearing areas lie.

As vegetation continues to grow and high-risk roads are treated, sediment volumes and peak flows are less of a potential on National Forest System (NFS) lands. Timber harvest has been greatly reduced on NFS lands and new road construction is currently a rare practice.

Mountain roads can affect the surface and ground water movement by rerouting flow patterns. A cut bank will release ground waters and become surface flows. Ditchlines provide paths for the water to follow causing water flows to converge or disperse depending on length of ditchline and the distance to next road crossing. Long ditchlines can cause surface flow concentrations to reach flow volumes where erosion and sedimentation are increased

Field visits to the proposed spur roads revealed unstable soil conditions, such as road fracturing, slumping, and pistol-butted vegetation. These conditions exist on the 2841, 2850, and 2860 roads. Road fracturing is a result of sidecast road construction or unstable soil conditions under the roadbed. The main road condition of concern is culverts, their condition, placement, size and the amount of potential fill that could be washed out if the culvert becomes plugged and impounds water. Another condition that may result from the water impounding behind the culvert is a redirected flow of water down the road if the fill over the culvert acts as an earth dam. When this occurs the water will either add water to the ditchline down from the plugged culvert (frequently exceeding the capacity of the next culvert) or run down a road surface until the tilt of the road surface changes enough to dump the flow off the outboard edge of the road. Either of the previously mentioned scenarios can result in large volumes of erosion.

Water Quality

Standards, 303(d) List, and Pollutant Sources

Washington State Water Quality standards classify the North Fork Stillaguamish River above Squire Creek and tributaries on National Forest lands as Class AA, extraordinary. While these classifications vary somewhat in numerical water quality standards, the beneficial use of most concern in these waters is cold-water biota and salmonid spawning. The key resource (beneficial use) using the mainstem and lower portions of the tributaries is anadromous fish including Chinook, pink, coho and chum salmon, steelhead and cutthroat trout, and native char.

The North Fork Stillaguamish River has been considered to be of relatively good water quality (Thornburgh 1993). However, monitoring over the last 20 years has raised concerns about the water quality in localized areas.

Water Quality Monitoring

Water quality monitoring has been relatively extensive in the North Fork Stillaguamish basin in recent years. The WDOE has established monitoring stations in the basin as part of its ambient monitoring program. The Tulalip and Stillaguamish tribes have also been monitoring since 1991. The Darrington Ranger District has also done limited monitoring in portions of the Upper NF. The North Fork Stillaguamish monitoring locations, period of record, and number of parameters on the 303(d) list are summarized in Table 3.4.

Table 3-4 Water quality monitoring stations in the North Fork Stillaguamish River above Deer Creek.

Map No.	Monitoring Station Name	Sponsor	Period of Record	Number of Parameters	& Samples
2	NF Stillaguamish R. near Darrington	WDOE	1973-1995	24	11 to 48
3	Squire Creek (Campground @ Hwy 530)	Stillaguamish Tribe[2]	1993-1995	9	
4	NF Stillaguamish R. @ Whitehorse	Stillaguamish Tribe	1993-1995	9	
7	NF Stillaguamish R. @ Whitman Bridge	Stillaguamish Tribe	1993-1995	9	
9	NF Stillaguamish R., upper	Tulalip Tribe	1991-1992	10	12
12	NF Stillaguamish R. RM. 19.5	USFS[4]	1989	2	61

1 Washington Department of Ecology data obtained from STORET
2 Unpublished data from Don Klopfer, Stillaguamish Tribe, Arlington, WA
3 Nelson et. al. 1995
4 Unpublished monitoring data, Darrington Ranger Station

Temperature

Reports from the Washington Department of Ecology and Stillaguamish Tribe contained only data summaries, so actual daily temperature measurements are not discussed for all data sources. Except for Forest Service data, stream temperatures were taken as part of on going water quality monitoring and are the result of point-in-time measurements. The older Forest Service data is from thermograph data and is discussed in relation to temporal and spatial temperature conditions in the upper North Fork Stillaguamish River. However, these data are fairly old and would not be expected to typify current conditions.

Stream temperature data are summarized in Table 3-5. Several sites along the mainstem North Fork Stillaguamish River reported temperatures exceeding 16°C. Stream temperatures that exceed 16 degrees begin to impair fish and aquatic life.

Squire Creek and Boulder River are major tributaries to North Fork Stillaguamish River that appear to remain relatively cool and likely assist in moderating temperatures in the mainstem of the river. Elevated temperatures in the mainstem may be caused by the combination of several factors: streamside shade is low on the mainstem (because of the wider channel and the dominance of hardwood and smaller conifer trees), low summer stream flow volume, and high levels of turbidity and suspended sediment (that absorb solar energy).

Table 3-5 Stream temperature ranges for selected monitoring stations in the North Fork Stillaguamish basin.

*Temperatures in excess of 16°C are in **bold text**.*

Location	Sponsor	Years of Record	Temperature Range (°C)
NF Stillaguamish R. nr Darrington	WA DOE	1973 - 1975	1.6 - 14.5
NF Stillaguamish R. at Whitehorse	Stillaguamish Tribe	1993 - 1997	3.1 - **17.3**
NF Stillaguamish R. at Whitman Br	Stillaguamish Tribe	1993 - 1997	3.8 - **19.0**
NF Stillaguamish R., (abv Squire)	Tulalip Tribe	1991 - 1992	3.2 - **16.9**
			Max. Daily Temperature.
NF Stillaguamish R. at RM. 19.5	USFS	1989	15.5 - **23.1**
NF Stillaguamish R above Crevice Cr.	USFS	1973 - 1976	1.1 - **18.9**

Forest Service stream temperature monitoring in the Upper North Fork from 1974 through 1976 (Zander 1976) blanketed the area above Squire Creek. One site had a continuous recording thermograph; other sites were sampled with hand-held thermometers in the 1976 study. This is an older study and vegetation conditions have changed considerably in the watershed since that time, but the study provides insights into potential impacts of vegetation cover in relations to slope aspect and flow regimes.

In 1976, considerable private timber harvest had occurred upstream of Alder Creek, and much of the upper portion of Crevice Creek had been harvested. Ten sample sites were monitored hourly for one clear, warm day (September 1, 1976). Sample sites included temperature measurements above and below units and in tributary streams.

Measurements in the North Fork where timber harvest had occurred upstream of the Alder Creek/North Fork Stillaguamish River confluence had a peak in maximum stream temperature of 19.4 degrees. Alder Creek reduced this temperature by 1.7 degrees. Alder Creek remained below 12 degrees. Squire Creek had a similar cooling effect on the mainstem. Squire Creek is nearly equal to the mainstem in flow volume and, the mainstem just below Squire Creek remained about 2 degrees cooler than the North Fork above Squire Creek. The mainstem North Fork Stillaguamish River, which runs north to south from the Middle Branch to above Squire Creek, was exposed to considerable mid-day solar radiation even where riparian conditions were undisturbed. Sites above and below harvest units showed increased stream temperatures suggesting that harvest of riparian trees resulted in increased solar exposure of the stream.

