United States
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Timberline Ski Area Mountain Bike Trails and Skills Park

Preliminary Assessment

Zigzag Ranger District
Mt. Hood National Forest

Clackamas County, Oregon

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Legal Description: T3S, R9E, Sections 7, 12, 13, Willamette Meridian

Lead Agency:	USDA Forest Service
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CHAPTER 1 - PURPOSE AND NEED FOR ACTION

1.0 Introduction

Timberline Ski Area is located on the Zigzag Ranger District of the Mt. Hood National Forest (Forest), on the southwest side of Mt. Hood, in northwestern Oregon (see Figure 1, Timberline Ski Area Vicinity Map). RLK and Company (RLK) operates Timberline Lodge and Ski Area (Timberline) under a 30-year Special Use Permit issued by the U.S. Forest Service. Timberline encompasses approximately 1,415 acres.

This preliminary assessment analyzes the effects of a proposal by RLK to develop a managed, ski lift-assisted downhill-only mountain bike trails system and skills park. The trails system would be located within the terrain serviced by the Jeff Flood Express Lift within and adjacent to the Timberline Special Use Permit boundary. The Skills Park would be located by the Day Lodge. The trail system would include approximately 17 miles of trail, and the Skill Park would encompass approximately 0.2 acre. The proposed action also includes a watershed restoration activity which would decommission or stabilize approximately 2.1 miles of native surface roads within or adjacent to the project area. This preliminary assessment analyzes two alternatives – the Proposed Action and No Action alternatives.

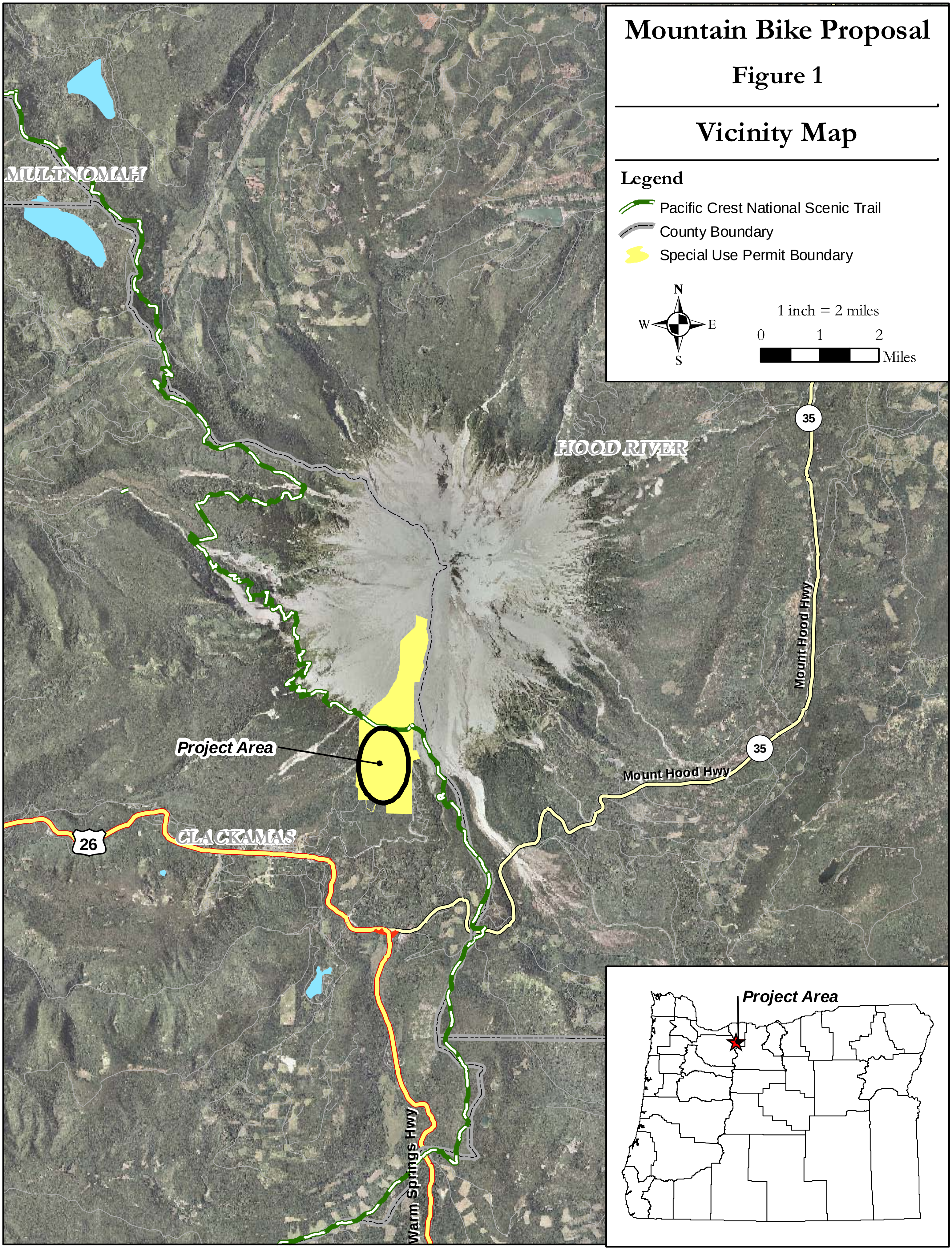
This document and all appendices are posted on the Mt. Hood National Forest web site in the “Land and Resources Management” section, and then under “Projects”: http://www.fs.usda.gov/mthood.

1.1 Background

Lift-assisted mountain biking is a popular and quickly growing sport that has evolved from an extreme sport for skilled athletes, to a mainstream sport accessible to a broad spectrum of riders. As an example, the Whistler B.C. Mountain Bike Park sees over 120,000 visitors per summer and the most popular intermediate trail sees over twice as many riders as the most popular advanced trail.

Lift-assisted mountain biking involves riders using a modified chairlift to bring themselves and their mountain bikes to the top of a downhill-specific bike trail system. Using a chairlift allows riders of all abilities and fitness levels to descend a variety of trails multiple times and develop new skills in a safe and progressive manner. As with winter ski operations, bike parks provide an opportunity for educational and skill building programs for the public.

One common misconception is that mountain bike riders descend the same runs as skiers use in winter. While mountain bike trails sometimes cross ski runs, it is important to understand that downhill mountain bike trails are built specifically for summer use and are generally far less steep than even the easiest winter ski run. Properly designed, constructed, and maintained lift-assisted mountain bike facilities provide well managed opportunities for local and destination visitors to practice their sport in a safe and sustainable fashion. Properly designed mountain bike



Mountain Bike Proposal

Figure 1

Vicinity Map


Illustration 1 – Typical Downhill Single-Track

trails use grade reversals and other techniques to control the downhill speed of the bikes. This is especially important at turns or other features in the trail as it reduces the need for braking and minimizes impacts to soil and vegetation. Additionally, with a well designed bike park, riders stay on the trail because of the way the trail flows, speeds up and slows down for the next feature.

Resorts, land managers, and nearby communities see lift assisted mountain biking as an efficient way to capitalize on existing infrastructure beyond just the ski season, providing year round recreation opportunities and a more viable operation for the permittee. It can also be a tool to help secure more stable year-round employment for those that might otherwise be seasonal employees.

Recognizing that the Forest Plan objectives include managing ski areas to provide a diversity of winter and summer developed recreation activities that emphasize the forest setting (Forest Plan pg. Four-191) and the growing demand for downhill-mountain biking, RLK contracted with Gravity Logic of Whistler, Canada to help develop a proposal for a mountain bike park at Timberline. Gravity Logic specializes in the development of lift-accessed and managed mountain bike terrain that utilizes chairlifts. Gravity Logic developed and ran the world class mountain bike park at Whistler and has since developed mountain bike parks around the world. RLK's goal is to develop a high quality, managed and maintained, mountain bike park that would appeal to families and feature predominantly beginner and intermediate level trails and areas for learning biking skills and riding etiquette.

RLK Master Development Plan

RLK submitted a Master Development Plan (MDP) in January 2009 to the Forest as required by their special use permit. RLK prepared the MDP to serve as a conceptual planning tool to provide their vision as to what the ski area may develop into over the next 10-15 years. The Forest reviewed the MDP and found the potential projects in the MDP appear to be, or can be made consistent, with applicable laws, regulations, policies, and the Forest Plan as amended. The Forest accepted the MDP in May 2009. In December of 2009 RLK submitted an amendment to their MDP, which clarified their interest in the development of a lift assisted mountain bike trail system served by the Jeff Flood chairlift. The Forest again reviewed the amended MDP and accepted it in February of 2010. The acceptance of a MDP does not represent Agency approval of any element in that plan. In essence it documents compliance with a provision in their special use permit to have a master development plan. As stated in the acceptance letter, any element of the plan that is proposed to the Forest Service would be subject environmental analysis under the National Environmental Policy Act (NEPA). In February 2010 RLK presented a formal mountain bike proposal to the Forest that they were ready to move forward with. In June of 2010 the Forest began the scoping process for this proposal.

During the scoping process a number of commenter's stated all of the projects in the MDP should be evaluated in an Environmental Impact Statement. The only element in their MDP that is being proposed by RLK at this time is the mountain bike trails and skills park. Unlike the mountain bike proposal, the other elements envisioned in the MDP are only conceptual in nature, have not received the level of planning and design necessary for environmental analysis, and have yet to be fully evaluated for their feasibility. RLK has not requested approval and the Forest is not considering approval of any of the other potential projects in the MDP at this time. It is expected other potential projects in the MDP may be modified over time or may never even be proposed. The proposed mountain bike project is not dependant on and does not trigger any of the other potential projects in the MDP. For these reasons other potential projects in the MDP are not being evaluated at this time.

1.2 Purpose & Need for Action

The Forest is responding to a proposal by RLK to develop a system of mountain bike trails and a skills park within their permit boundary. The purpose of the project is to allow RLK to provide the public with additional year round recreational activities to better use the existing ski area infrastructure while helping to meet the demand for lift serviced mountain biking in this area. An additional purpose of the proposal is also to help meet the Desired Future Condition (DFC) for Timberline. A goal for this Ski Area in the Forest Plan includes providing for areas of high quality winter and summer recreation opportunities (Forest Plan, page Four - 190). Mountain biking is listed as a DFC on page Four–191 of the Forest Plan.

The outdoor recreation market is thriving in Oregon and mountain biking is an important component of that market. Because of limited managed mountain biking areas on public land the Forest Service is seeing an increase in unauthorized "free-ride" mountain biking areas. These illegally constructed trails are creating resource damage as they appear throughout Oregon's public lands. A managed, well designed, downhill-only, mountain bike trail system and skills park in Northwestern Oregon would provide an opportunity for safe, sustainable, managed mountain biking. Further, development of this area is supported by existing infrastructures such as roads, ski lifts, parking lots, lodge facilities, restrooms and signage.

1.3 Proposed Action

In January of 2010 RLK submitted a proposal to the Mt. Hood NF to develop a managed, ski lift-assisted downhill-only mountain bike trails system and skills park within the southern portion of the ski area permit boundary. The proposal would consist of an approximate 17 mile trail network and a separate "skills park" that would encompass approximately 0.2 acre. The trail system would be designed to accommodate all skill levels with an emphasis on beginner and intermediate levels. The bike trails and skills park would be a fee based system similar to a lift ticket for downhill skiing and would be managed and maintained by RLK under the terms and conditions of an operating plan as part of their Special Use Permit. A detailed description including project design criteria, and a map of the proposed trails system and skills park is provided in Chapter 2.

In addition to the proposed mountain bike park, a restoration proposal has been developed with the collaboration of RLK, and is also included in the proposed action. Over the last several years the Forest has utilized site specific project analysis as an opportunity to identify road related issues or concerns in a project area and to design corrective actions that will help reduce road related aquatic impacts and restore watersheds. The interdisciplinary team (IDT) that is preparing the environmental analysis has identified approximately 2 miles of native surface roads in the project area that are contributing sediment to nearby stream systems and has developed corrective measures. These restoration activities are also described in detail in Chapter 2.

1.4 Decision Framework

The deciding official (i.e., Responsible Official) for this project is the Forest Supervisor. Based on the environmental analysis, and considering the public comments received, the Responsible Official will decide:

- Whether to construct mountain bike trails and a skills park as proposed, including all associated project design criteria;
- To select and modify an alternative; or,
- To take no action at this time.

The primary factor that will influence the Forest Supervisor's decision is based on how well the purpose and need are addressed coupled with addressing key issues. The Decision Notice will document and describe what activities will be implemented to address the purpose and need. The decision will be consistent with the Mt. Hood Forest Plan, as amended by the Northwest Forest Plan, and will incorporate the associated project design criteria.

1.5 Management Direction

This preliminary assessment is tiered to the Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) for the Mt. Hood National Forest Land and Resource Management Plan (hereafter referred to as the Forest Plan) (USDA Forest Service 1990), as amended. The Forest Plan guides all natural resource management activities and establishes management standards and guidelines for the Forest. It describes resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management. Additional management direction for the area is also provided in the following Forest Plan amendments:

- The Northwest Forest Plan (NWFP) - *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl and Standards and Guidelines for Management of Habitat for*

Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (USDA & USDI 1994);

- Survey & Manage – *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (USDA Forest Service et al. 2001); and,

- Invasive Plants– *Pacific Northwest Invasive Plant Program Preventing and Managing Invasive Plants Record of Decision* (USDA Forest Service 2005); and *Site-Specific Invasive Plant Treatments for Mt. Hood National Forest and Columbia Gorge Scenic Area in Oregon* (USDA Forest Service 2008).

Land Designations

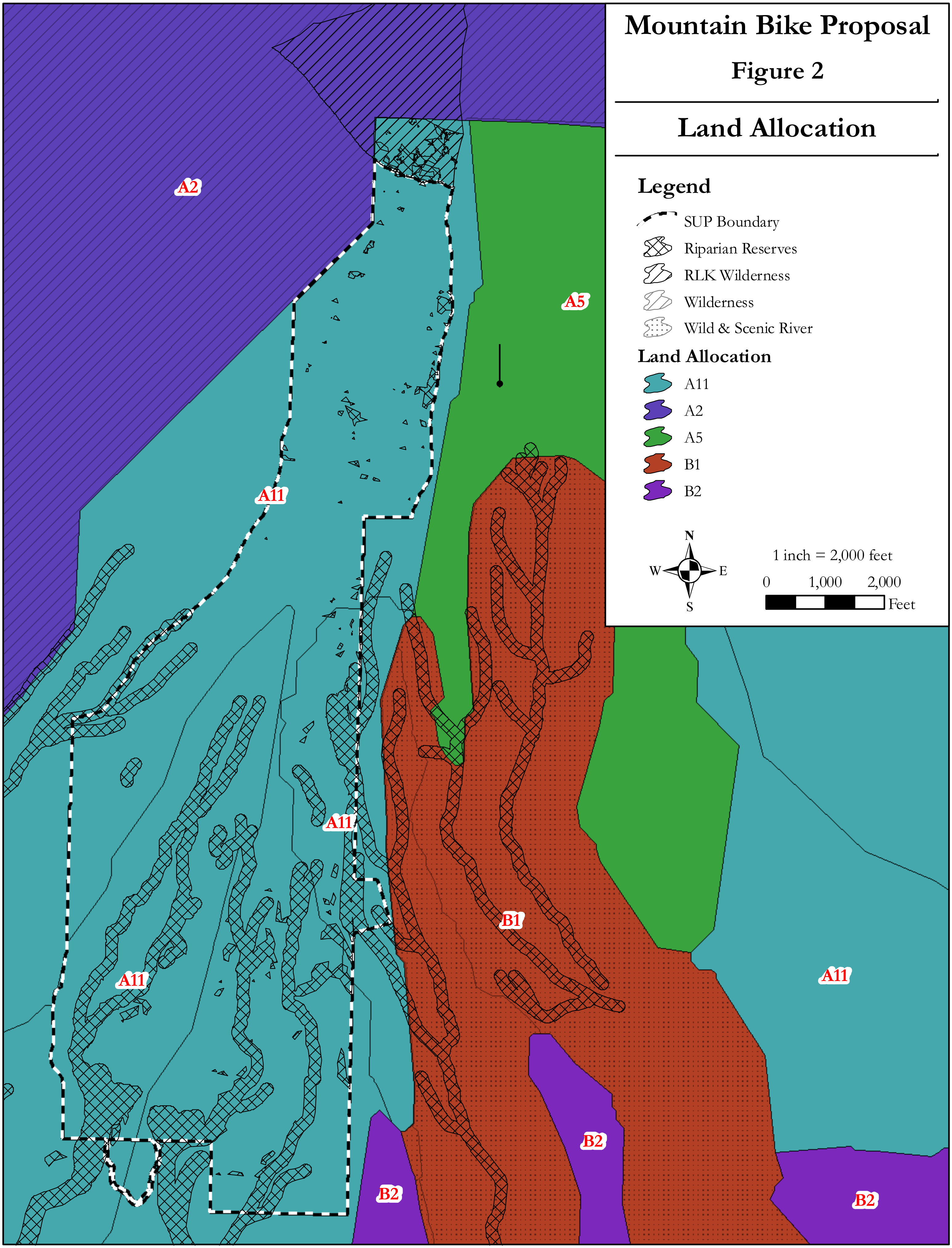
The 1994 NWFP ROD land allocations amend those allocations described in the 1990 Forest Plan. There is considerable overlap among some allocations; therefore, more than one set of standards and guidelines may apply. Where the standards and guidelines of the 1990 Forest Plan are more restrictive or provide greater benefits to late-successional forest-related species than do those of the 1994 NWFP ROD, the existing standards and guidelines apply. The proposed mountain biking and road-related restoration activities would occur primarily in Management Area A-11 (Winter Recreation Areas), which emphasizes winter recreation (see Figure 2 below). The stated goal of Management Area A-11 is to "provide high quality winter recreation (and associated summer) opportunities including: downhill skiing, nordic skiing, snowmobiling, and snowplay within a natural appearing forest environment" (USDA, 1990a). A11 lands within Timberline's Special Use Permit (SUP) area have been allocated to Administratively Withdrawn Area (AWA) under the Northwest Forest Plan.