Crevice Creek appeared to be an anomaly. The channel has a north-south orientation and was extensively harvested. As expected, stream temperatures were higher in the clearcut-harvested areas of the upper subwatershed, but the middle reach of the subwatershed actually had cooler temperatures even though the stream had a north-south orientation to the sun. In this portion of the drainage, Crevice Creek is aptly named with steep inner gorge area that minimizes direct solar exposure. Measurement of small tributary channels revealed that cool groundwater was providing a moderating effect and that this effect continued downstream to the confluence with the North Fork Stillaguamish River. This study suggested the important of vegetative cover, solar exposure, and influences of major groundwater recharge on the mainstem stream temperatures. Groundwater recharge would appear to be an important source of cooler water for this stream system that receives solar input because of the north-south orientation, and reduction riparian shade.

In summary, the study recorded stream temperatures that are elevated in the mainstem North Fork Stillaguamish River and Montague Creek. This is likely due to less than optimal riparian shade along the mainstem and some tributaries, and shallow, wide sections of channels. The contribution of large amounts of sediment can fill pools and result in the stream occupying a wide channel with shallow water depths that are more prone to solar heating. Historic temperature measurements showed that removal of shade from timber harvest resulted in stream temperatures above 16 degrees. Regrowth of harvest units in the upper watershed is expected to result in moderating temperature of tributary streams in the upper watershed.

Fine Sediment

The following information on water quality is from the mainstem of the N. F. of the Stillaguamish River. While this is outside of the project area, the condition of the mainstem of the river is an accumulation of the contributions of the tributaries to the river and the immediate influences along the mainstem. The project area is of concern for its contribution to the overall health of the main N.F. Stillaguamish River.

Turbidity

The WDOE no longer lists the North Fork Stillaguamish River on the 303(d) list for fine sediment, however, observations reveal that the river runs dirty with any increase in flow and remains dirty for long periods of time (Ketcheson, personal observations). Several sources of turbidity monitoring information are available. The Tulalip Tribe water quality assessment of 1991-1992, the Stillaguamish Tribe water quality monitoring of 1993-1997, and the Washington Department of Ecology Ambient Monitoring Program included measurements of turbidity on regularly scheduled monitoring visits (see below)

Table 3-6 Turbidity monitoring values, North Fork Stillaguamish River

Source	Station	Period of Record	Turbidity Range and (sample n)
WA DOE	NF Stillaguamish R. nr Darrington	1973-1974	1.0 - 150 (24)
WA DOE	NF Stillaguamish R. at Oso	1973-1974	1.0 - 125 (24)
Stillaguamish Tribe	NF Stillaguamish R. at Whitehorse	1993-1997	0.1 - 94.9
Stillaguamish Tribe	NF Stillaguamish R. at Whitman Br.	1993-1997	0.3 - 187
Tulalip Tribe	Upper North Fork	1991-1992	0.7 - 82.0 (12)

These data have limited utility for monitoring turbidity because they are regularly scheduled samples, not targeted at storm events.

Total Suspended Solids

Total Suspended Solids (TSS) is measurement of sediment in a stream system that can be correlated with suspended sediment. The Stillaguamish and Tulalip Tribes included TSS in their monitoring. As with turbidity, the highest measured TSS is in the North Fork at the Whitman Bridge, Deer Creek, and in Boulder River and Montague Creek. These streams carry very high-suspended solid loads during storm events.

Table 3-7 Total Suspended Sediment monitoring values, North Fork Stillaguamish River

Source	Station	Period of Record	TSS Range (mg/l)	(n)	TSS Load Range (kg/day)
Stillaguamish Tribe	NF Stillaguamish at Whitehorse	1993-1997	0.0 - 88.2		
Stillaguamish Tribe	NF Stillaguamish at Whitman Br.	1993-1997	0.0 - 274		
Tulalip Tribe	Upper North Fork	1991-1992	0.0 - 111	(12)	<0.1 - 349,442

Suspended Sediment

Turbidity and TSS are two relatively easy measurements of sediment in a system. Suspended and bedload sediment are other measures that reveal more about the sediment load of a system, but are more difficult to measure The following sediment flux information underestimates sediment transport by an unknown amount

The largest calculated transport, since 1978, was in Water Year 1991 when 1.1 million tons are estimated to have passed the Cicero site. The average 19-year transport is 340,000 tons per year. Overall, 83 percent of the annual sediment transport is during the four months from November through February. Higher transport during the 1983-1996 period suggests that more sediment sources were present then than the 1978-1982 period.

An assessment of low flow suspended sediment flux in both the North Fork and South Fork Stillaguamish rivers (Collins, 1997) indicates that between 1983 and 1990 sediment concentrations were greater in the North Fork than the South Fork. This shift toward higher summer low-flow sediment concentrations in the North Fork Stillaguamish River may be due to the DeForest Creek landslide in Deer Creek and the Hazel landslide in the North Fork. These sources continue to “bleed” into the water during low flows where other sources are more related to higher flows.

Sediment Sources

The Pacific Fishery Management Council (1997) discusses Pess and Benda’s (1994) findings of a six-fold increase in sediment supply to the North Fork Stillaguamish River from landslides in the Upper NF. These landslides, accompanied by increased peak flows have resulted in sediment waves moving down the river causing the widening of particular reaches in the North Fork Stillaguamish River and dramatic fluctuations in stream bed elevation. A combination of landslide sediment, which is efficiently delivered from the upper watersheds to the mainstem, and channel-derived sediment has filled in pools and aggraded some reaches of the river.

The monitoring data above only address the smaller suspended sediment. The bedload, which results in the filling in of pools and increased channel migration and bank cutting, has not been quantified. A partial sediment budget could be done to look at the contribution of coarse sediment but time did not allow for such an

assessment for this analysis. The landsliding discussed elsewhere and mentioned in this section certainly contributes to the bedload sediment in the North Fork Stillaguamish River. However, since the landslide information does not include volumes for all inventoried landslides, estimates of sediment input are not possible.

The widening and aggradation of the river is potentially contributing to higher stream temperatures discussed above. Also the mobile gravel bed may be limiting the success of spawning by anadromous fish. Information is being collected to estimate egg-to-fry survival as a function of scour depth and fine sediment concentration.

Fecal Coliform

Fecal coliform sampling by the Stillaguamish Tribes, Tulalip Tribes, and WDOE has documented violations of standards in Montague Creek in 1996, the mainstem North Fork Stillaguamish River at C-Post Bridge in 1997, Squire Creek in 1996, and in the Upper North Fork Stillaguamish at the Forest Service Road #28 Bridge in 1996. At this time, the source of the fecal coliform is not known. Potential sources in the Upper North Fork Stillaguamish would be animals and unsanitary practices of human visitors at dispersed recreation sites. For those sites downstream of Cascade Creek, rural residences on septic systems and small livestock operations/hobby farms may be contributing.