The Timberline SUP area and surrounding National Forest System Lands include several other Forest Plan management area designations:

Management Area A-4 (Special Interest Area) - The goal for this management allocation is: Protect, and where appropriate, foster public recreational use and enjoyment of important historic, cultural, and natural aspects of our national heritage. Preserve and provide interpretation of unique geological, biological and cultural areas for education, scientific and public enjoyment purposes.

Management Area B-7 (General Riparian Areas) - The goal for B7 is to achieve and maintain riparian and aquatic habitat conditions for the sustained, long-term production of fish, selected wildlife and plant species, and high quality water for the full spectrum of the Forest's riparian and aquatic areas. A secondary goal is to maintain a healthy forest condition through a variety of timber management practices.

Management Area B-2 (Scenic Viewshed) - As identified in the *Forest Plan* (USDA, 1990a), Scenic Viewsheds "include landscapes which are visible from selected travel routes, rivers and lakes, major viewpoints, and popular recreation areas". The stated goal of Scenic Viewsheds is to "provide attractive, visually appealing forest scenery with a wide variety of natural appearing


Mountain Bike Proposal
Figure 2
Land Allocation
Legend
SUP Boundary
Riparian Reserves
RLK Wilderness
Wilderness
Wild & Scenic River
Land Allocation
A11
A2
A5
B1
B2
N
W
E
S
1 inch = 2,000 feet
0
1,000
2,000
Feet
A2
A5
A11
A11
A11
A11
B1
B2
B2
B2

landscape features. Utilize vegetation management activities to create and maintain a long term desired landscape character".

Tier 1 Key Watersheds (from the Northwest Forest Plan) - A portion of the Timberline SUP area lies within the Salmon River watershed, which has been designated as a Tier 1 Key Watershed under the *Forest Plan, as Amended*. Tier 1 Key Watersheds are one of the four components of the Aquatic Conservation Strategy (ACS), as described in the Northwest Forest Plan.

Riparian Reserves (from the Northwest Forest Plan) - The Timberline SUP area lies within both the Salmon River and Zigzag River Watersheds, which contain Riparian Reserves along streams, wetlands, ponds, lakes and unstable and potentially unstable areas. Riparian Reserves are one of the four components of the ACS.

1.6 Additional Documents Incorporated by Reference

This analysis is tiered to the Final Environmental Impact Statement for the Mt. Hood National Forest Land and Resource Management Plan (Forest Plan), 1990; the Final Environmental Impact Statement for the Northwest Forest Plan, 1994; the Timberline Express Proposal Final Environmental Impact Statement (November, 2005), and the Timberline Lodge Final Environmental Statement, 1975 *(40 CFR 1502.20).*

Zigzag Watershed Analysis - The Zigzag Watershed Analysis "develops and documents a scientifically-based understanding of the ecological structures, functions, processes and interactions occurring within a watershed. In doing so, this analysis process identifies trends, conditions and restoration opportunities." The analysis is intended to support broad ecosystem management objectives at the watershed scale. The Assessment serves as a comprehensive aquatic resource assessment of the Zigzag River watershed.

Salmon River Watershed Analyses - The Salmon River Watershed Analysis was conducted "to develop and document a scientifically based understanding of the ecological structures, functions, processes and interactions occurring within a watershed, and to identify desired trends, conditions, and restoration opportunities". The analysis is intended to support broad ecosystem management objectives at the watershed scale. The Assessment serves as a comprehensive aquatic resource assessment of the Salmon River watershed.

1.7 Public Involvement

Scoping is an integral part of environmental analysis. Scoping includes refining the Proposed Action, identifying the interdisciplinary team (IDT) and the preliminary issues, and identifying interested and affected persons. The results of scoping are used to 1) identify public involvement methods; 2) refine the issues; and 3) explore alternatives to the Proposed Action and associated potential effects *(36 CFR 220.4(e)(1)(2)).*

Scoping for this project was first published in the spring, 2010 issue of the Mt. Hood National Forest Schedule of Proposed Actions (SOPA), and has appeared in each issue since then (the

SOPA is published quarterly). On June 29, 2010 a letter and map describing the project was mailed to a list of approximately 200 agencies, organizations, and individuals that have been identified as being interested in projects on the Mt. Hood National Forest. The letter and map were simultaneously posted on the main page of Forest's web site: http://www.fs.usda.gov/mthood/. A field trip was also hosted on September 23, 2010 where members of the public were able to view the proposed trails on the ground and ask questions of the Forest Service, RLK, and Gravity Logic.

1.8 Issues

Since the proposal was first published in the spring of 2010 the Forest has received approximately 200 letters or emails from agencies, organizations, and the general public. Many commenters (approximately 70%) expressed support for the proposal. The major reasons given included they felt this type of a mountain bike park was needed and that it would benefit the local economy. Many commenters (approximately 30%) expressed opposition or concerns with the proposal. Several concerns were raised about the potential adverse effects the proposed mountain bike park could have on wildlife, soils, vegetation, water quality, other recreational uses, heritage resources, and surrounding communities. The following section of this document summarizes the comments that were received and how they are being addressed in the environmental analysis.

Area of concern	Issue	Response – how this issue is addressed in the analysis
Timberline Lodge	The proposal would degrade the experience for visitors at a Historic National Landmark. Even if the Skills Park is not visible from Timberline Lodge, the rest of the park will be visible from many locations around the lodge. The aesthetic values of the area will be diminished. Aesthetic appeal will be degraded and relative peacefulness will be seriously impaired. The construction of downhill mountain bike trails and a bike park near the Lodge conflicts with the designation of this historic area. The park will result in noise and traffic that will impact the surrounding uses.	Timberline Lodge from its inception was designed to be a developed, year-round recreational resort for the public to enjoy. The bike park would utilize the day lodge for its' staging activities to help keep bike traffic away from Timberline Lodge. The heritage, visual, and recreation sections of the analysis address any aesthetic impacts to the lodge from this proposal.
Soil Erosion	Downhill mountain biking would cause soil erosion in the fine volcanic soil and duff layer. The eroded soil would work its way into streams endangering anadromous fish species. This area is a high-elevation alpine environment with a fragile ecology not suited which would suffer damage from a downhill mountain bike trails system. All streams, seeps, springs and run-off channels should be fully protected.	The trails are being designed to prevent erosion through features such as grade reversals, sediment traps, and other surface water control features that would prevent sediment mobilization and/or delivery to streams. Also all stream crossings are being designed to minimize soil erosion. The project design criteria that are being used to minimize the risk of soil erosion are listed in Chapter 2 of the analysis, and the potential impacts associated with sediment are

		addressed in the soils and hydrology sections of the analysis.
Quantity of area disturbed	It is incorrect for the Proposed Action to claim that only 7 acres of ground will be affected; actually several hundred acres will be effected in the lower half of the permit area.	Point well taken. The acreage mentioned in the scoping letter estimated the area of actual trail construction and was not intended to mean that there would not be any other areas affected. This is has been clarified in the analysis.
NEPA Compliance	The proposal will significantly affect the quality of the human environment and will be highly controversial; therefore an Environmental Impact Statement must be prepared.	One of the purposes of the environmental assessment is to evaluate the significance of the effects. Once the analysis is complete the Deciding Officer will make a determination of whether or not an Environmental Impact Statement is warranted.
NEPA Compliance	The Master Development Plan has not undergone public review or input. FSM 2341 directs that project specific specifications for developments shall be determined via planning and environmental analysis for master plans.	The relationship between RLK's Master Plan, which is a requirement of their special use permit, and this analysis is described in Chapter 1 of the analysis. This site specific project is being evaluated thru environmental analysis.
Illegal trails	It is not true that a Timberline Mountain Bike Park will prevent unauthorized bike trails from being built. It is a leap to conclude that rogue free-ride bikers building illegal trails are seeking well designed, downhill only trails with a skills park for the price of a lift ticket. A better alternative for addressing the unauthorized trails issue is to work with an advocacy group to develop a low or no fee biking area. The demand for downhill mountain bike trails is evident all over the region. Groups spend significant time building unapproved trails in unmanaged portions of the forest.	We agree that a Timberline Mountain Bike Park would not prevent unauthorized bike trails from being built elsewhere. Several commenters pointed this out and the analysis has been clarified to better reflect what was intended in the discussion in the scoping letter. The presence of unauthorized trails is an indication of the demand for this type of activity and it is an anticipated desirable effect of the Proposed Action that providing managed downhill mountain biking opportunities at Timberline would reduce unauthorized use. However, eliminating unauthorized trails on the Forest is not one of the purposes of this proposal. We agree with commenters that addressing unauthorized use (i.e., illegal mountain bike trails) would need to include law enforcement, working with partners, and public education.
Uphill trail use	At least one trail in the Timberline plan should be designated "uphill only". In this manner, bicyclists who do not wish to pay for a lift pass will still have access to the trails.	The Timberline Bike Park proposal has been designed specifically to provide lift-served, downhill mountain biking in a manner that is very similar to downhill skiing. Access to the managed mountain bike trails at Timberline would require a pass for their use whether or not a rider chose to use the lift. Uphill trails are designed differently than downhill only trails and are not included in this proposal. There is a Timberline to Town mountain bike trail that is under construction. This trail is both up and downhill and has no fee.

Public Safety	Downhill mountain biking would be a threat to public safety from collisions between bikers and hikers	The proposed mountain bike park includes trails that are specifically designed for, and are limited to downhill mountain biking (see Chapter 2 of this analysis). Several project design criteria are included in the proposal to address safety concerns regarding other trails and roads in the area. These are also listed in Chapter 2 of the analysis. Public safety is also addressed in the recreation section of the analysis.
Traffic/Parking Conditions	Timberline has a persistent traffic problem which would be further stressed with more people on the mountain at one time. Parking at Timberline is already limited based on the number of summer visitors. Adding a summer activity will likely exceed the limited capacity for visitors.	Timberline's most limited parking is during the ski season in the winter when this proposal would not be operating. Also the activity would be located away from Timberline Lodge and near the Day Lodge to reduce congestion near Timberline Lodge. It is anticipated that there is adequate parking for this proposal. Parking capacity is addressed in the socio-economic section of the analysis.
Visual Standards	Forest Plan A11-002 (Four-192) states that recreation facilities shall remain unobtrusive in the landscape [implication that mountain bike project would not be unobtrusive]	All of the developed recreational facilities (e.g., Day Lodge, parking lots, and ski lifts) associated with the proposed trails and skills park already exist within an area designated in the Forest Plan for year round developed recreation. The proposed mountain bike trails and associated facilities have been specifically designed to use the existing forest cover and topography to make them unobtrusive, as described in Chapter 2 of this analysis and the visual section of this analysis.
Invasive Plants	Mountain bike tire tread are likely sources of invasive plant and insect species.	Several project design criteria are included in the proposed action to address invasive species. These are included in Chapter 2 of the analysis. Invasive species are also addressed in the Vegetation section of the analysis.
Sensitive Plants	The analysis should include an exhaustive survey for sensitive plant species and sensitive plant habitats within the project area.	Surveys for Threatened and Endangered and sensitive species have been conducted and Biological Evaluations for Wildlife, Fish and Botany are included in the analysis.
Wildlife Habitats	Trail construction will require removal of down wood which is a critical part of habitat and slope stability. Mountain bikes can cause animals to flee much further than they would flee from hikers, causing them to expend valuable energy and avoid areas that may be prime habitat. This forest provides escape cover and bedding for the area's deer and bicyclists moving through the area will effectively eliminate this portion of their habitat. The proposed mountain bike trails system will	Although a trail may occasionally be constructed thru a down log no down wood material would be removed from the site for construction or operation of the mountain bike park. The mountain bike system would only be used during a portion of the year (approx. mid July to early October) and only a portion of the day. Project design criteria have been included in the proposal that would limit the hours of operation from one hour after sunrise to one hour before sunset to allow animals to use the areas during the most active grazing periods.

	adversely affect endangered species and critical habitat.	The potential impacts to wildlife, including disturbance from park operations are addressed in the Wildlife section of the analysis.
Cumulative Impacts	Cumulative Impacts**:** In light of all of the other activities already allowed on Mt. Hood, the combined impact of millions of annual visitors to the forest (including the application of over one million pounds of salt on the Palmer Glacier) poses significant cumulative impacts to the mountain ecosystem.	There is no proposal to use salt in conjunction with the mountain bike trails or skills park. Cumulative effects are addressed in Chapter 3 of the analysis.
Damage from out-of-bounds riders	Downhill mountain bikers will ride out of bounds causing damage to the environment**.**	The proposed downhill mountain bike trails have been designed specifically for downhill riding where the trail itself offers by far the best riding experience. Also the trails and any out-of-bounds riding would be managed daily by a trails crew that would be on-site to patrol the trails.
SNOTEL Test Site	NRCS would like to ensure that the proposed action will mitigate any possible human or environmental effects to climate data collection at the Mt. Hood Test Site SNOTEL.	The trails have been located away from the SNOTEL site and no impacts to this site are anticipated from this proposal.
Alternatives	The Forest Service must consider whether or not viable alternatives to increased mountain bike use in the Timberline area exist nearby that could be created with less risk of environmental damage. The Forest Service must consider options for downhill trails in other locations both with and without lift assistance. We hope that the agency will seriously consider alternative locations for this use – whether for a new park or the expansion of an existing facility.	The agency believes the Jeff Flood lift provides the best opportunity in the Timberline area for a lift-assisted mountain bike trail system and that other lifts in the area would either be not as conducive for this use or would result in greater impacts. Also creating a new lift in this area to provide for lift assisted mountain biking trails would create far greater impacts than utilizing an existing lift. Developing an area without lift assistance or at another area would not address the purpose and need of this proposal.
Market Competition	The proposal would impact Ski Bowl economically by competing for a small market of downhill bike riders. The Timberline proposal would cannibalize the Mount Hood Ski Bowl Bike park and would jeopardize the viability of the Ski Bowl Resort.	Based on comments received from the managers of Ski Bowl they do not anticipate that the Timberline proposal would adversely affect their operations, especially in the long-term. As with winter sports, improvements at the different ski areas can create competition and a greater variety of opportunities for users. Ski Bowl is addressed in the Recreation section of the analysis.