Water Quality Summary

Sampling for sediment, temperature and fecal coliform suggest water quality concerns in the mainstem of the N.F. Stillaguamish River. Landslides in the upper watershed have contributed to increased sediment loads in the mainstem, with bank erosion, and filled pools and likely exacerbated stream temperatures. Portions of the Stillaguamish River, upper reach, have unstable soils, early seral vegetation, are within rain-on-snow zone conditions, and have roads not maintained to desired standards. These conditions often lead to peak flows that transport more sediment to the mainstem downstream and increase the potential for landslides.

In 1997, B.D. Collins reported on landslides and channel dynamics in the entire Stillaguamish River basin from the late 1800s to 1990. He concluded that most landslides were associated with clearcuts and roads, and that landslide sediment delivery in the upper North Fork peaked in the 1980s. However, with vegetation regeneration, road treatments and tighter land management policies, hydrologic conditions such as precipitation interception, distribution concentrations, and infiltration rates, have improved.

Aquatic Environment

Salmonid Fish Presence

The project area in the upper North Fork Stillaguamish River provides habitat for resident fish species only, as a barrier falls downstream at river mile (RM) 37.3 completely blocks upstream migration. A cascades at RM 36.1 stops most fish. Several anadromous and resident fish species, including those listed as Threatened under the Endangered Species Act or listed as “Sensitive” by the Pacific Northwest Region of the Forest Service, utilize habitat downstream of the project and could be influenced by proposed project activities. See the table below and the *North Fork Stillaguamish Watershed Analysis* for a summary of information on anadromous salmonid fish.

Table 3-8 Summary of Anadromous Salmonid Fish

Species/ Stock	Status	Primary Utilization	Limiting Factors
Chinook (Summer)	NMFS – Listed threatened (3/99) SASSI – Depressed; chronically low numbers	North Fork mainstem, esp. RM 21-34; large tributaries: Boulder, Squire.	**Loss of quality/quantity of holding pools due to increased sediment** and reduced summer flows limiting spawning. High flows scouring redds. Thermal barriers in lower river reducing fecundity. Poaching.
Coho	NMFS – Candidate USFS – Sensitive SASSI – Depressed; short-term severe decline	Squire Creek system; accessible tributaries, side channels & pond /slough complexes.	Squire – low flows reducing quantity of summer rearing habitat; other tributaries – lack of winter rearing habitat.
Pink (North Fork)	SASSI – Healthy NMFS – Not Warranted (10/95)	Mainstem; Squire Creek system; Boulder R., other tribs. as accessible w/ flows(French, Segelsen).	Drought reducing access to North Fork. Sedimentation reducing quality/quantity of spawning habitat, sedimentation of estuary reducing rearing.
Chum (North Fork Fall)	SASSI – Healthy NMFS – Not Warranted (3/98)	Mainstem and side channels; Squire system, Boulder, Fortson.	**Sedimentation** reducing spawning and rearing as with pinks.
Steelhead (Winter)	SASSI – Healthy NMFS – Not Warranted (8/96)	Mainstem and tributaries (Squire, Boulder, French) as accessible.	Sedimentation causing widening and shallowing, resulting in increased summer temperatures impacting both spawning and rearing.
Sockeye	NMFS – Not Warranted (Baker River stock in Skagit; 3/99) USFS – Sensitive	Mainstem around RM 26-28; Hazel area.	Undetermined; Possibilities include **sedimentation of holding pools** and estuary.
Coastal sea-run cutthroat	NMFS – Not Warranted (4/99) USFS – Sensitive SaSI – Healthy	Squire system and downstream tribs. of mainstem.	**Sedimentation**, low summer flows and high temperatures, particularly in lower river.
Bull trout	USFWS – Listed threatened (11/99) USFS – Sensitive SaSI – Unknown	N. Fork mainstem and tributaries (Boulder, Squire). Adults seen; few juveniles seen.	**Reduction of deep holding pools**, low summer flows, high temperatures.

NMFS-National Marine Fisheries Service; USFS-United States Forest Service; USFWS-U.S. Fish and Wildlife Service. SaSSI-Washington State Salmon & Steelhead Stock Inventory (WDF et al. 1993 WDFW and WWTT 1994[14], SaSI - Washington Salmonid Stock Inventory (WDFW 1998[15]])

Resident Salmonid Fish

Resident trout spawn and rear in the mainstem North Fork Stillaguamish and portions of Crevice Creek and the South Branch of the North Fork. Habitat is limited in the tributaries by steep gradients and inadequate spawning gravels. The North Fork above the barrier falls at RM 37.3 provides refugia from competition with anadromous fish. Rainbow trout were identified in the North Fork mainstem and in Crevice Creek during 1992 habitat surveys, and unidentified trout were found in Crevice Creek in a 2001 culvert inventory. While native char (bull trout/Dolly Varden) have not been verified to persist above the falls, habitat is present, though temperatures are suspected to limit reproductive success.

Non-salmonid Sensitive Fish

The Regional Forester has listed four fish species known to occur on the Mt. Baker-Snoqualmie National Forest as Sensitive: Smallish sucker, Puget Sound/Strait of

Georgia coho, Baker River sockeye in the Skagit watershed, and Puget Sound coastal cutthroat trout (all life forms).

The Salish sucker has been identified to occur in off-channel rearing ponds in the Skagit basin, but very little distribution information is known for the Stillaguamish basin. The project area does not contain the most suitable habitat for Salish sucker due to steep gradients and general lack of off-channel habitats.

Coho and riverine sockeye are found downstream of the project area below the barrier falls. Limited habitat is available for resident coastal cutthroat (see above), and presence has not been confirmed,

Aquatic Habitat

Watershed-scale Assessment

The North Fork Stillaguamish River watershed was preliminarily assessed to determine baseline conditions of fish and fish habitat indicators for chinook and bull trout, per criteria established in the U.S. Fish and Wildlife Service (USFWS) Matrix of Diagnostics/Pathways and Indicators (in: USFWS[16]). The objective of the matrix is to integrate the biological and habitat conditions to arrive at a determination of the potential effect of land management activities on a proposed or listed species.

Of the subpopulation and habitat diagnostic indicators, only two indicators (Life History Diversity/Isolation and Physical Barriers) were identified as “functioning appropriately” at the fifth-field watershed scale of the upper North Fork Stillaguamish. All other indicators were “functioning at-risk” or “functioning at unacceptable risk” (Project File)

Limiting Factors

Several factors are limiting salmonid habitat in the Stillaguamish basin, including loss of side channel habitat, lack of intact riparian forests leading to low levels of large woody debris and associated pool habitat, sedimentation of spawning and rearing habitat, and others. See Salmon Habitat Limiting Factors Final Report for the Stillaguamish Watershed (Washington State Conservation Commission 1999[17]) for more details.

As emphasized in the fish table above, sedimentation of spawning and rearing areas in the North Fork Stillaguamish is a limiting factor for several fish species. Pess and Benda[18] (1994) documented a downstream shift in peak densities of spawning chinook in the mainstem North Fork from RM 27 down to RM 22, and related this movement to sedimentation of holding pools and reduced summer low flows. Pink salmon production in the mainstem North Fork above Squire Creek was much higher 20-30 years ago, but spawning gravels have become filled or transported downstream (Hendrick, personal communication[19]).

Perkins and Collins (1997[20]) found that while 74 percent of landslides inventoried in the Stillaguamish were associated with roads and clearcuts, these management-related landslides account for 98 percent of the volume of sediment delivered. They also found that of the slides delivering sediment to stream channels, 61percent occurred in the North Fork, with Upper North Fork, Deer Creek, and Higgins Ridge areas accounting for the most landslide sediment delivered to streams.

Essential Fish Habitat

The Sustainable Fisheries Act of 1996 amended the 1976 Magnuson Act, becoming known as the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act[21]), and required Federal agencies to consult with the National

Marine Fisheries Service (NMFS) on all activities, or proposed activities, authorized, funded, or undertaken by the agency that may adversely affect Essential Fish Habitat (EFH). EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and is designated for those fish managed under the fishery management plans of the appropriate regional fishery management council.

The Pacific Fishery Management Council (PFMC) manages three species of Pacific salmon: chinook, coho, and pink salmon. EFH for chinook, coho, and pink is present in the North Fork Stillaguamish, but not in the project area above the anadromous barrier.

Project-area Assessment

Aquatic habitat in the project area consists of unnamed first-order tributaries primarily draining the Crevice Creek and the north slope of the South Branch North Fork subwatersheds. These unnamed tributaries are non-fish bearing but provide habitat for aquatic macroinvertebrates and amphibians. For a description of the wetland/riparian habitat, see other sections of this document.

Stream survey information is dated and limited. A survey of the lower reaches of Crevice Creek (0-0.66mi) and South Branch (0-0.44) were completed in 1982. While rainbow trout were found in Crevice Creek, spawning and rearing habitats were poor in both quality and quantity. Steep gradients, lack of gravel, abundance of fine sediments, and lack of cover combined to limit habitat. South Branch did have some patches of spawnable gravels behind the large boulders.

A biological assessment specific to the selected alternative for this project can be found in the project file. Refer to the Environmental Consequences chapter of this document for a more detailed description of project-level effects.

Of the subpopulation and habitat diagnostic indicators, nine indicators were identified as "functioning appropriately" at the project-level scale, while 14 indicators were "functioning at-risk" or "functioning at unacceptable risk" (see Table 3-8 The overall integration of habitat and subpopulation characteristics for the project-level site was determined to be functioning at-risk, primarily due to influences by the road network on hydrology and resulting sedimentation of habitat.

Wildlife Environment

Threatened and Endangered Species

Marbled Murrelet and Northern Spotted Owl, Critical Habitat for Marbled Murrelet and Northern Spotted Owl

The project area is within an LSR (Labbte Successional Reserve) and AMA (Adaptive Management Area) and contains designated critical habitat for the northern spotted owl and marbled murrelet. Suitable habitat exists within one-quarter of a mile of the proposed project area for both northern spotted owls and marbled murrelets (USDA Forest Service GIS Data[22]). Previous field surveys (USDA, Forest Service, Darrington Ranger District[23]) have identified activity centers and associated detections. Recent surveys by the Stillaguamish Tribe in the summer of 2000 detected both spotted owl and barred owl in historic owl locations.

Time is often considered the most critical factor for the development of old forest stand characteristics favored by the spotted owl and marbled murrelet. Evaluating forest stands for potential vegetation adjustment is recommended in the *North Fork*

Stillaguamish WSA (USDA Forest Service, 2000[24]) and *Late Successional Reserve Assessment* (USDA Forest Service, 2001[25]) for the area. Pre-commercial thinning could benefit some stands meeting criteria in the Pacific silver fir and western hemlock zone. Commercial thinning is primarily recommended for stands meeting certain criteria in the western hemlock zone. Wildlife habitat in LSRs is considered to be fully functioning when 80 percent of the western hemlock and Pacific silver fir zone is in late and old successional stages. Currently, 55 percent of the western hemlock and Pacific silver fir zones in the Finney LSR are in late and old successional stages. It is estimated that it would be a minimum of 60 years before 80 percent of the wildlife habitat in this LSR reaches 80 plus years of age.

Gray Wolf

Wolf are habitat generalist that respond to areas which have a prey base large enough to support wolf reproduction, and are relatively isolated from high levels of human induced mortality. In the analysis area, wolf would be largely dependent on deer as a food source. There are no known denning sites or confirmed wolf occurrences within the project area, although the greater watershed may be considered as potential dispersal area for wolves in the North Cascades (USDA, Forest Service, Darrington Ranger District[26]). Large tracts of land away from human use may reduce mortality (Mech 2001[27]).

Grizzly Bear

The project area lies within the North Cascades Grizzly Bear Recovery Zone and is part of Finney Bear Management Unit (BMU) where management is aimed at providing “no net loss” of bear habitat. Currently there are no known occurrences of grizzly in the project area (USDA, Forest Service, Darrington Ranger District[28]). Grizzly bear foraging habitat in this area is largely a function of early seral habitats that provide herbaceous, shrub, and berry forages. Past grizzly bear use was likely also tied to foraging on salmon, but most areas with salmon are currently in areas populated by humans where grizzly bear occurrence is not desirable.

Currently, grizzly bear habitat quality in the North Cascades Ecosystem is measured by forage availability and the amount of core habitat. Core habitat, those areas greater than 1/3 mile from an open road, is considered important for grizzly bear due to the use of important foraging areas is often higher in core areas, and less interaction with humans is less likely to lead to bear mortality. The Finney block has approximately 32 percent of the area in core habitat. In other grizzly bear ecosystems, 60-70 percent core habitat has been identified as desirable for meeting grizzly bear habitat objectives.

Northern Bald Eagles

While Bald Eagles use riparian, upland and riverine features in the North Fork Stillaguamish watershed area (USDA, Forest Service, Darrington Ranger District[29]), a fish barrier on the North Fork Stillaguamish River excludes salmon from extensive use of the upper watershed where road treatments are projected to take place. The absence of a prey base for bald eagles within the project area, coupled with more productive areas located within the greater watershed is such that bald eagles are not expected to be within the project area.