Economics	Whistler is a community that has embraced the summer sport and added an estimated tourism impact of $16M in the 2006 summer season. Combined with mountain biking outside of the downhill park, the total tourism impact was closer to$34M. An estimated 63% percent of the bike part visitors were from outside of Canada. Whistler has become a destination for mountain biking much like Timberline is for summer ski training. Development of a well managed and maintained trail system that minimizes forest clearing and erosion, that avoids natural water courses and sensitive riparian areas and plants, and that ensures riders stay on designated trails rather than off-trail freeriding, would help to sustain a year-round regional recreation economy surrounding Mt. Hood.	The Socio-economic section of this analysis includes information pertaining to the Whistler operation, including on- and off-site spending and the origin of Whistler mountain bikers. The Recreation and Socio-economic sections of this analysis address the projected visitation and market demand for downhill mountain biking at Timberline, as well as projected economic effects.
Market Demand	Living in Boise ID, Mt Hood is completely within what I would consider acceptable driving distance to spend a weekend riding.	The Socio-economic section of this analysis addresses the regional and local market demand for downhill mountain biking at Timberline
Market Demand	I have ridden at Ski Bowl. I hope that the Timberline program will be more of a world class design like Whistler and Fernie with a range of features and designs.	The Timberline Bike Park has been designed by the same company that designed the Whistler program, as well as others. As described in Chapter 2 of this analysis, the proposed trails at Timberline include different ability levels and various types of trails and trail features.
Market Demand	High Cascade, one of the many summer ski and snowboard and recreation camps, backs the proposed park in a big way. We attract over 1300 campers from around the country to experience the Mountain experience and will have many interested campers out of the 200 plus daily campers that attend our camp.	The Socio-economic section of this analysis addresses the regional and local market demand for downhill mountain biking at Timberline
Market Demand	Downhill mountain biking is a small niche market that is already served by the downhill bike park at Ski Bowl. Ski Bowl could be expanded to accommodate the need for this niche segment of the mountain biking community. Very few options for any type of mountain biking exist on the West and South slopes of Mt. Hood. The Portland area biking community needs more areas open close to town. Mount Hood Ski Bowl should be given priority in meeting whatever demand exists for ski-lift assisted bike trails. If the Forest Service cannot demonstrate unmet	It is recognized that lift-assisted downhill mountain biking is a niche market and a feasibility analysis for downhill mountain biking at Timberline is included in this analysis. As described in the Recreation and Socio-economic sections of this analysis, the Ski Bowl mountain biking program is different than the proposal by RLK. It is expected that their markets will overlap, but Ski Bowl's operation does not directly serve the intended market for this proposal. Ski Bowl has not requested an expansion of their mountain bike system. The proposal before the agency is to develop a mountain bike system at Timberline consistent with the

	demand for ski-lift assisted bike trails, then the Timberline proposal should be denied.	desired future condition for this area in the Forest Plan. Based on comments received from the managers of Ski Bowl they do not anticipate that the Timberline proposal would adversely affect their operations, especially in the long-term. As with winter sports, improvements at the different ski areas can create competition and a greater variety of opportunities for users. Market demand is addressed in the Socio-economic section of the analysis.

CHAPTER 2 - PROPOSED ACTION

2.0 Introduction

This chapter describes the Proposed Action in detail, including Project Design Criteria. This chapter also describes the No Action Alternative

2.1 Proposed Action

The proposed action is to develop a managed, ski lift-assisted downhill-only mountain bike trails system and skills park within the southern portion of the Timberline Ski Area permit boundary. The proposal would consist of an approximate 17 mile trail network and a separate "skills park" that would encompass approximately 0.2 acre. The trail system would be designed to accommodate all skill levels with an emphasis on beginner and intermediate levels.

The proposed action also includes a watershed restoration activity to reduce sediment erosion that is occurring within the project area. The watershed restoration activity would involve road stabilization and decommissioning measures on approximately 2.1 miles of native surface roads within or adjacent to the project area.

2.1.1 Bike Park Trails

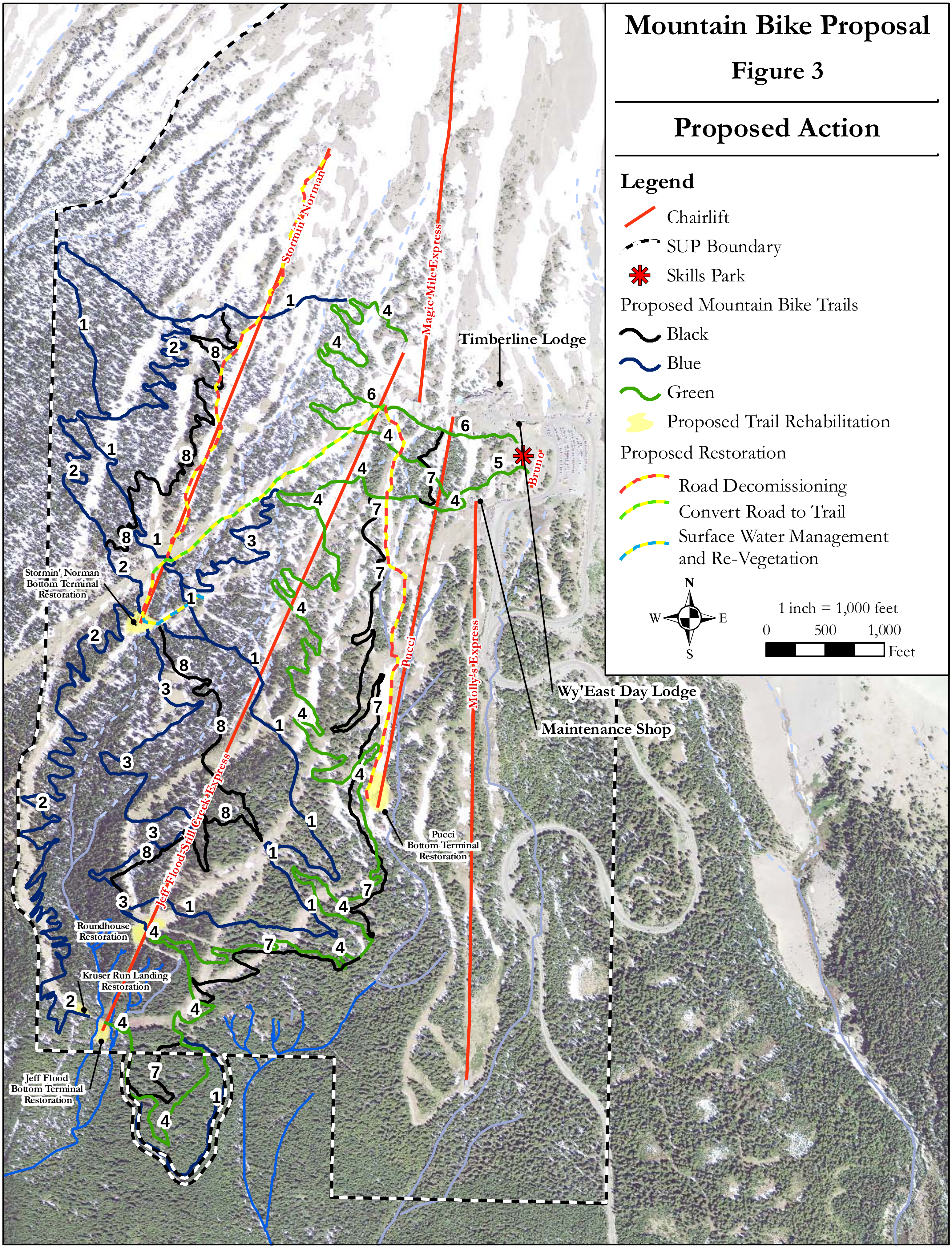
The trail network would be constructed in phases over a two year development period, in the area served by the Jeff Flood Express Chairlift (see Figure 3). All of the proposed trails are within the Ski Area Special Use Permit Boundary except for the lowest portions of trails 1,4 and 7 (see Figure 3). These trail portions would be authorized thru a special use permit as an ancillary facility to the Ski Area Permit. The trail system would offer trails for all ability levels with a design emphasis on beginner and intermediate levels. Trails would include natural and human-created features and banked turns where appropriate, particularly on the intermediate and advanced trails. Human-created features would include structures such as ladder bridges. A summary of each of the proposed trails is provided in Table 1 and more detailed information is included in Appendix B.

Three ability levels would be served by the mountain bike trail network. Similar to the ski terrain at Timberline, these include Beginner, Intermediate, and Advanced.

Beginner (Green) – Easiest. Gentle climbs and descents with obstacles such as rocks, gravel, roots, bridges and pot holes. Rider must have ridden a bike before using these trails.

Intermediate (Blue) – More difficult than Green. Challenging riding with steep slopes and/or obstacles, including narrow trail or elevated skills park with poor traction. Riders must have off-road riding experience.

Advanced (Black) – Most difficult. Mixture of steep descents, loose trail surface, numerous trail and man-made obstacles including jumps, ramps, elevated features, berms, drops, and rocks.


Mountain Bike Proposal
Figure 3
Proposed Action
Legend
Chairlift
SUP Boundary
Skills Park
Proposed Mountain Bike Trails
Black
Blue
Green
Proposed Trail Rehabilitation
Proposed Restoration
Road Decomissioning
Convert Road to Trail
Surface Water Management and Re-Vegetation
N
S
E
W
1 inch = 1,000 feet
0
500
1,000
Feet
Timberline Lodge
Wy'East Day Lodge
Maintenance Shop
Stormin' Norman
Magic Mile Express
Pucci
Molly's Express
Jeff Flood Still Creek Express
Bruno
Stormin' Norman Bottom Terminal Restoration
Pucci Bottom Terminal Restoration
Roundhouse Restoration
Kruser Run Landing Restoration
Jeff Flood Bottom Terminal Restoration

The development plan proposes a construction schedule of two years to provide enough trails to allow an entertaining riding experience for a variety of ages, abilities and riding preferences during each year of construction. During construction, approximately three mini-excavators and/or mini-loaders and 5 - 10 person trail crew would be used to construct trails.

Three types of mountain bike trails would be constructed: Wide- excavated trails, narrow-excavated, and single-track trails.

Wide-Excavated Trails - Average tread width of 66 inches and a construction corridor that averages 99 inches in width. The tread is graded primarily using excavators, which are capable of working around individual trees or other sensitive areas. Excavated trail features such as berms, jumps, drops, rocks, and elevated ladders are located during construction.

Narrow-Excavated Trails - Average tread width of 42 inches and a construction corridor of approximately 63 inches. The tread is graded primarily using excavators, which are capable of working around individual trees or other sensitive areas. Excavated trail features such as berms, jumps, drops, rocks, and elevated ladders are located during construction.

Single-Track Trails - Average trail width of 16 inches and a construction corridor of 24 inches. The tread is constructed primarily by hand, with some use of machinery where necessary.

Table 1 provides details on the proposed Bike Park trails.

Table 1
Trail Specifications
Timberline Bike Park (Proposed Action)

Trail No.	Phase	Total Vertical (ft)	Total Length (mi.)	Average Grade (%)	Average Tread (in)	Avg. Disturbed Width (in)	Total Area (ac)
1	1	1,135	3.25	4 - 7	66	99	3.2
2	1 and 2	1,010	3.11	6 - 7	16 - 42	24 - 63	1.8
3	1	653	1.74	7	16	24	0.4
4	1	1128	4.66	5	66	99	4.7
5	1	43	0.15	5	66	99	0.2
6	1	-16	0.29	-1	66	99	0.3
7	2	846	2.00	7 - 8	16	24	0.5
8	2	751	1.99	6 - 8	16 - 42	24 - 63	0.8
Skills Park	1			n/a	n/a	n/a	0.2
Total			**17.19**				12.1

Above – Typical Single-Track Trail

Upper Left – Typical Narrow-Excavated Trail

Lower Left – Typical Wide-Excavated Trail

All mountain bike trails have been designed with approximately 4% to 8% average grade over the length of the trail. In an effort to understand how best to approach trail design suitable to the soil and topography at Timberline, Gravity Logic spent a significant amount of time studying local trails (e.g., Highway 44, Sandy Ridge, Bridle Trail, Alpine, and Glade) to better understand what works on Mt. Hood's soil and what does not. Additionally, they visited offsite areas such as Northstar at Tahoe Bike Park, the sandy trails around South Lake Tahoe, and the trails around Mammoth Lakes, California. Based on this reconnaissance, Gravity Logic found that:

- Trails with a ***sustained*** grade over 8% are simply not suitable for downhill bike traffic. Trails 7% and less showed little or no soil movement and a very compact riding surface. Important to all trail design is the installation of numerous rolling dips and grade reversals to both moderate speed and shed water at regular intervals. Trails with short segments from 8%-20% can be sustainably incorporated providing the approach and exit are designed to manage speed, sightlines, and by avoiding abrupt turns and corners prior to steeper segments.
- Soils are typically well draining.
- Soils are not negatively affected by a moderate amount of moisture and/or rain, and in fact benefit from damp conditions. An important consideration, however, is to not allow water to follow the trail for sustained pitches. Grade reversals, bridges, and culverts would all manage water before

it has a chance to gain enough velocity and volume to recruit sediment and/or cause damage to the trail surface.

- Corners /switchbacks have significant grade reversals prior to the turn to reduce or eliminate aggressive braking.
- Steep pitches on advanced trails would be successfully armored with wood and/or rock to protect the soil.

The average gradient (i.e., 6% - 8%) has been established in the field by not aligning trails along the fall line. Rather, the trails typically run across the fall line. The Timberline Bike Park trails have been designed to include numerous rolling dips and grade reversals to both moderate speed and shed water at regular intervals. These would be sited and designed in the field during construction. As a result of the grade reversals and rolling dips, very short trails segments (approximately 20 - 40 feet in length) ranging from 8%-20% may be present along the downward pitch of a rolling dip, for example. Depending upon the field conditions, these steeper pitches may be armored with wood and/or rock.

The Timberline Bike Trails would have an average gradient of 4% – 8%, as described above. However, grade reversals and rolling dips would be applied throughout the trail network.

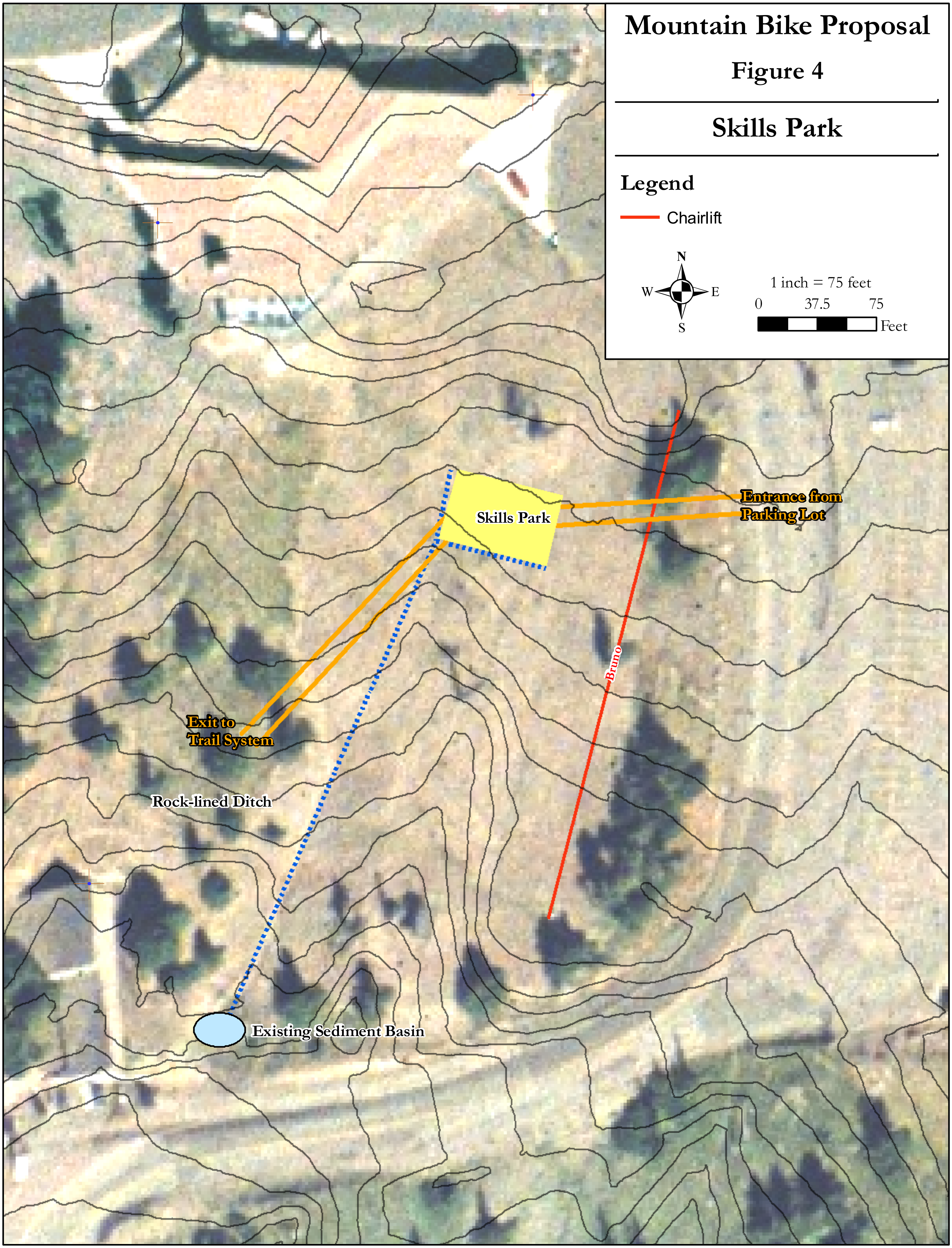
An important operational consideration is the management of surface water along the trail system. Grade reversals, bridges, and culverts would all manage water before it has a chance to gain enough velocity and volume to rill or recruit significant sediment. The field design of the trail is intended to minimize sediment mobilization that would cause damage to the trail surface. Bike Park staff (RLK) would patrol the trails on a daily basis and sediment deposited in sediment basins or rolling/drain dips would routinely be cleaned out and replaced onto the surface of the trails to protect the trail surface and to prevent delivery of this sediment downslope.