Canada Lynx

Potential lynx habitat has been modeled for the Mt. Baker-Snoqualmie National Forest with no suitable habitat identified in the analysis area. The closest suitable habitat is over 25 mile to the east in the Suiattle River drainage.

Regional Forester's Sensitive Species

Common Loon, Townsend's Big-Eared Bat, Spotted Frog, Wolverine, Peregrine Falcon

Terrestrial wildlife species on the Regional Forester's Sensitive Species (revised 2001[30]) list for the Mt. Baker-Snoqualmie National Forest, and not currently federally listed or proposed under the Endangered Species Act, are common loon, Townsend's big-eared bat, Oregon spotted frog, peregrine falcon, and wolverine. Habitat for loon (large lakes), and spotted frog (low gradient streams and rivers is not present in the analysis area.

Townsend's Big-eared Bat

Townsend's bats use a variety of habitats while foraging for insects including coniferous forests. Various elements including caves and human-built structures are used during the summer months for roosting and as maternity sites (Scharpf and Dobler[31]). The potential exists for the occurrence of these bats in the project area, with the bridge on the 2850 road providing structure for potential roosts.

Adjacent stand treatments aimed at accelerating the development of older-aged stands may provide both short-term and long-term benefit to Townsend's big-eared bats by providing foraging and roosting sites (Humes et.al.[32])

California Wolverine

As with the grizzly, wolverine have extensive home ranges and use a variety of seral stages and ecotypes. Wolverines are closely associated with large ungulate densities and are regular consumers of carrion left by other predators such as wolves and grizzlies (Banci 1994[33]). Wolverine may be present in the analysis area, but currently there are there are no known occurrences of wolverine in the project area (USDA, Forest Service, Darrington Ranger District[34]).

Peregrine Falcon

The Peregrine Falcon is known to use cliff faces as prime nesting habitat and waterways for foraging (Oakley et al. 1985[35]). The project area contains no cliff habitat for peregrines and foraging areas are projected to be in the valley floor outside of the project area.

Management Indicator Species (MIS)

Black-tailed deer, Mountain Goat, American Marten and Pileated Woodpecker

Black-tailed deer: Deer populations are reported by the Washington Department of Wildlife as currently low compared to populations that increased following large-scale timber harvest. Black-tailed deer habitat quality in this area is largely a function of early seral habitats to provide herbaceous, shrub, and berry forages. Timber harvest in the analysis area will be extremely limited under current management direction, so the deer population is not expected to increase. As existing early seral forest stands created by timber harvest mature, deer forage is expected to continue to decrease and deer populations may continue to decline. The deer population is likely to be largely dependent on non-forest vegetation types, areas of naturally low crown closure, and forest disturbances such as floods, avalanches, and windstorms. Non-forest areas in the analysis area are relatively few and disturbances sufficient to increase deer forage are relatively rare. As a result, the analysis area may not be able to produce a prey base sufficient to support wolf.

American Marten and Pileated Woodpecker: Under the Mt. Baker-Snoqualmie National Forest Land and Resource Management Plan an area along the upper Crevice Creek drainage between the lower and middle sections of the 28 road was identified as mature and old growth habitat for MIS American Marten and the Pileated Woodpecker. The project area lies with in potential dispersal, foraging, and nesting/denning areas of both species. Marten use mature and old growth stands with mostly closed canopies, abundant coarse woody debris, and abundant prey species such as squirrels (Buskirk et.al. 1994[36]). Pileated woodpeckers rely on large diameter snags found in a variety of age forest stands for foraging. These snags may also provide both resting and denning sites for martens (Neitro et al. 1985[37]) The project will not remove snags and stand adjustments will only occur in early seral stands with the objective of enhancing mature forest stand characteristics. This project may provide benefits to both marten and pileated woodpecker habitat and is not expected to affect either species.

Mountain goats: Mountain goats are not currently found in the analysis area and a past introduction on Mt. Higgins was unsuccessful. .

Survey and Manage Species

Mollusks

Survey and manage terrestrial wildlife in the project area of the Mt. Baker-Snoqualmie National Forest is limited to one snail specie, Puget Oregonian (*Cryptomastix devia*). Since existing roads are not considered suitable habitat, impacts to mollusks are not expected with any of the alternatives.

Vegetation

The stands in the project area are a mix of age classes due to past harvests. The majority of stands were harvested in the 1960s, 1970s, and 1980s, but a few date from the 1950s and 1990s. This patchwork lies within a larger context of stands originating from fires in either circa 1300, 1508, or 1701.

Botanical surveys were conducted during summer, 2001, along all the roads proposed for treatment. During those surveys, the Survey & Manage fungus *Spathularia flavida* was located along Road #2800019. This is a “Category B” species, where management of all known sites is required (USDA, USDI 2001[38]). It was located approximately 20 feet from the road edge, under hemlock and alder.

Also noted during surveys were several noxious weeds that typically occur along roadsides, including St. John’s-Wort, bull thistle, and Canada thistle. All three are State-listed Class C weeds. No Class A weeds were seen. No unique habitats were seen during the surveys.

Vehicle access for pre-commercial thinning activities can be the deciding factor in determining if a proposed thinning project will be economical or not. Thinning contractors will walk up to a mile to reach a thinning area. However, there is an extra cost for this extra effort. In the past, walking over a mile to a thinning unit was not considered cost effective and has resulted in no early management for those stands--and a missed opportunity. Optimum pre-commercial thinning usually should occur in stands between ten and twenty-five years of age for best results in keeping the stands growing well and healthy.

Depending on site conditions and past tree growth, commercial thinning can occur in stands as young as forty years old. Road access for commercial thinning is not as critical as for pre-commercial thinning. The commercial timber sale contract usually

includes temporary road construction as part of the contract package. Roads will be needed in the future to access these stands in about ten to twenty years when they have slowed in growth.

Table 3-9 shows road segments accessing stands, along with the current age and acres of that are affected by this project.

Table 3-9 Tree Stands With Potential for Precommercial Thinning

Road Number	Current Age of Stand	Acres	Existing Environment:The optimum age for pre-commercial thinning are stands ages of 10-25 years.
2800-017	38	27	
2800-018	29	54	
	38	23	
2800-19	25	53	optimum age for pre-commercial thinning
2800-020	0	0	
2830	16	29	optimum age for pre-commercial thinning
	18	73	optimum age for pre-commercial thinning
2832	16	20	optimum age for pre-commercial thinning
2840-011	12	30	optimum age for pre-commercial thinning
	14	33	optimum age for pre-commercial thinning
	27	15	
2840	27	17	
	33	71	
	36	38	
	41	61	
2849	16	19	optimum age for pre-commercial thinning
2850	12	15	optimum age for pre-commercial thinning
	15	47	optimum age for pre-commercial thinning
	16	21	optimum age for pre-commercial thinning
	25	49	optimum age for pre-commercial thinning
	26	20	optimum age for pre-commercial thinning
2851	15	24	optimum age for pre-commercial thinning
	19	34	optimum age for pre-commercial thinning
	25	43	optimum age for pre-commercial thinning
2860	8	29	optimum age for pre-commercial thinning
	15	83	optimum age for pre-commercial thinning
	18	7	optimum age for pre-commercial thinning
	27	96	
2871	0	0	

These roads offer potential access to about 1,030 acres of stands between eight and forty-one years old. Of these stands 460 acres are currently between the ages of eight and twenty years, which is the optimum age for pre-commercial thinning. In the near future, one or two decades, portions of the remaining 570 acres could be commercially thinned.