Another important operational consideration is the management of biker velocity along the trails. Sharper turns such as corners and switchbacks have been designed with grade reversals prior to the turn to reduce or eliminate aggressive braking, thereby reducing damage to the trail surface.

Wooden features such as bridges, boardwalks, wall rides, ladders, wood tables, rollers, and doubles (examples provided in the attached documentation) are used to avoid sensitive areas such as puddles and tree roots. It is estimated that a total of 70-90 wooden features would be constructed in the Timberline Bike Park, providing a total protected trail length of approximately 2,400 linear feet, or 2% - 3% of the total trail length.

2.1.2 Skills Park

In addition to the individual trails, a Skills Park would be constructed on approximately 0.2 acre (80 feet by 100 feet) in the vicinity of the *Brunos* chairlift (See Figure 4). The Skills Park would include temporary, removable wooden structures built by hand tools on site and removed prior to winter operations (see Appendix A). These structures would consist of elevated ladder systems, teeter totters, rock structures and other obstacles. The Skills Park offers practice areas for all skill levels.



Mountain Bike Proposal
Figure 4
Skills Park
Legend
Chairlift
N
W
E
S
1 inch = 75 feet
0
37.5
75
Feet
Skills Park
Entrance from
Parking Lot
Exit to
Trail System
Rock-lined Ditch
Bruno
Existing Sediment Basin

The Skills Park would include entrance and exit gates and it would be encircled with native materials that would serve as a fence – this may include logs, rocks or actual fencing. This fencing would direct riders into and out of the Skills Park. The perimeter of the Skills Park would include drainage ditches that would convey surface water from the area to a sediment basin. Water leaving the sediment basin would be conveyed via a rock-lined channel to the existing sediment basin near the wastewater treatment plant (see Figure 4).

Left – Typical Skills Park. Note Raised Ladders and features for all ability levels.

Above – Intermediate Teeter-Totter

Above – Typical Elevated Ladder

2.1.3 Watershed Restoration

Based on comments received from the public during scoping and concerns raised by the ID Team doing the environmental analysis, watershed restoration activities are being included as part of the proposed action. Site specific project analysis affords the Forest Service the opportunity to identify existing problems in a project area and propose corrective measures. There are currently approximately two miles of native surface service roads in this area that are contributing sediment to downstream areas in both the Still Creek and West Fork Salmon River drainages (see Figure 3).

The proposed action would include 5.9 acres (2.1 miles) of restoration projects in both the Still Creek and West Fork Salmon drainages. In the Still Creek drainage a total of approximately 1.4 miles (4.3 acres) of roads and disturbed areas would be treated. In the west Fork Salmon drainage approximately 0.7 mile (1.6 acres) would be treated. The watershed restoration projects include decommissioning of existing service roads[1], where the roadway surface would be graded to match natural topographic contours, topped with topsoil or amended local material, and seeded with native plant species or suitable stabilizing cover. The existing access road to the bottom terminal of the *Stormin' Norman* lift would be enhanced to provide improved surface water management, including re-grading of the road surface to divert surface flows to ditches and sediment basins, and the new road prism would be surfaced with inches of gravel. The areas surrounding several bottom terminals of the *Pucci* and *Stormin' Norman* lifts would be restored by better defining service vehicle access routes and parking areas for terminal maintenance. Road areas to remain would be re-graded to provide improved surface water management and surfaced with a 6 inch lift of gravel. Areas outside of the gravel would be scarified and seeded with native plant species. The mazing area at the bottom terminal of the Jeff Flood Express would be protected through the installation of a geo-grid, which will harden the loading area to protect the ground surface from mountain bikers loading the chairlift. The geo-grid would be framed with a hard curb or other similar structure to prevent bikers from leaving the geo-grid and trampling the restored bottom terminal area[2] (See Figure 5).

Table 2 outlines the proposed restoration projects and Figure 3shows the location of the restoration projects.

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[1] The Glade Trail currently consists of a series of ill-defined user trails that have resulted in a road-like situation. This restoration action would decommission the majority of the disturbed area and convert it to a defined trail. This trail would not be constructed until after the Timberline to Town Trail is completed and the Glade Trail is closed to mountain biking.

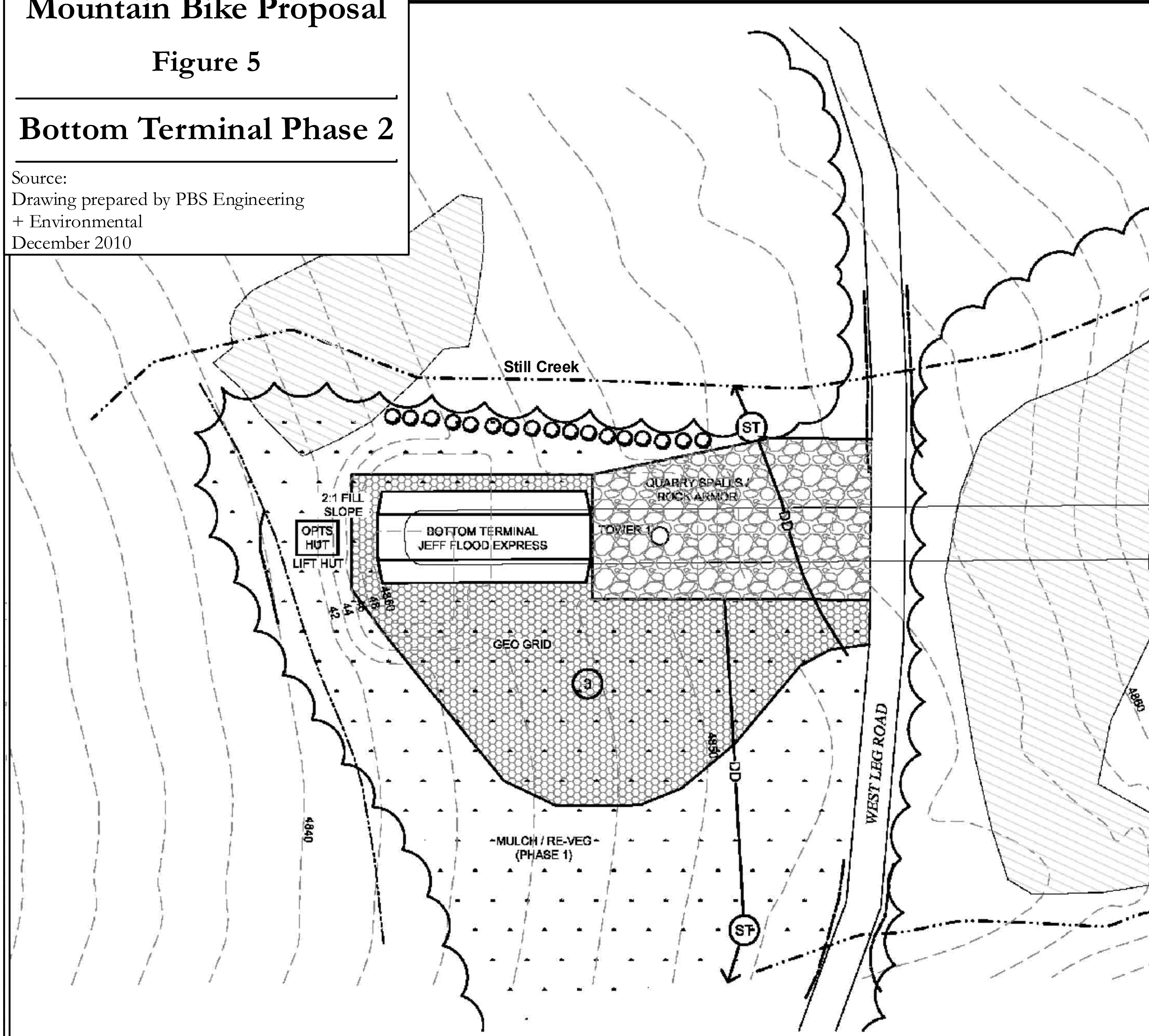
[2] The restoration of the bottom terminal of the *Jeff Flood Express* is a requirement of the ROD for the Timberline Express EIS. The action included in this proposal is the protection of the restored area from impacts due to the mountain biking activity at the bottom terminal.

Mountain Bike Proposal

Figure 5

Bottom Terminal Phase 2

Source:
Drawing prepared by PBS Engineering + Environmental
December 2010



NOTES

1. THIS DRAWING IS DIAGRAMMATIC.
2. BACKGROUND IMAGE FROM 2006 ESCP.
3. INSTALL GEOGRID ON EXISTING MAZING AREA FOOTPRINT AND VEGETATE WITH SUITABLE NATIVE GROUNDCOVER. EDGE OF GEOGRD TO BE LINED WITH A HARDENED EDGE SUCH AS CURBING TO PREVENT BIKERS FROM DISTURBING REVEG AREA.

LEGEND

- STREAM CENTERLINE
- WETLAND
- EXISTING CONTOURS
- SHRUB/TREE
- SILT FENCE
- WATER BAR (BUILT AT 2-3%)
- EDGE OF TREE COVER
- REVEG AND SLOPE STABILIZATION
- ST SILT TRAP
- DD DRAINAGE DITCH

SCALE: NOT TO SCALE

Table 2
Watershed Restoration Projects Included in the Proposed Action
Timberline Mountain Bike Trails and Skills Park Proposal

Road/Project	Action	Length (ft.)	Width (ft.)	Area (ac.)
Still Creek Basin				
Glade Trail	Convert Road to Trail (Decommission Road)	2,512	15	0.9
Alpine Trail	Surfacing and Surface Water Management	332	12	0.1
Stormin Normal Access Road	6" lift of gravel, surface water control	686	18	0.3
Stormin' Norman Service Road	Decommission	3,937	12	1.1
Jeff Flood Bottom Terminal	Surface Water Management and Re-Vegetation	-	-	0.4
Kruser Run Landing	Surface Water Management and Re-Vegetation	-	-	0.2
Stormin' Norman Bottom Terminal	Surface Water Management and Re-Vegetation	-	-	0.8
Roundhouse - West Leg Road	Surface Water Management and Re-Vegetation	-	-	0.6
Still Creek Subtotal				*4.3*
WF Salmon				
Pucci Service Road	Decommission	3,651	12	1.0
Pucci Bottom Terminal	Drainage Control and Re-vegetation	-	-	0.6
WF Salmon Subtotal				*1.6*
Total		11,118 (2.1 mi)		**5.9**

2.1.4 Construction

Bike Park Trails - The construction season would begin in summer 2011, or later depending upon snowmelt, and extend through early October. The Trails and Skills Park would be flagged in the field for approval by the Forest Service prior to any construction activity. In addition, the Construction Plan/SWPCP would be approved by the Forest Service prior to construction. Whether excavated or single-track, the first step in the construction of a bike trail would be grubbing the organic matter from the trail surface. The trail surface would then be shaped using native soil material and stone. Once the rough trail tread is established, trail features such as rock or wooden structures would be constructed, and surface water management structures would be installed. As final grading is completed, organic material would be broadcast onto slopes and other areas that are to be re-vegetated, and re-vegetation would take place. The construction of wooden trail features may reduce the need for grubbing or disturbance to soil. For example, post-holes may be excavated for an elevated ladder, resulting in less ground disturbance than grubbing the entire trail (see above discussion regarding the percentage of the total trail network that would include wooden feature

Above and Upper Right – Mini-excavator preparing narrow-excavated bike trail.

Lower Right - Hand Crew preparing final grade on narrow-excavated trail.

Prior to de-mobilizing for the day, trail workers would install temporary erosion and sediment control protection (e.g., mulch, native organic material) along the outer edges of the trails using hand equipment. Equipment access to the trails would be via West Leg Road and newly constructed trails. For example, if an excavated trail takes three days to excavate, the mini-excavator would begin work at West Leg Road and work north or south away from the road. At the end of the first day, the mini-excavator would de-mobilize using the newly constructed trail. The next day, the operator would use the same trail for access to complete the trail.

Construction equipment, fuels, spill response materials and erosion control materials would be staged in disturbed areas throughout the project area, depending upon the location of trail work at any given time. Staging areas would include the ski area maintenance shop, the top and bottom terminals of the *Jeff Flood Express*, the bottom terminals of *Pucci* and *Stormin'Norman Express*, existing work roads, and other existing open areas. West Leg Road would provide access to the construction areas.

During Year 2, the Year 1 trails would be reviewed and maintained after snowmelt, and the Timberline Mountain Bike Park operation would begin. Construction of Year 2 trails would begin as described above. Staging and construction activities during Year 2 would be designed so that the construction equipment and activity results in the least amount of disturbance to mountain bikers. If necessary, segments of Year 1 trails may be closed temporarily to allow for Year 2 trail construction.

Watershed Restoration – Construction of the watershed restoration projects would generally be as described for the bike park trails. The equipment used for watershed restoration projects will include the mini-excavators and crews described to for the bike trails. However, RLK would also use a larger excavator and/or small bulldozer to prepare road surfaces for decommissioning (or drainage control and gravel placement). For road decommissioning, equipment would first obliterate the road surface and restore the natural grade, to the extent possible. Depending on the slope gradient and sustained length of roadway on the fall line, surface water control structures such as water bars or cross-drain logs would be installed to prevent high-velocity surface water drainage.

Upon establishment of the rough grade and surface water controls, site stabilization would be completed through application of topsoil and/or mulch and seed material. The mulch crew would follow closely behind the grading crew to ensure that newly decommissioned road surfaces are stabilized. Similar to the bike park trail construction, temporary erosion and sediment control measures would be applied to decommissioned road segments at the end of each work day, if the areas have not been mulched and planted.

Roadway segments to be enhanced would follow a similar construction sequence as decommissioning, except that the roadway surface would be modified to reduce slope gradients or install drain dips to the extent possible, or to install other surface water drainage controls such as water bars, road-side ditches or culverts. Sediment basins would be installed below drainage ditches and culverts, and rock check-dams would be installed in the drainage ditches in accordance with Forest Service standards.

Bottom Terminal sites and the Roundhouse area of West Leg Road would be treated similar to road decommissioning projects, with a rough grade established to manage surface water, fine grading with topsoil and/or mulch and seeding planting.

Watershed restoration projects would be phased to occur in areas where Bike Park trails are being constructed, in order to reduce the number of incursions into any one area. Consequently, the restoration effort would take place in two phases.

2.1.5 Operation Timing

Similar to the existing ski operations at Timberline, the Timberline Bike Park operations would be guided by weather and seasonal conditions. On a seasonal basis, the park would open once snowmelt is sufficient to allow trail maintenance crews to maintain the trails, entry/exit trails, and skills park (expected to be July 15 – 30 each summer). Closure of the park in the Fall would take place in October (usually by October 15) or when soil moisture is determined to be sufficient to warrant closure of the park.

On a daily basis, activity at the park would not begin until at least one hour after sunrise. Currently, RLK proposes to start public operations at 10:00 a.m., which allows trail maintenance crews several hours to conduct trail maintenance before riders enter the park. Activity at the park would cease at least one hour before sunset. Actual closure times in the evening would depend on the demand and level of use. However, park patrol staff would be given at least one hour to sweep the trail network after closing and before sunset.

2.1.6 Design Features and Best Management Practices Common to Trails Network and Skills Park

The project design criteria (PDC) represent best management practices and are part of the proposed action (See Table 3). They were developed by the Interdisciplinary Team during project analysis to address site-specific environmental concerns and to meet standards and guidelines in the Forest Plan.