Low-level maintenance would provide the needed vehicle access now, and in the future for these stands. Decommissioning the roads would not allow vehicle access,

and may require rebuilding road at a future date in order to access it for commercial thinning.

Human Use and Influence

Recorded human (American Indian and Euro-American) use in the North Fork Stillaguamish valley dates back to the late 1800s. Homesteading, mining, trapping and hunting, fishing and plant gathering were the most common activities during this era.

Currently there is timber management and some dispersed recreational activities in this area. While there are few developed recreation sites in the area, there is dispersed roaded recreational use. In the winter months, moderate snowmobile use is supported by the Washington State SnoPark Program and includes grooming on 33 miles of Road 17 and 18, which are outside the project area. Cross-country skiing and snowshoeing are also very limited activities during the winter months. There are no system trails within the area, but there are some social trails around Texas Pond east of the project area, as well as a toilet and picnic tables. Dispersed campsites might exist at old log landings adjacent to or at the end of those forest spur roads that are still driveable, but these sites would be remote, few in number, and rarely used. Other recreational use includes scenic driving, rock hounding for fossils and rocks, huckleberry picking, mushroom collection, bough cutting, Christmas tree cutting, fishing, and hunting. Refer to the follow table for a summary of the recreation activities and locations. None of the roads proposed for treatment have known recreation use except for possible hunting and dispersed camping.

Table 3-10 – Human Uses by Road

Road	Access and Recreation Use
28: North Fork Stillaguamish Twin Bridges by 2820 28 between 2840 to 2860	Twin bridges near junction of 2820 and 28 provides swimming, fishing, and dispersed camping. Native American herb gathering also berry picking and mushrooms.
2840: Crevice Creek	Dispersed recreation.
2880: North Branch	Access for berry picking, vistas.
2881: Lost	Access for berry picking, vistas.
2882: Stilly Pass	Access for berry picking, vistas.
29: Rinker Ridge Texas Pond	Rinker Point, vistas, berry picking Fishing, dispersed camping, historic ranger station and shake bolt camp. Native American use area.

Fire and Fuels

Fuel Types

The analysis area is a patchwork of fuel types ranging from Fuel Model G to H*. Each of these has a different response to fire in energy release and spread rates[39]. These fuels when combined with weather conditions and topography may result in a large fire event, recent history would identify this potential to be rated as: Low. (project analysis file)

This proposal would have no significant impact on this fuel matrix. (Currently, there are about 20 days per year that are projected to have conditions that would support large fire growth if a start were to occur where fuels, weather, and topography would support large fire growth. The potential of this happening, based on recent history, is rated as: Low (NWCG Fireline Handbook Fire Behavior, 1993[40])

Fire History

Fire history studies show large fires (over 1,000 acres) have occurred in the North Fork Stillaguamish watershed. However, the occurrences of stand-replacing fires are infrequent. GIS mapping shows two fires in the early 1300s totaling 32,000 acres. Subsequent fires occurred in 1508 (10,000 acres, near Texas Pond), 41,000 acres burned in 1701, 1,400 acres in 1748, and 10,000 acres were shown to burn in 1834. A 600-acre fire burned in 1880.

From 1900 to present, records show fires have burned relatively few acres (under 100 acres).

The North Fork Stillaguamish watershed has averaged three to ten lightning fires, and five to ten human caused fires each year. These fires are less than one acre in size, and are located in high recreational areas such as rivers, highway corridors, and camping sites.

The potential for a large fire exists within the area under extreme weather conditions, along with environmental and topographical components. This complexity of elements makes predicting such an event impossible. (USDA Forest Service 2000[41])

* Fuel Model G – dense conifer stands where there is a heavy accumulation of litter and down wood, Fuel Model H- Stands with sparse undergrowth and a thin layer of ground fuels.

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

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

This section will describe environmental consequences to botanical, fish, wildlife species that are: listed as threatened, endangered, or proposed under the Endangered Species Act; listed as Survey and Manage species in the Northwest Forest Plan; on the Regional Forester's list of Sensitive Species; Management Indicator Species and Early Seral Dependent Species whose habitat requirements represent other species with similar habitat needs.

Hydrology

Alternative A -No Action

This alternative would result in the project area remaining in its present state. No changes in the hydrologic distribution and function would occur. The soil conditions would remain the same. Road conditions would remain at present conditions.

Mass wasting and consequently the sediment source, transport and storage would remain the same in the drainages that contribute to surface flows of Crevice Creek and the South Branch North Fork Stillaguamish. Roads would continue to potentially contribute to mass wasting events that may enter streams, eventually reaching the North Fork Stillaguamish River and downstream resident and anadromous habitat.

Alternative B-Action

Road treatment would occur on National Forest System Roads # 2800-017,2800 -018, 2800-19, 2800-20, 2830, 2832, 2840-011, 2841, 2849, 2850, 2851, 2860, & 2871 to improve distributions of water flow caused by ditchline dimensions, locations and blockages resulting in better hydrologic conditions in the South Branch and Crevice Creek subwatersheds. This alternative would also involve removal and/or redistribution of fill material, and removal of culverts improving stream/road-crossing sites. Pullback of sidecast material will be implemented to help lessen overburden preventing accelerated down slope movement resulting in adverse delivery of sediment into aquatic habitat.

The proposed project address concerns with road conditions through removal of culverts, removal of much of the fill over the culvert in a dipped configuration to keep the channel flow in the channel if the culvert plugs, and/or additional cross drains to the road surface that are firmly keyed into the inboard road bank to add surface flow distribution to the road

Cumulative Effects

The North Fork Stillaguamish Watershed Analysis stated, "The North Fork Stillaguamish River has been considered to be of relatively good water quality (Thornburgh 1993[42]). However, monitoring over the last 20 years has raised concerns about the ability of the area to support beneficial uses". Most of the concerns by Washington Department of Ecology (WDOE) were focused downstream of NFS lands.

Washington State Water Quality standards classify the North Fork Stillaguamish River above Squire Creek and tributaries on NFS lands as Class AA, extraordinary. In contrast, the watershed analysis' water quality summary said, "some specific problems exist on Federal lands within the analysis area. Landslides in the upper watershed have increased sediment loads in the mainstem, increased bank erosion, infilled pools and exacerbated stream temperatures". Another side to the North Fork Stillaguamish watershed is its ability to recover rapidly from slope failures reaching active streams, with the example from the natural Squire Creek slide (2002). This was a large (estimated to be in excess of 100,000 cubic meters) delivery of sediment, rock, and vegetation into Squire Creek channel and riparian area. While on-going investigation of the slide's impact on the North Fork Stillaguamish River is still being examined, the bulk of fine sediments in the Squire Creek channel flushed out rapidly over a one water-year cycle.

Sediment and temperature in the upper North Fork Stillaguamish River are intertwined, where increased delivery of material to a channel can fill the stream channel resulting in a wide, shallow stream reach with potential for increased stream temperatures. However, temperature data collected from past monitoring in the upper North Fork and Crevice Creek show water temperatures influenced most by cool groundwater as stated in the Watershed analysis (pg 3-139) The past temperature monitoring efforts suggest that activities such as road construction, timber harvest, trails, and dispersed camping have cumulatively affected the natural hydrologic regime within the Upper North Fork Stillaguamish watershed.

Over the millennia the watershed has experienced geomorphic change in the form of mountain range formation, glacial and flooding processes that have shaped the landscape. Whether the effects are a result of human activities or natural processes, sediment delivery to downstream fish habitat has and will continue to occur. Because there is such a large percentage of steep stream channels and a relatively low percentage of intermediate gradient channels, eroded material in the upper watersheds is transported to the low gradient mainstem. This makes the mainstems of the North Fork Stillaguamish River and major tributaries vulnerable to upslope disturbances.

In 1997, B.D. Collins reported on landslides and channel dynamics in the entire Stillaguamish River basin from the late 1800s to 1990. He concluded that most landslides were associated with clearcuts and roads, and that landslide sediment delivery in the upper North Fork peaked in the 1980s. However, with vegetation regeneration, road treatments and tighter land management policies, hydrologic conditions such as precipitation interception, distribution concentrations, and infiltration rates, have improved.

An example related to road treatment affects in the North Fork Stillaguamish watershed can be found in the lower portion of Forest Service Road # 28 where the road was decommissioned (USDA Forest Service 2000[43]). This section of road had multiple unstable pockets of soils delivered to downstream fish habitat and was a high risk of delivering more sediment to the mainstem. The road treatment consisted of installing multiple cross-drains, culvert removal, road fill pullback, and road closure berms, which are similar road treatment work features proposed for this project. A 2002 field visit to Forest Service Road #28 project found the road treatment operating effectively. No new road related failures where noted on this segment of treated road. The surface and ground water flow, affected by the road presence, were found to be functioning adequately with the treatment prescribed preserving the hydrologic integrity of the surrounding landscape. It is assumed, that continued road treatment work in the North Fork Stillaguamish River drainage will promote the hydrologic integrity of the surrounding landscape.

Fisheries

Alternative A – No Action

The risk of impacts to fish species of interest and their habitats in Crevice Creek, South Branch, and North Fork Stillaguamish due to road-related sedimentation associated with these 14.9 miles of roads will increase due to lack of treatment. Particularly along the 13 miles of roads with a high or moderate risk of failure, fill material entering the channel could be transported to downstream resident and anadromous fish habitat. Both fish and their habitats could be negatively impacted through scouring of channels and redds and deposition in spawning and rearing habitats depending on the timing and intensity of these failures. Impacts to Salish sucker are not likely to occur due to lack of habitat for these fish.

Alternative B – Proposed Action

Treatment of these 14.9 miles of roads will help minimize the risk of sedimentation that may impact downstream fish and their habitats.

The checklist for documenting environmental baseline and effects of proposed actions on relevant indicators are in the Fisheries Biological Assessment - Project Consistency Form in the b. This checklist shows that for the action area defined as the South Branch North Fork Stillaguamish, Crevice Creek, and mainstem North Fork down to Squire Creek (RM 31.2-38.7), short-term effects are likely to occur during, or within the first year following, project implementation. Short-term, direct effects would occur to banks as culverts are removed, but project activities will help prevent road-related failures and consequent erosion of banks downstream where fish occur. Short-term sedimentation during and within the first year after the project might reduce the quality/quantity of pools and spawning/rearing areas, but long-term benefits are expected as catastrophic sedimentation will be avoided, and sediments will flush and not be replaced as quickly due to decreased inputs. See the Fisheries Biological Assessment - Project Consistency Form in the project file for additional comments on how the proposed action would help to restore conditions for fish.

The proposed action alternative is expected to maintain habitat and subpopulation indicators at both the upper North Fork Stillaguamish River watershed scale, and at the broader scale of the Stillaguamish River.

Cumulative Effects

The cumulative effect of the proposed action to the watershed is negligible when considering the percentage of National Forest to other land management/ownership within the watershed. Harvest guidelines and road treatments on state and private lands in conjunction with the Forests and Fish rules and DNR's Habitat Conservation Plan will help to improve fish habitat conditions in the North Fork and in the basin. As sedimentation related to management activities is reduced, however, the trend in fish habitat quality/quantity, as well as the resulting fish productivity, is expected to improve. Fish productivity remains tied to other factors besides habitat availability and condition, however.

Forest stand management activities within the Late-Successional Reserve and Adaptive Management Area allocations in the upper North Fork Stillaguamish will help to improve hydrologic and riparian vegetation conditions that will have direct and indirect benefits to fish species of concern.

Vegetation

Alternative B

Survey and Manage Species: No effects are anticipated to the Survey and Manage fungus *Spathularia flavida* since mitigation measures prescribe a 100-foot buffer around the site. This buffer would maintain the species, as well as its habitat.

Noxious Weeds: Alternative B is expected to be favorable to the control of noxious weeds because of the mitigation measures prescribed. All disturbed surfaces will be seeded with non-native, but non-invasive, species meant to quickly colonize bare sites and prevent the establishment of noxious weeds. All mulch would be weed seed-free. Machinery brought in will be weed and soil-free. Alternative A, on the other hand, would have no work done on the roads, leaving bare soil exposed which is typically conducive to weed seed germination.

Cumulative Effects

Cumulative effects to Sensitive or Survey/Manage plant species is expected to be negligible as the only species of concern found in the project area will be protected by a buffer, and if any other species of concern are located work would cease until appropriate mitigation is enacted.

Cumulative effects to vegetation management is that vehicle access will decline for pre-commercial thinning activities and access can be the deciding factor in determining if a proposed thinning project will be economical or not. Thinning contractors will walk up to a mile to reach a thinning area. However, there is an extra cost for this extra effort. In the past, walking over a mile to a thinning unit was not considered cost effective and decreased road access would result in no early management for those stands--and a missed opportunity for treating stands farther than a mile from open road systems.