Table 3
Project Design Criteria
Timberline Mountain Bike Trails and Skills Park

PDC #	Project Design Criteria (PDC)	Construction or Operation?
	Monitoring (Mon)	
Mon-1	The Forest Service Permit Administrator will monitor construction and operations on regular basis and will have the authority to provide direction and/or take action if construction or operations are not conducted according to the project design criteria.	Both
Mon-2	RLK would provide a written annual report to the Forest Service detailing any trail damage, soil erosion, vegetation trampling, wildlife issues, "rogue riders," user conflicts, successes and issues, and restoration efforts in the mountain bike park. The Forest Service would review the report and, if need be, work with RLK to institute needed changes in the management of the mountain bike park.	Both
	Heritage Resources (Her)	
Her-1	Trails and trail terrain features would be sited to be the least visible from West Leg Road, allowing for consideration of riparian protection.	Both
Her-2	No new man-made openings would be created for this project. Trail crossings would utilize naturally occurring or previously created clearings/openings.	Construction
Her-3	No cutting of trees larger than 6" dbh would occur along West Leg Road.	Both
Her-4	Historic culverts would be avoided; no trails would be placed adjacent to culvert locations.	Construction
Her-5	No treated lumber would be used for terrain features.	Both
Her-6	Vegetative screening, to the extent possible, would be utilized to lessen any visual impacts associated with the proposed development.	Both
Her-7	Deleted	
Her-8	As specified in the Signage Plan (see Rec-6), bike trail signs or any types of barriers along West Leg Road would be compatible with the character and design of the historic roadway. Wood posts or stone barriers are compatible options.	Both
Her-9	Wood or stone barriers would be used to delineate the skills park.	Both
	Recreation (Rec)	
Rec-1	Parallel trails would be joined into one trail prior to crossing West Leg Road. Mountain bikers would enter each crossing through a	Both

	chicane which would slow the rider down and give him/her clear sight lines down and up the road for at least 50 yards. Signage would be placed to warn mountain bikers and motorists of trail crossings over the road.	
Rec-2	Bike trail crossings of Forest Service trails and West Leg Road would include the use of chicanes (i.e., S-curves) and uphill grades to reduce the speed of bikers as they cross the road.	Construction
Rec-3	Bike trail crossings of Forest Service trails and West Leg Road would include signage directing bikers to stay on designated bike trails.	Operations
Rec-4	Forest Service trails and West Leg Road would include signage at bike trail crossings and throughout the bike park to warn trail users/motorists of the presence of cyclists and trail crossings.	Operations
Rec-5	A Spectator Management Plan would be prepared by RLK and approved by the Forest Service to address the management of spectators during different types of mountain bike park events. The plan would address the following: • Spectator viewing areas would be located in existing disturbed areas; location of viewing areas would be dependent on the event type and location (e.g., skills park or specific bike trail). • Defining spectator areas with rope, fencing, or other similar means. • Access corridors for spectators via West Leg Road, or other roads and trails. • Preventing spectator access to sensitive areas such as wetlands, meadows, subalpine-timberline environments, and designated riparian areas. • Restroom facility location (Porta Potties not allowed at the bottom terminal of the *Jeff Flood* chairlift.) The Forest Service Permit Administrator would review each upcoming event with RLK to assess spectator locations and access. The Forest Service Permit Administrator would review the site after each event to assess the success of the Plan and provide direction to RLK to address issues for future events.	Operations
Rec-6	A signage Plan would be prepared by RLK and approved by the Forest Service prior to the installation of bike park signs, Forest Service trail signs, and signs along West Leg Road.	
Rec-7	The Glade Trail conversion from road to trail would meet Forest Service standards for trail construction as contained in the Forest Service Manual and Handbook. A qualified trails designer would oversee the trail layout and design and the final design would be approved by the Forest Service Permit Administrator. Trail maintenance for the converted Glade Trail within the Timberline SUP area would be carried out by RLK. The converted section of the Glade Trail would meet the Forest Wide Standards and Guidelines on page Four-115 and 116 of the Forest Plan for visual quality within five to ten years of conversion activities. Any new trail that is not converted on the road bed (e.g., new switchbacks in the trail that extend outside of the existing road bed) should meet standards within one year of construction.	Construction
	Soil Resources (Soil)	
Soil-1	Stabilization of mountain bike trail surface would be accomplished through a combination of rock armoring and wooden features or	Both

	other similar protective measures. Any rock used for armoring would be sourced from either the bike park/ watershed restoration construction limits or from an approved offsite source. No quarrying of rock materials would take place.	
Soil-2	The spacing of surface water control structures along the length of the bike trail network would be per Forest Service Handbook guidelines at a minimum. The spacing of surface water control structures (e.g., grade reversals, drain dips, water bars) along mountain bike trails within 200 feet of a stream crossing would be no less than 50 feet to minimize extension of the stream drainage network and to minimize sediment delivery to riparian reserves. Water bar placement along decommissioned roads would be determined in the field based on site conditions and approved by the Forest Service Permit Administrator.	Construction
Soil-3	Wood features (e.g., ladder bridges, boardwalks), native soil causeways, and/or rock armoring would be incorporated into mountain bike trails to avoid impacting sensitive resources such as steep soils, tree roots, vegetation, and wet areas Wood materials would be sourced from local suppliers and would be free of invasive species.	Both
Soil-4	Additional surface water controls, rock armoring, wooden features, or other acceptable measures would be installed on trails that exhibit unacceptable erosion.	Both
Soil-5	Bike park staff (RLK) would monitor trail conditions throughout the hours of operation on a daily basis to ensure that erosion or sediment mobilization away from the trail corridor is not occurring and/or to implement corrective action in accordance with the project design criteria.	Both
Soil-6	A Travel Route Plan would be required and included in the SWPCP/Construction Plan for the project to minimize compaction of soils by limiting equipment to designated travel-ways (e.g., existing roads, bike trails that are under construction) as approved by the Forest Service .	Construction
Soil-7	All exposed mineral soil not included in bike trail treadwidth would be mulched with certified weed-free Woodstraw or equivalent at a rate to achieve 70% ground cover (approximately 7 tons per acre) or mulched with a certified weed-free straw, at approximately 3,000 pounds per acre and seeded with approved seed at a predetermined rate. Application rates would be validated and verified in the field to ensure that mulch application is not too sparse or too excessive.	Construction
Soil-8	Temporary erosion and sediment control measures (e.g., plastic sheeting, mulching) would be in place prior to the end of each work day or prior to any rain event (as defined by when the National Weather Service, or other accepted source, predicts a 50% or higher chance of measurable precipitation for the local area).	Construction
Soil-9	The bike park staff (RLK) would patrol the park on a daily basis to ensure that re-vegetated areas are not disturbed, or to remedy disturbance to re-vegetated areas (see also Soil-5). Project areas with any ground disturbance would be surveyed annually to ensure success of re-vegetation efforts. If seeding or other re-vegetation efforts are not successful in re-vegetating disturbed areas, the Forest Service Permit Administrator would be contacted and a site-specific, alternative, re-vegetation solution would be developed.	Both
Soil-10	In cleared areas, topsoil would be carefully removed and stockpiled for placement onto the cleared area outside of the trail tread width.	Construction

	During construction, topsoil would be carefully stored using approved erosion and sediment control methods. Additional measures (e.g., plastic covering) to cover exposed soils would occur during inclement weather. Excess topsoil from trail construction may be hauled to other construction/restoration sites for placement.	
Soil-11	RLK would install a rain gauge near the middle elevation in the bike park. The rain gauge would be accessible and monitored by RLK and the Forest Service via the internet. Earth-disturbing operations (construction and/or bike park operations) would be suspended if there is more than 1inch of rain in a 24-hour period and/or the Bull Run River above the reservoirs exceeds 200 cubic feet per second (suggesting a rise in base flows in the watershed). Operations would remain suspended until the Bull Run River drops below 200 cubic feet per second and there is less than 1 inch of rain in a 24-hour period or onsite conditions are dry enough to allow operation. Prior to suspending all bike park operations, the Forest Service Permit Administrator may decide to close certain trails, or portions of trails, to allow continued operation of the bike park in locations where trail conditions are dry enough for operation and there is no risk of sediment delivery to the stream system. (See also Soil-5)	Both
Soil-12	Stockpile areas, temporary roads, and other areas where soil compaction has occurred from this project would be ripped or scarified prior to the start of re-vegetation.	Construction
Soil-13	Activities for the season would be suspended if soil moisture is recharged and stream flows rise above baseflow levels and are predicted to stay above baseflow levels (i.e., 200 cfs in the Bull Run River, upstream of the reservoirs) and/or if onsite conditions warrant closure of the park. (See also Soil-11).	Both
	Vegetation (Veg)	
Veg-1	All mountain bike trails would be designed to avoid the cutting of trees with a diameter at breast height (dbh) greater than 6” to reduce impacts to upland forest and riparian reserves. No whitebark pine would be cut. Bike park trails would be routed around large trees and, where possible, around the roots of larger trees to prevent damage to tree roots. (See also Soil-3).	Construction
Veg-2	Clearing limits for bike park trail, including any trees greater than 6”dbh that cannot be avoided, would be reviewed in the field and approved by the Forest Service Permit Administrator.	Construction
Veg-3	If any new populations of special-status plant species are encountered during the construction process, work would be suspended in that area until the Forest Service Permit Administrator is consulted.	Construction
Veg-4	Clean heavy equipment either: A) prior to arrival on MHNF, to prevent the introduction of invasive plant seed or other vegetative propagules (e.g., stem and root fragments). The contract administrator or project activity coordinator would inspect all project equipment before it is allowed to operate at the project site. The equipment should be free of soil clumps and vegetative matter or other debris that could contain or hold seeds or other vegetative propagules. Cleaning of the equipment would include pressure washing and should be done outside of the National Forest boundary; or B) a self-contained heavy equipment cleaning station may be set up at the project site, for cleaning the equipment thoroughly in order to remove soil clumps and vegetative matter or	Construction

	other debris that could contain or hold weed seeds.	
Veg-5	If gravel, soil, or wood is imported from outside the project area, it should be determined to be from a source approved by the Forest Service Permit Administrator, who will consult with the MHNF botanist to determine if the soil, gravel, or wood is free of invasive species.	Construction
Veg-6	Survey project areas with any ground disturbance or vehicular traffic annually, during the time of year when invasive non-native plants, including noxious weeds, are identifiable. Long-term control must include periodic removal of any invasive non-native plant species and reporting of their presence and exact location (UTM coordinates in NAD-83 datum), when found, to the Forest Service Permit Administrator, who will consult with the MHNF Forest botanist within one month of finding.	Both
Veg-7	Avoid daylighting the trail by protecting overstory vegetation and defining the limits of the bike trails with vegetation, wood, rocks, or other native materials.	Both
Veg-8	Aggressively treat invasive plants by manual control or with herbicides. The Forest Service Permit Administrator will consult with the MHNF botanist on which method works best for which species.	Operations
Veg-9	Bike park staff (RLK) would monitor trail conditions throughout the hours of operation on a daily basis to ensure that unauthorized trails or terrain features are not created by riders.	Operations
Veg-10	RLK would prepare a Plant Salvage Plan in conjunction with the Forest Service. The plan will be approved by the Forest Service prior to construction. The plan will identify methods (outlined in the botany specialist report) and locations for the salvage of whole plants from proposed trails in advance of trail construction. The plan will also identify transplant locations for re-planting once construction is completed (e.g., areas along trails where excavated material has been sidecast, in restoration projects, or in sparsely vegetated areas in adjacent ski runs). The objective is to make use of (i.e., salvage) plants in the area that would needlessly be destroyed during trail construction.	Construction
Veg-11	Vegetation transplanting would be carried out as described in the section “Plant Propagation & Restoration” in the botany specialist report.	Construction
Veg-12	Collect seed from native plants in the special-use permit area and propagate seedlings from this seed in a nursery for restoration of disturbed areas in subsequent years. Directly sow collected seed in disturbed areas for those species for which this method is effective. Consult with Mt. Hood National Forest botanist for details.	Construction
Veg-13	Use only native plant materials (seed, transplants, seedlings, divisions, cuttings) collected locally on the Mt. Hood National Forest. If supplies of locally collected native seed (e.g., mountain brome, blue wildrye grass) are low and erosion control or restoration of disturbed areas is urgent, use annual ryegrass (*Lolium perenne* ssp. *multiflorum*), which is a nonpersistent nonnative grass species, or a mix of native species mixed with annual ryegrass.	Construction
Veg-14	Use GIS and GPS mapping technology and photopoints to provide an accurate and informative assessment of the impact of mountain bike riders on trails in the mountain bike park. Repeating the assessment at regular intervals (e.g., annually) can identify problems (e.g., trail widening, excessive soil disturbance,	Both

	vegetation trampling, informal trails), document informal trails, and determine where re-vegetation or other remedies are needed. Include this information in the Annual Monitoring Report (see Mon-2).	
Veg-15	Through signage, educate riders about the environmental consequences of unauthorized trail development, about the benefits of low-impact riding practices (e.g., avoiding skidding on the trail, riding within established trail corridors, avoiding impacts to vegetation) and about invasive non-native plants and the potential for the transport of invasive plant seed or vegetative propagules on mountain bikers (e.g., tires, wheels, spokes, frame, pedals, shoes, clothing). Educate riders that dirt and mud on their clothes and shoes from riding elsewhere before coming to the Timberline downhill mountain bike park could harbor and spread invasive plant seed or propagules.	Operations
Veg-16	RLK would provide a cleaning station for mountain bikes near the proposed skills park in the Wy'East parking lot area and require that all riders coming to the bike park for the first time from riding elsewhere (outside the park) ~~to~~ clean their bikes of mud, dirt, and other debris, which could harbor invasive plant seeds or propagules.	Operations
Veg-17	Open the mountain bike park each summer only after trails are snow-free and soils are not saturated. Snow drifts may be removed from the trails when the surrounding ground is snow-free, provided no earth or vegetation disturbance takes place.	Operations
Veg-18	Regulate access to trails and the skills park by use of physical barriers (e.g., boulders, fences, logs, vegetation).	Operations
Veg-19	Patrol for trash and clean up trash along trails and elsewhere in the mountain bike park.	Operations
Veg-20	Salvage plants currently occupying the proposed skills park and proposed bike park trails and transplant them in and around the historic Timberline Lodge. (See also Veg-11).	Construction
Veg-21	Confine soil disturbance around the skills park using entrances and barriers. Prevent soil disturbance and trampling/denudation of vegetation around and outside the skills park.	Operations
	Wildlife (Wild)	
Wild-1	A review of proposed hazard tree removal along the Bike trails would be conducted by RLK and a Forest Service Permit Administrator prior to implementation. Hazard trees that must be felled would remain on site for habitat purposes. For example, if a tree is felled across a trail, cut out a section of the log to allow riders to proceed along the trail, but leave the rest of the log in place for the ecological/ecosystem functions it provides and to confine riders to the trail.	Both
Wild-2	If any nest, den, or reproductive sites of vertebrate species are discovered along a mountain bike trail, a Forest Service Permit Administrator would be consulted and measures to ensure reproductive success at the site would be negotiated. Factors such as rarity, likelihood of disruption or reproductive failure, and timing would be considered.	Both
Wild-3	Mountain bike park operations would be limited to daytime use only (i.e., from one hour after sunrise to one hour before sunset) to minimize disturbance to nocturnal wildlife.	Both
	Watershed Resources (WS)	
WS-1	Prior to construction, the Forest Service Permit Administrator and	Construction

	Forest Service specialists (watershed and/or fisheries) would walk the flagged trails with RLK to examine each proposed stream crossing and to determine the appropriate crossing type. Bridge length would span the distance 1.5 times bankfull width and no piers would be placed within this width. For higher-elevation, ephemeral streams, the Forest Service and RLK would apply the following criteria for placement of crossing structure (in order of most impactful to least): 1 – Use out-sloped ford, contoured native material and/or rock-fortified for all ephemeral channels with low-gradient approach (3-5%) 2 – Bridge all intermittent and perennial channels, and ephemeral channels with steep approach (>5%).	
WS-2	No mountain bike trails would cross jurisdictional wetlands.	Construction
WS-3	Bike park patrol (RLK) staff would review the trails each day to locate wet soil areas or mud puddles. If the problem persists, the area would be crossed, if necessary, using a combination of raised mineral soil causeways, raised wooden boardwalks, and/or rock armoring.	Operations
WS-4	A Construction Plan and Stormwater Pollution Control Plan (SWPCP) would be prepared for each year of construction to guide decision-making by contractors, RLK staff, and Forest Service staff during construction.	Construction
WS-5	A spill prevention and response plan would be developed and included in the Construction Plan/SWPCP. No fuels or construction machinery would be stored within riparian areas.	Construction
WS-6	Deleted	
WS-7	Turns in bike trails would generally be in-sloped to drain toward the uphill into a sediment trap or into a pipe under the tread that discharges to a sediment trap.	Construction
WS-8	Sediment traps would be rock-fortified. Drainage pipes would be located at least three inches from the bottom of sediment traps to allow for sediment to settle out. Sediment basins would be sized to accommodate a minimum of two significant rain events (e.g., 1" in 24 hours) before maintenance is needed. The outlets of sediment traps would not release water directly to any water bodies.	Both
WS-9	During sediment trap maintenance, sediment that is cleaned out of sediment traps would be returned to the mountain bike trails.	Operations
WS-10	The skills park would include perimeter drainage diversion structures, drainage ditches, and a sediment basin to capture silt.	Both
WS-11	During construction activities, a soil and water protection coordinator would be assigned by RLK and assigned the following duties, to be documented in the SWPCP/Construction Plan: 1.) Oversee the implementation of the soil and water protection design criteria; 2.) Conduct or oversee daily site inspections to ensure effectiveness of soil and water protection design criteria; 3.) Oversee the maintenance of structural soil and water protection design criteria; 4.) Ensure that any changes to the construction site plans are addressed by coordinating with the Forest Service aquatics staff and insuring that any new soil and water protection design criteria are implemented; 5.) Coordinate job site activities with the RLK Project Manager, the Forest Service Project Coordinator, agency	Construction

	representatives, and contractors.	
WS-12	Prior to construction, a National Pollutant Discharge Elimination System (NPDES) permit with an associated Erosion and Sediment Control Plan (ESCP) would be obtained if required under current regulations. The permit would be included in the SWPCP/ Construction Plan.	Construction
WS-13	An erosion control plan would be included in the SWPCP/ Construction Plan and approved by the Forest Service prior to earth-disturbing activities and the plan would be revised annually to minimize erosion.	Construction
WS-14	Redundant erosion protection (such as two rows of silt fence, straw bales, and/or more permanent structures such as logs) would be provided between streams and construction areas close to stream channels.	Construction
WS-15	No access corridors, staging areas, spoils piles, or other construction-related materials would be staged or stored within riparian reserves.	Construction
WS-16	Stream turbidity would be monitored during construction in a manner that allows for evaluation of the effects of the project on turbidity (e.g., monitoring above and below construction, paired stream monitoring). If an increase in turbidity, as a result from project operations, exceeds 10 Nephelometric Turbidy Units (NTU's) for a period exceeding 30 minutes, operations would cease until a plan has been developed and approved to address the cause of increased turbidity. Operations would cease immediately if turbidity is over 100 NTU's and would not resume until a plan has been developed and approved to address the cause of increased turbidity.	Construction
WS-17	A water quality monitoring plan would be included in the SWPCP/Construction Plan and would be updated annually assessing project activities. At a minimum Still Creek and West Fork Salmon River would be monitored in the vicinity of the project.	Both

2.2 No Action

Under the no action alternative current management plans would continue to guide management of the area. No new mountain bike trails or skills park would be constructed and the proposed restoration projects would not be implemented. The no action alternative provides a baseline to evaluate impacts of the proposed action.

2.3 Development of the Proposed Action

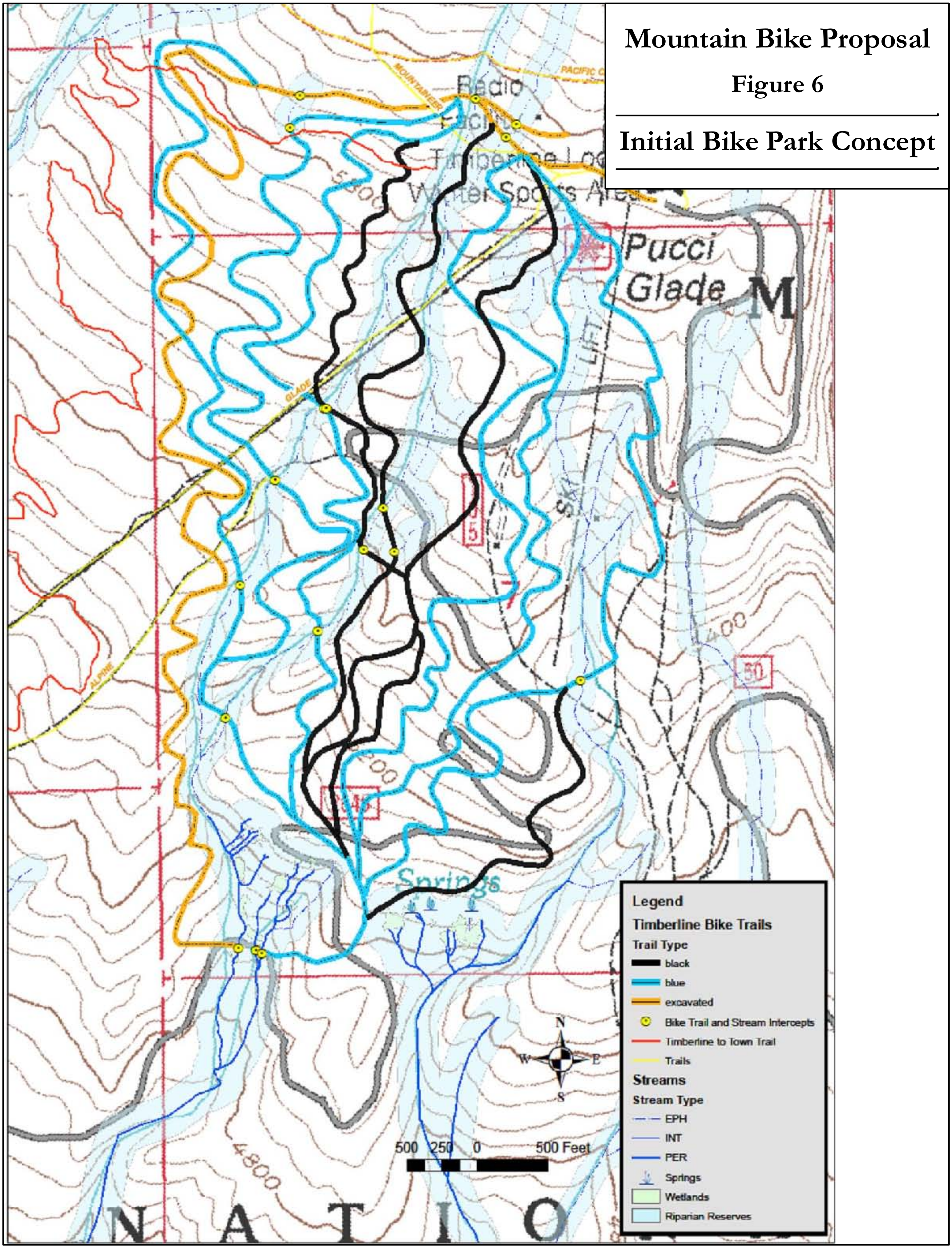
During the early stages of proposal development an initial conceptual proposal and an initial field proposal were developed and considered. Each of these proposals is briefly described below along with an explanation of why and how they were modified to become the proposed action.

2.3.1 Initial Conceptual Proposal: An initial proposal was sent out for scoping in June of 2010 (see Figure 6). Although this proposal was developed using aerial photos, contour maps, and field reconnaissance, it was anticipated that further field verification would better define the

Mountain Bike Proposal

Figure 6

Initial Bike Park Concept

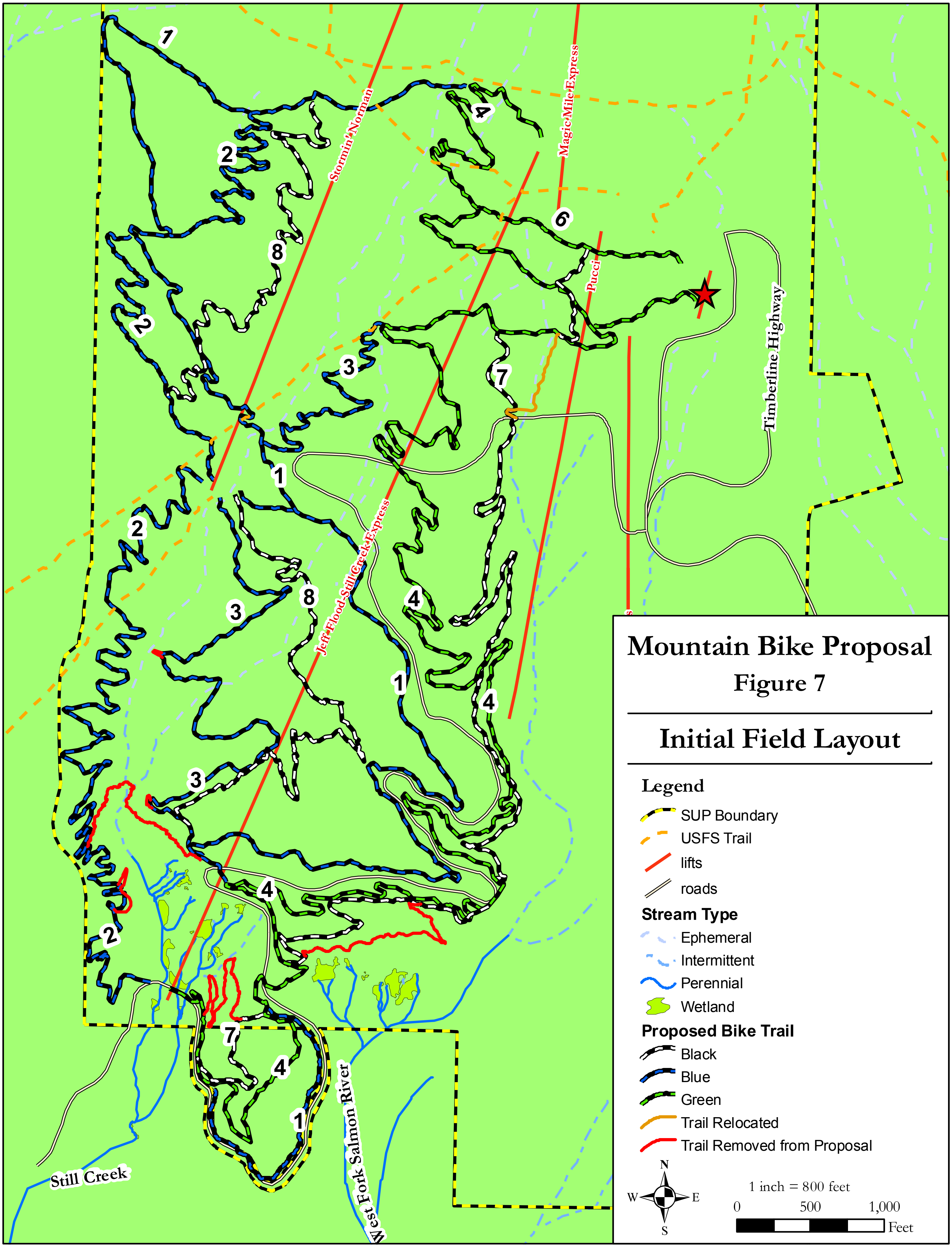


location of proposed trails. The conceptual map initially prepared by Gravity Logic used ortho-photos that did not clearly indicate West Leg Road. Upon ground-proofing in summer 2010, detailed trail layout was immediately modified to significantly reduce the numver of West Leg Road crossings. Both the Green and Blue Free-ride trails were designed to follow either side of the road as much as possible. Once further field investigations provided better data and detail of the trails this initial conceptual proposal was replaced by the initial field developed proposal.

2.3.2. Initial field-developed trail network by GravityLogic. During the summer of 2010 RLK employed the company Gravity Logic of Whistler B.C. to design and layout the mountain bike trails on the ground. In designing the trails Gravity Logic met with and received input from Forest Service specialists. Early in the process Gravity Logic and RLK personnel met with the Forest Service IDT onsite to go over the initial trail layout and discuss sensitive areas to avoid and concerns with the initial trail location and design. Once the initial trails were laid out and maps produced the trails were reviewed by the Forest Service specialists on the ID Team (see Figure 7). Based on concerns raised by the ID Team as well as scoping comments from the public several changes were made to the initial trail network. These changes included:

1. A trail from Westleg Road heading west and crossing two forks of Still Creek and connecting with the lower portion of trail #2 was removed from the proposed trail network because of potential impacts to the aquatic system.
2. To the extent practical, trails were designed to stay within tree islands between the more obvious ephemeral stream corridors. With input from the IDT, crossings of more sensitive areas were designed to enter and leave with minimal ground disturbance (i.e. crossing at right angles). Segments of trails that lay within important drainages (e.g. lower portions of trail #2 near Still Creek) were moved, where possible, to areas outside of drainages.
3. To the extent practical, trails were designed to avoid seepage areas with a high water table indicated by false hellebore.
4. An important part of the overall trail plan was to include a Green trail suitable for riders of all abilities. The terrain near the bottom of the Jeff Flood lift within the permitted area posed some significant design and construction challenges due to the steep terrain, and was further limited by the presence of wetlands and springs. A solution was to propose to use a small section of forest outside the permitted area with a slope angle much more conducive to sustainable trail design and without any identifiable sensitive features. This area also includes a Blue and a Black trail all of which benefit from the far more suitable terrain.
5. A trail from the top of Jeff Flood back to the parking lot was needed. The initial design had two crossings of the mountaineers trail and/or the Timberline to Town trail. To reduce the number of crossing one of the crossings was eliminated.
6. The upper portion of trail #7 that was within 50 feet of and paralleled the headwaters of the West Fork of the Salmon River for over 500 feet in a stringer of riparian forest was rerouted outside the riparian reserve and the intact stringer of riparian forest.
7. Lower portions of trail #7 that were adjacent to wetland seep areas of both West Fork Salmon River and Still Creek were removed from the trail network.

The initial field developed trail network along with the changes described above became the proposed action described in section 2.1.


Mountain Bike Proposal
Figure 7
Initial Field Layout
Legend
SUP Boundary
USFS Trail
lifts
roads
Stream Type
Ephemeral
Intermittent
Perennial
Wetland
Proposed Bike Trail
Black
Blue
Green
Trail Relocated
Trail Removed from Proposal
1 inch = 800 feet
0
500
1,000
Feet
N
S
E
W
Stormin' Norman
Magic Mile Express
Pucci
Jeff Flood Still Creek Express
Timberline Highway
Still Creek
West Fork Salmon River

CHAPTER 3 – ENVIRONMENTAL CONSEQUENCES

This chapter summarizes the physical, biological, social, and economic environments of the affected project area (the baseline or existing condition) and the expected effects or changes to those environments, if any of the alternatives were to be implemented. This chapter provides a summary of the scientific and analytical basis for comparing the alternatives. More detailed analysis is in the project file.

The chapter is arranged by resource, with the affected environment or existing condition discussion presented first, followed by the estimated project effects (direct and indirect), and then estimated cumulative effects. Cumulative effects are those effects on the environment resulting from the incremental effect of the proposed road decommissioning activities when added to the effects of other past projects (that still have residual or on-going effects); the estimated effects of other current projects; and the effects of reasonably foreseeable future activities. Cumulative effects analysis was guided by 36 CFR 220.

3.1 Soils

Existing Conditions

The top of the project area is at slightly over 6,000 feet in elevation; the bottom is at about 4,800 feet. This is a very important 1,200 feet. Soils nearer the top can barely support a thin groundcover at best, while at the lower elevations soils provide for a much wider array of vegetation.

Despite the differences in vegetation vertically in the area, the physical characteristics of the soils are quite similar, especially texture. In trail locations and skills park, loamy surface soils (very fine sandy loams to loamy sands) are the rule, with varying degrees of gravel and boulders in the subsoil. Soils become slightly coarser on steeper ground, especially near incised drainages, and at the higher elevations where wind and water erosion has removed some of the finer soil particles. This phenomenon is also observed and documented in numerous planning projects from the Mt Hood Meadows Ski Area just to the east.

SRI soil types mapped in the area are 379, 380, and 382, with some included areas of 381. A review of the map units and their accompanying interpretations compared to the field showed a good match, although slightly less gravel content was seen in surface soils in the lower half of the area.

Observed Geomorphic Process

Near the top of the project area, small drainages form where annual snowmelt begins to define channels that downcut through loose sandy material. The ground here is very undulating, with numerous small incised draws and huge supply of erodible material moving around the local landscape via wind and water. Soils in this area are actively eroding at a chronic natural level where they are not otherwise impacted by either user created or sanctioned trails. The naturally coarse material in the upper elevation areas allows for rapid water infiltration compared to lower elevations (not as rapid), which results in lower surface erosion that would otherwise occur.

Observed Road and Trail Erosion

Several roads exist within the analysis area, most of which are native surface. Most access lifts, and have visible signs of erosion occurring. Most notable are the roads at the bottom of the Stormin' Norman lift, which were rilled and are impacting a small drainageway.