Depending on site conditions and past tree growth, commercial thinning can occur in stands as young as forty years old. Road access for commercial thinning is not as critical as for pre-commercial thinning. The commercial timber sale contract usually includes temporary road construction as part of the contract package. Roads will be needed in the future to access these stands in about ten to twenty years when they have slowed in growth.

Wildlife

Alternative A - No Action

The current pattern of wildlife use in the project area would be expected to continue with wildlife using the currently brushed-in roads as travel paths and foraging areas (approximately 13 miles), and avoiding open road areas (approximately 2.0 miles of road). With this alternative, there would be no reduction in open road density, so disturbance to wildlife near open roads would continue. Vulnerability to legal and illegal harvest of bear, deer, wolf, wolverine, lynx, and marten would also continue. Alternative A may impact the above species through reduced habitat quality and potential human-caused mortality, but it is not expected to result in a loss of viability or lead towards federal listing for the wolverine since wolverine habitat is limited in the area and poorly connected to better quality habitat. This alternative does not provide an increase in bear foraging habitat within the BMU core area, as does the action alternative.

Alternative B – Proposed Action

This alternative, if implemented, would change the road maintenance level on approximately 5.6 miles of three roads that currently are mostly brushed in and not drivable, but are listed as open to high clearance vehicles (ML2). These roads would be in storage or closed to vehicle access (ML1). This alternative also identifies approximately 1.5 miles of road that would no longer be needed and would be decommissioned (.5 miles of Road #2850 and one mile of Road #2860). Reduced open road density is expected to increase a variety of wildlife species use near roads and may reduce their vulnerability to legal and illegal harvest. Some short-duration adverse noise disturbance to spotted owl and marbled murrelet could occur with this alternative if proposed road work could not be scheduled outside of the nesting season and if active nests were nearby.

Reduced human disturbance can allow for an increase in use of natural early seral habitats (snow chutes, meadows, and shallow soil or wetland areas). Black-tailed deer, grizzly bear, and gray wolf all are reported to have reduced habitat use near roads open to vehicles. Reduced road traffic is expected to increase deer use of foraging areas near roads and may reduce vulnerability to legal and illegal harvest. This could result in a larger deer population.

If implemented, alternative would provide for approximately 1.5 miles of road decommissioning that would result in additional 450 acres of grizzly bear core habitat in the Finney BMU. Any reduction in the amount of forest roads accessed by humans would likely be beneficial to grizzlies (Hood and Parker 2001[44]). The action alternative could result in a short-term reduction in habitat use due to noise disturbance when roadwork occurs.

If implemented, this alternative would remove a bridge on Road #2850. No sign of bat use was detected in surveys of the bridge, and due to the wet conditions underneath the bridge, bat use of the area is not suspected. Bat use is of structures is variable and may not have been picked up during the surveys. Other bridges within the project area were also checked and not found to have Townsend-big eared bats so no impact to the bats is projected from the 2850 bridge removal.

Impacts to wolverine with the action alternative would be beneficial by creating more habitat with little human use, potential increase in deer populations, and reduced risk of human-caused mortality.

Other terrestrial wildlife Management Indicator Species (MIS) on the Mt. Baker-Snoqualmie National Forest could benefit from implementing the action alternative. Pine marten is likely to occur in the analysis area, and while habitat would not be modified by either alternative, reductions in open road density could reduce trapping impacts. Pileated woodpeckers habitat would not be directly affected by the alternative, but closed roads may reduce the occasional felling of roadside hazard trees, and the removal of standing and down wood by firewood hunters. The amount of habitat affected is very small and is likely inconsequential for the pileated woodpecker since most suitable and capable habitat would not be within the road influence zone. None of the alternatives are expected to impact mountain goat or its potential habitat

Cumulative Effects

There is little direct effect on wildlife expected from the proposed project; direct effects are short-term noise disturbance with wildlife moving away from sources of disturbance on approximately 2400 acres during the road treatments. Indirect effects will be from management of the habitat to provide additional foraging, bedding

roosting, rearing habitat for wildlife using interior older aged forests. The Draft Finney Adaptive Management Area (AMA) Plan calls for 80-90 percent of the area to be managed for older forests. Within the project area the AMA proposes to retain older forests as part of the interior forests for spotted owl and marbled murrelet and manage younger age stands for a balance of age classes. Thinnings of 60–80 year old stands is proposed in the WSA and LSRA for adjustment of stands to better meet desired old forest conditions. Within portions of the project area that are not LSR, commercial thinning or harvest is a potential activity that would be considered in the area. Given the approximate 850 acres that has been harvested in this drainage on private land, additional harvest would be designed to retain forest canopy in rain-on-snow areas and to provide connecting habitat. Continued efforts to manage much of the area for Late Successional Reserve will benefit species such as the spotted owl and marbled murrelet, but will limit populations of wildlife species that use early seral habitat. Those species will be likely to find suitable habitat in the State and private lands adjacent to the National Forest.

Continued road and spur road treatments in the North Fork Stillaguamish may benefit bald eagles using the lower reaches of the watershed due to decreased sedimentation, hence improved fish habitat once road and spur sections are treated.

Continued road and spur road treatments in the North Fork Stillaguamish may also benefit species such as black-tailed deer, and bear with increases in foraging opportunities near roads with reduced vulnerability to legal and illegal harvest. Other trapped species such as American marten may also have reduced vulnerability to legal and illegal harvest.

Recreational use of the area for hunting, fishing, berry picking, swimming (Twin bridges) and dispersed camping is expected to continue with the potential to impact wildlife use of areas adjacent to roads, and dispersed camping sites, and to contribute to legal and illegal take of wildlife.

Human Use and Influence

Alternative A -No Action

The current pattern of dispersed recreation use and access in the project area would be expected to continue on an infrequent basis; most dispersed recreation use occurs on the National Forest System Road 28 and outside of the project area.

Alternative B - Action

The current pattern of dispersed recreation use in the project area is expected to continue on an infrequent basis. Most of the spur roads to be put in storage or decommissioned make up a small part of the overall road network in the area, and they are dead-end segments averaging 1.1 miles in length. Also, most of these spurs are already overgrown and not driveable; they are accessible by foot only. After the road treatments are completed, people would still be able to access the areas by foot for the various recreational uses as listed in Chapter 3 (footpaths on the longer roads will be left for TSI crews). Displacement of any dispersed camping is expected to be negligible. The main Road 28 system would continue to be open to motor vehicles of the public.

The project area has a high road density. Nationally there is increasing interest in maintaining and protecting non-wilderness roadless areas of the National Forests for their ecological and social values. The proposed road treatments would reduce road densities and move the area toward a less-roaded character.

Cumulative Effects

Road maintenance would continue on Road 28, as well as trail systems and administrative areas. Road closures will shift any dispersed camping to other areas, such as the main road, as well as other local roads and open road systems.

CHAPTER 5 CONSULTATION AND COORDINATION

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

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