Westleg Road is paved, but the ditchline has not been maintained sufficiently to prevent water from moving sediment. In addition, some pipes are blocked/not functioning.
The bottom of Pucci Lift has a large compacted area where water runs across the surface. A similar situation exists at the bottom of the Jeff Flood lift.
The Glade and Alpine Trails cutting across the area have erosion occurring on them as well.

All of these situations can be changed in order to reduce the erosion occurring in each one.

Direct and indirect effects

Trail and Skills Park Construction

There are two main things that would happen to the soil in the trail alignments and skills park. First, soil would be exposed through the loss of its groundcover as the trail locations and skills park are roughed in. Second, the trail treads themselves would be compacted in order to establish the running surface. The result would be bare, and bare/compacted soil surfaces that are at risk of erosion. The beginner level trails, which are the widest, would be at highest risk simply due to the amount of bare ground exposure and because they are constructed with heavy equipment. This would be followed by the intermediate level trails (slightly narrower, smaller machine); and finally at lowest risk would be the expert trails, which are hand constructed and the narrowest of the three types.

Project Design Criteria that minimize environmental impacts caused by trail and skills park:

Preface: It is always preferable to minimize erosion through proper use of various techniques than to try and manage sediment once soil has left the site. Under this premise, the following PDC's have been developed.

PDC Soil-1
Stabilization of mountain bike trail surface would be accomplished through a combination of rock armoring and wooden features or other similar protective measures. Any rock used for armoring would be sourced from either the bike park/ watershed restoration construction limits or from an approved offsite source. No quarrying of rock materials would take place.

PDC Soil-2
The spacing of surface water control structures along the length of the bike trail network would be per Forest Service Handbook guidelines at a minimum. The spacing of surface water control structures (e.g., grade reversals, drain dips, water bars) along mountain bike trails within 200 feet of a stream crossing would be no less than 50 feet to minimize extension of the stream drainage network and to minimize sediment delivery to riparian reserves. Water bar placement along decommissioned roads would be determined in the field based on site conditions and approved by the Forest Service Permit Administrator.

PDC Soil-3
Wood features (e.g., ladder bridges, boardwalks), native soil causeways, and/or rock armoring

would be incorporated into mountain bike trails to avoid impacting sensitive resources such as steep slopes, tree roots, vegetation, and wet areas. Wood materials would be sourced from local suppliers and would be free of invasive species.

PDC Soil-4
Additional surface water controls, rock armoring, wooden features, or other acceptable measures would be installed on trails that exhibit unacceptable erosion.

PDC Soil-5
Bike park staff (RLK) would monitor trail conditions throughout the hours of operation on a daily basis to ensure that erosion or sediment mobilization away from the trail corridor is not occurring and/or to implement corrective action in accordance with the project design criteria.

PDC Soil-6
A Travel Route Plan would be required and included in the SWPCP/Construction Plan for the project to minimize compaction of soils by limiting equipment to designated travel-ways (e.g., existing roads, bike trails that are under construction) as approved by the Forest Service .

PDC Soil-7
All exposed mineral soil not included in bike trail tread width would be mulched with certified weed-free Woodstraw or equivalent at a rate to achieve 70% ground cover (approximately 7 tons per acre) or mulched with a certified weed-free straw, at approximately 3,000 pounds per acre and seeded with approved seed at a predetermined rate. Application rates would be validated and verified in the field to ensure that mulch application is not too sparse or too excessive.

PDC Soil-8
Temporary erosion and sediment control measures (e.g., plastic sheeting, mulching) would be in place prior to the end of each work day or prior to any rain event (as defined by when the National Weather Service, or other accepted source, predicts a 50% or higher chance of measurable precipitation for the local area).

PDC Soil-9
The bike park staff (RLK) would patrol the park on a daily basis to ensure that re-vegetated areas are not disturbed, or to remedy disturbance to re-vegetated areas (see also Soil-5). Project areas with any ground disturbance would be surveyed annually to ensure success of re-vegetation efforts. If seeding or other re-vegetation efforts are not successful in re-vegetating disturbed areas, the Forest Service Permit Administrator would be contacted and a site-specific, alternative, re-vegetation solution would be developed.

PDC Soil-10
In cleared areas, topsoil would be carefully removed and stockpiled for placement onto the cleared area outside of the trail tread width. During construction, topsoil would be carefully stored using approved erosion and sediment control methods. Additional measures (e.g., plastic covering) to cover exposed soils would occur during inclement weather. Excess topsoil from trail construction may be hauled to other construction/restoration sites for placement.

PDC Soil-11
RLK would install a rain gauge near the middle elevation in the bike park. The rain gauge would be accessible and monitored by RLK and the Forest Service via the internet. Earth-disturbing operations (construction and/or bike park operations) would be suspended if there is more than 1inch of rain in a 24-hour period and/or the Bull Run River above the reservoirs exceeds 200 cubic feet per second (suggesting a rise in base flows in the watershed). Operations would remain suspended until the Bull Run River drops below 200 cubic feet per second and there is less than 1 inch of rain in a 24-hour period or onsite conditions are dry enough to allow operation. Prior to suspending all bike park operations, the Forest Service Permit Administrator may decide to close certain trails, or portions of trails, to allow continued operation of the bike park in locations where trail conditions are dry enough for operation and there is no risk of sediment delivery to the stream system. (See also Soil-5)

PDC Soil-12
Stockpile areas, temporary roads, and other areas where soil compaction has occurred from this project would be ripped or scarified prior to the start of re-vegetation.

PDC Soil-13
Activities for the season would be suspended if soil moisture is recharged and stream flows rise above baseflow levels and are predicted to stay above baseflow levels (i.e., 200 cfs in the Bull Run River, upstream of the reservoirs) and/or if onsite conditions warrant closure of the park. (See also Soil-11).

Restoration Actions

The following list of restoration actions are proposed to address specific observations made during the field reconnaissance in summer 2010. Some of the problems observed were summarized in the section above titled ‘Observed Road and Trail Erosion’. An observable reduction in human caused erosion would result when these projects are implemented.

- Surface identified native surface roads with at least a 6” lift of gravel, a proven method to reduce erosion potential by over 90%.
- Form ‘fit in the field’ rolling dips and waterbars on identified roads, which is another proven technique to reduce erosion from roads and similar to PDC Soil-2 above.
- Define and keep all vehicle access needs for lift mtc to the narrowest possible. Decompact and revegetate the remainder.
- Design and implement a long term erosion control plan for the Glade and Alpine Trails.
- Evaluate road mtc backlog to address blocked pipes, ditches, etc.

Cumulative Effects

This proposal adds to several existing trail and road systems in the ski area. However, the restoration actions have been modeled and evaluated to reduce sediment risk by a two to one ratio, a substantial improvement over the current condition. In addition, the restoration actions are scheduled to occur either slightly before or concurrently with the proposed trail construction, thereby offsetting potential impacts in both time and space. The restoration projects are in fact, so essentially important to offsetting the impacts of the proposed trails that they themselves are included in the proposed action. Proven effective in other locations on the mountain, it is with the highest confidence that they will be fully effective as designed.

3.2 Hydrology, Geology, and Water Resources

The underlying geology within and adjacent to the Study Area in described as a large pyroclastic-flow (volcanic-flow) and debris flow deposits in the report entitled, "Preliminary Geologic Map of the Mount Hood 30-Minute by 60-Minute Quadrangle, Northern Cascade Range, Oregon" (U.S. Geological Survey, 1995). These highly permeable pyroclastic and debris flow deposits covered older volcanic deposits to create the smooth fan that is currently discernable between Zigzag Canyon and White River Canyon. The thickness of this debris fan is largely undocumented, however a test well located just south of Timberline Lodge revealed a measured thickness of 120 feet (USFS, 1992). The dominant materials found within this layer include poorly sorted pebbles, cobbles, and boulders in a reddish-gray sandy matrix (U.S. Geological Survey, 1995). It is likely that the young age and high permeability of these deposits are the dominant factors responsible for the limited stream development above Timberline Lodge and the large amount of shallow groundwater flow. Finally, it is thought that the older volcanic deposits found under the permeable pyroclastic and debris flow materials have low permeability and act to concentrate groundwater flow and create groundwater springs at specific elevations where bedrock is exposed (DeRoo, Pers. Comm., July, 2004).

Water Resources

Management Direction

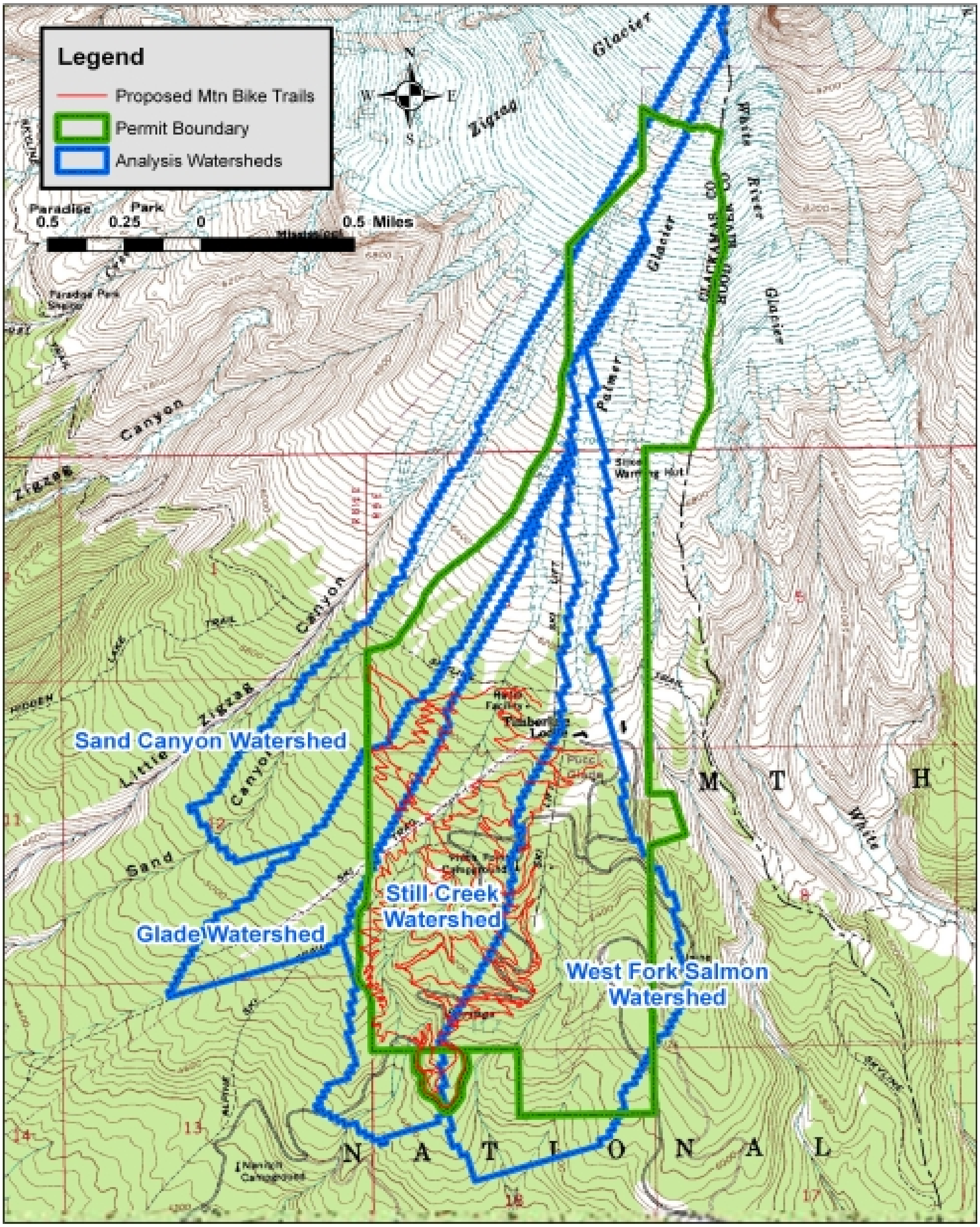
For analysis purposes a hydrologic planning area was identified for this project. The hydrologic analysis area (analysis area) extends from the uppermost extent of any drainage that is intersected by trail construction to the bottom of the drainage associated with trail construction. For this project the hydrologic planning area is 1,732 acres, divided into four subwatersheds (Hydrology Table 1).

Hydrology Table 1
Analysis Subwatersheds

Subwatershed	Area (ac.)
Glade	199
Sand Canyon	495
Still Creek	464
West Fork Salmon	573
Total	**1,732**

There are 4 land allocations in the analysis area that address water resources. These allocations are detailed in Hydrology Table 2. The analysis area is shown in Hydrology Figure 1.

Hydrology Figure 1 - Watershed Resources Analysis Area



Hydrology Table 2
Land Allocations Related to Watershed Resources

Allocation	Management Direction
Special Emphasis Watershed	Maintain or improve watershed, riparian, and aquatic habitat conditions and water quality for municipal uses and/or long term fish production.
Wild and Scenic River	Protect and enhance the resource values for which a river was designated into the Wild and Scenic Rivers System
Riparian Reserve	Riparian resources receive primary emphasis and special standard and guidelines apply
B7 General Riparian Area	Achieve and maintain riparian and aquatic habitat conditions for the sustained, long-term production of fish, selected wildlife and plant species, and high quality water for the full spectrum of the Forest's riparian and aquatic areas.

In addition to the land allocations listed in Hydrology Table 2. the Salmon River Fifth Field Watershed is a Tier 1 Key Watershed under the Northwest Forest Plan. There are 573 acres of the analysis area in the Key Watershed. The objective of Key Watersheds is to contribute directly to conservation of at-risk anadromous salmonids and resident fish species. The emphasis within Key Watersheds is to reduce existing system and non-system road mileage and receive priority for restoration.

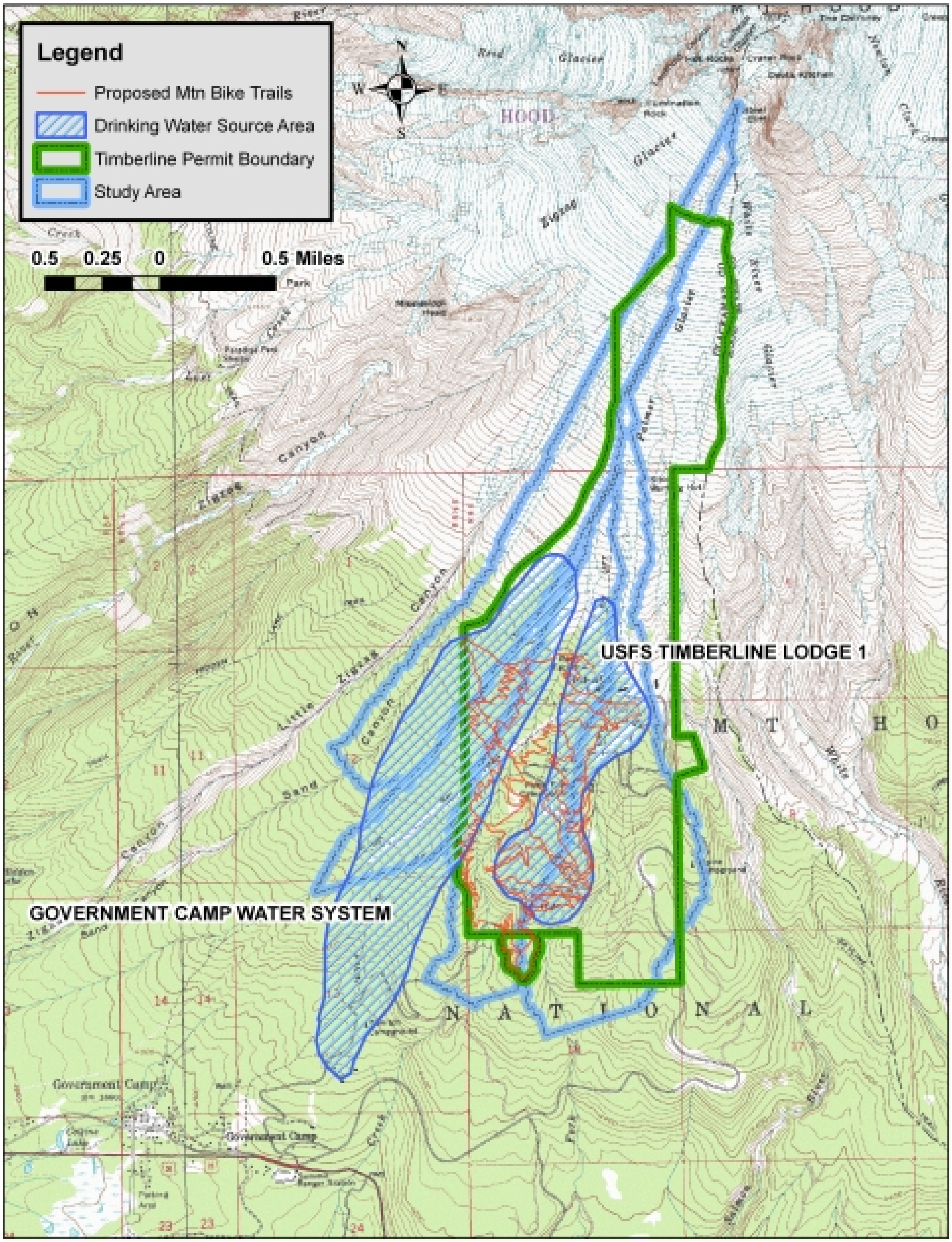
The Study Area also contains a portion of the Government Camp Drinking Water Protection Area (DWPA) and the entire Timberline Lodge DWPA. The Timberline DWPA contains 243.3 acres and is located entirely within the planning area. The Government Camp DWPA incloudes a totla of 582.4 acres, 385.3 of which are located in the planning area (see (Hydrology Figure 2). Although the boundaries of the Government Camp and Timberline Lodge DWPA have been identified, Drinking Water Protection Plans have not been developed, and therefore, no management guidelines or protection standards have been established.

Climate

Average yearly temperatures within the analysis area were 37 degrees Fahrenheit during the period of record. Temperature ranged from average highs of 54 degrees in August to average lows of 27 degrees in December, January, and February. Average annual precipitation within the Study Area is 106.6 inches, ranging from a high of 152.6 inches observed in 1997 to a low of 68.4 inches recorded in 2001. An average of 65 inches falls as snow within the Study Area, measured as a snow water equivalent at the SNOTEL site. With approximately one half of the annual precipitation arriving as snowfall, the flow characteristics of channels draining the analysis area are dominated by snowmelt.

Data from the Mt Hood Test Site site from 1981 through 2004 is summarized in Hydrology Table 3.

Hydrology Figure 2 – Drinking Water Protection Areas



Hydrology Table 3
Mt Hood Test Site Climate Summary

	Total Precipitation	Snowpack measured as inches of Snow Water Equivalent	% of Total Precipitation contained in the Snowpack
Average	106.6	67.1	63
Minimum	68.4	37.9	39
Maximum	152.6	102.4	81

Surface Water Resources

The analysis area includes portions of two Fifth Field Watersheds (Zigzag and Salmon River) and three Sixth Field Watersheds (See Hydrology Figure 1 and Table 1).

The total length of streams in the analysis area is approximately 12.0 miles. The stream system in the analysis area is based on field validated streams during the planning process for the Timberline Express FEIS (USDA, 2004). Hydrology Table 4shows the length of these channels by flow regime.

Hydrology Table 4
Stream Length by Flow Regime

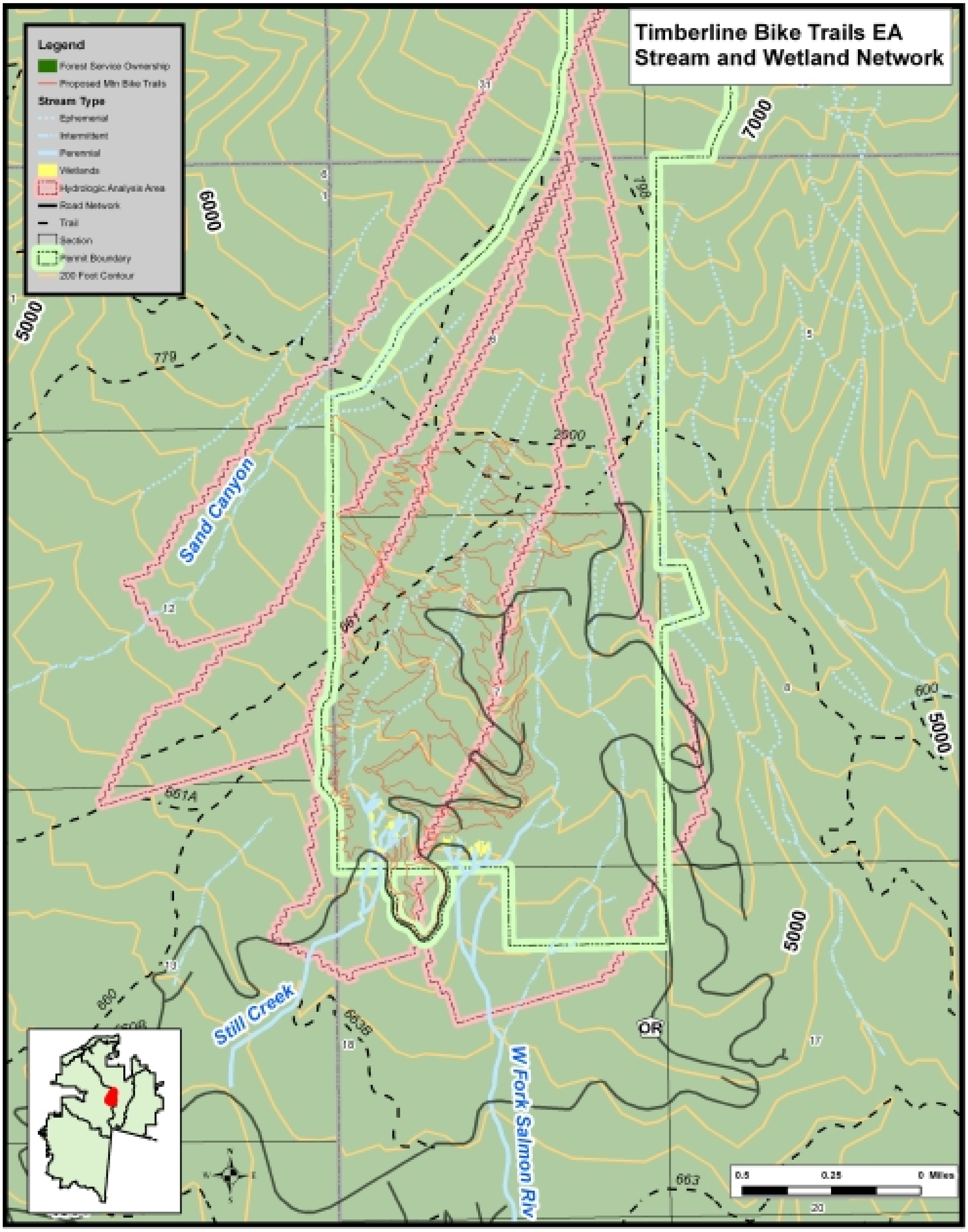
Watershed	Ephemeral	Intermittent	Perennial	Subtotal
Glade	0.1	0.0	0.0	0.1
Sand Canyon	1.7	0.7	0.0	2.4
Still Creek	3.0	0.5	1.4	4.8
West Fork Salmon	0.7	2.7	1.3	4.7
Total	**5.4**	**3.9**	**2.7**	**12.0**

Geomorphology

The headwaters of Still creek emerge out of a set of perennial and ephemeral wetland seeps originating at about 4800 feet elevation on the south side of Mt Hood. Fed by snowmelt surface runoff and groundwater flow emanating from the Palmer Snowfield, these numerous wetland seeps join together at the 4800' elevation level and form the mainstem channel of Still Creek (Timberline Express FEIS).

Thick pyroclastic flow and debris flow deposits from approximately 1,500 years ago comprise the surface material in the project area. These permeable deposits filled in over the older topographic surface (including stream channels) and created the present smooth fan on the southwest side of Mt. Hood (USGS, 1995). The age and permeability of this material explains the limited stream development above Timberline Lodge; the buried topography (including stream channels) probably helps to concentrate groundwater flow in certain areas and partially explains why springs are located where they are (DeRoo, Pers. Comm).

Hydrology Figure 3 – Stream and Wetland Network



The topography of the land around these seeps and wetlands is very steep (30 to 50 percent slope), and because of the steep slope, these tributary streams all are moderately to highly incised and have distinct stream morphology with limited floodplain development. The perennial reach of the mainstem of Still Creek in the vicinity of the project area is classified as a Rosgen A4a+ channel type. The A4 stream types typically have a high sediment supply which is combined with high energy streamflow to produce very high bedload sediment transport rates. The A4 stream types are generally unstable, with very steep rejuventated banks that contribute large quantities of sediment. A4a+ stream types are usually located in slump/earthflow landforms and are often associated with debris avalanches and debris torrent erosional processes. (Rosgen 1996).

Similar to Still Creek, West Fork Salmon River is in the area affected by pyroclastic flow and debris flow deposits from approximately 1,500 years ago. West Fork Salmon River is very similar to Still Creek in that it is fed by snowmelt surface runoff and groundwater flow emanating from the Palmer Snowfield, into numerous wetland seeps that join together at the 4800' elevation level and form the channel of the West Fork of Salmon River.

The perennial reach of the West Fork of the Salmon River in the vicinity of the project area is classified as a Rosgen A4a+ channel type. The A4 stream types typically have a high sediment supply which is combined with high energy streamflow to produce very high bedload sediment transport rates. The A4 stream types are generally unstable, with very steep rejuventated banks that contribute large quantities of sediment. A4a+ stream types are usually located in slump/earthflow landforms and are often associated with debris avalanches and debris torrent erosional processes. (Rosgen 1996).

However, significant stream bed and bank erosion in the lower perennial reachs of Still Creek and West Fork Salmon River within the Study Area was not observed during stream mapping and characterization surveys associated with the Environmental Impact Statement associated with the Timberline Express Project that were conducted in 2002 and 2003 (SE Group, 2004a). The 1998 stream survey of Still Creek in the vicinity of the project area notes 0.8% of the stream reach with unstable banks. The lack of observed bank erosion and instability that would be expected in this sensitive stream type from existing lift and trail development in the Study Area is likely due to the moderating affect of groundwater contributions to the stream hydrograph, the well-connected floodplain wetlands, and the dense overbank vegetation along both sides of the channel. However, some bank instability approximately 1.5 miles downstream of the Study Area was noted during a survey of Still Creek near the Still Creek Campground (USFS, 1996) and another area of bank instability was noted in the West Fork of Salmon River in the vicinity of Timberline Road where an abundance of road sand and gravel was observed within and adjacent to the channel and from a natural slope failure zone that is approximately 75 feet in length and 50 feet high adjacent to the streambank approximately 500 feet upstream of the Timberline Road (SE Group, 2004d).

Flow Regime

With the lowest elevation in the hydrologic planning area at 4,800feet and the highest elevation area at 10,000 feet (however the majority of the analysis subwatersheds only extend up to 7,000 feet) at least 50% of the annual precipitation is contained in the snowpack based on data from adjacent SNOTEL sites. Based on the amount of precipitation associated with the snowpack a snowmelt dominated hydrograph would be expected for this area. Hydrology Figure 4 details the mean daily values for the Salmon River stream gage at 3,445 feet which measures a watershed of 8 square miles. This gage is approximately 1 mile east of Trillium Lake. Figure 4 clearly details the influence of the melting snowpack (staring in early April and peaking in late May) on the annual hydrograph. Baseflows at this site generally occur from mid July through mid November.

Hydrology Figure 4
Daily Average Streamflow Salmon River at 3,445 feet

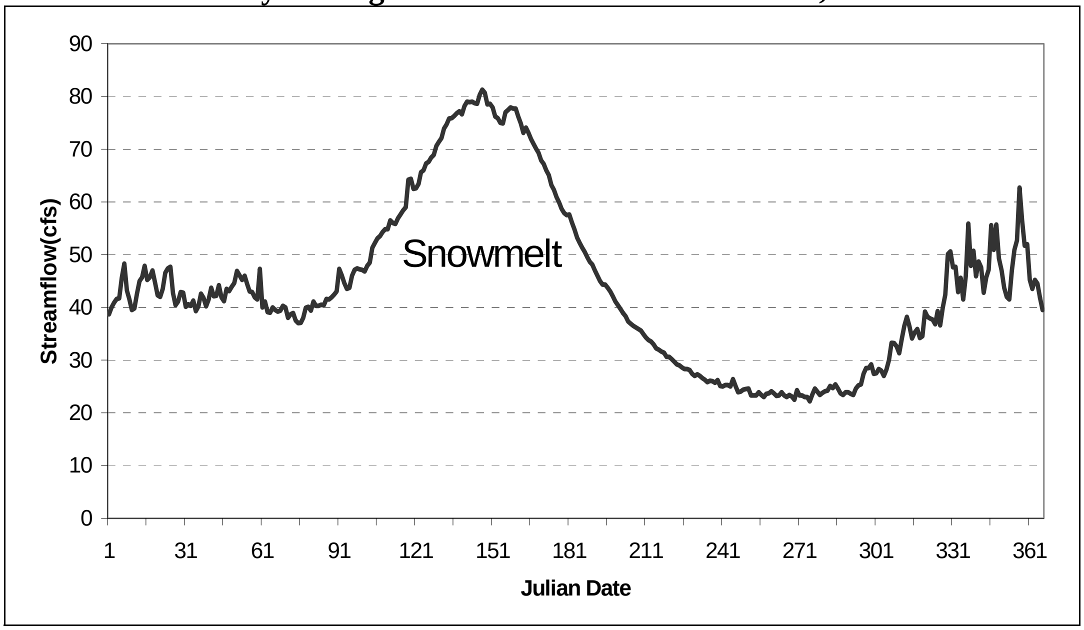
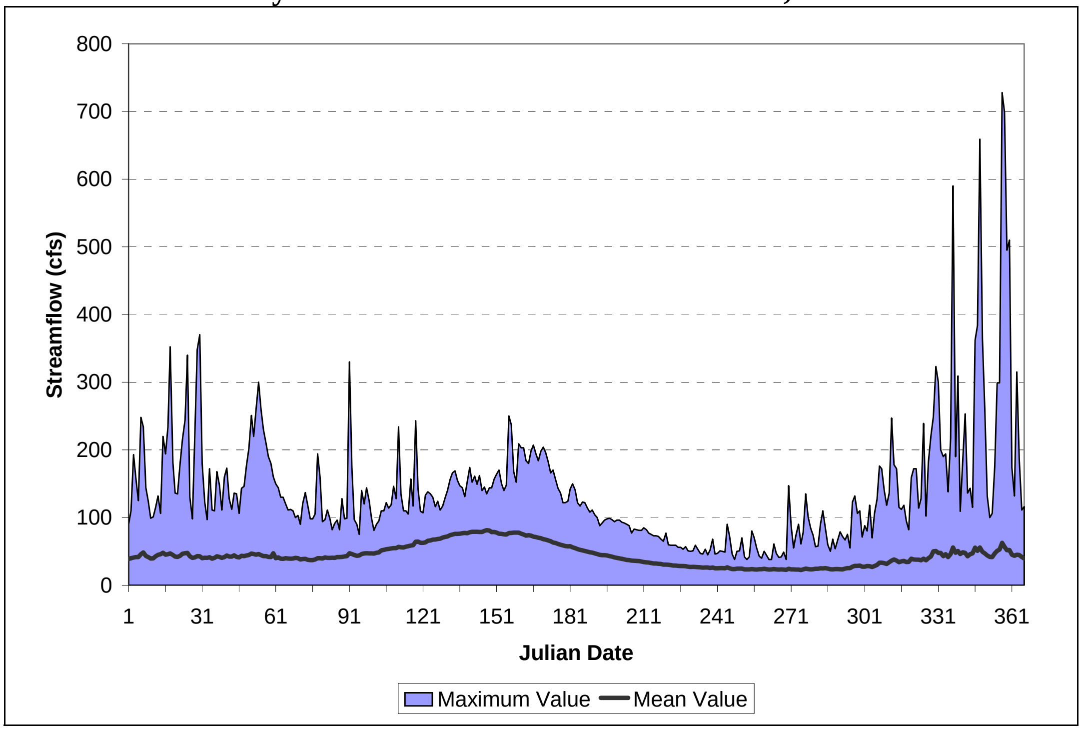


Figure 5 details the maximum daily streamflows for the 67 years of record for the Salmon River gage at 3445 feet. This figure details that the maximum streamflows occur from late November to early March. This would indicate that peak streamflows are associated with runoff from rapid snowmelt and rainfall during rain on snow events.

Hydrology Figure 5
Daily Peak Streamflow Salmon River at 3,445 feet



Current streamflow data from Still Creek in the vicinity of Still Creek Campground indicates Still Creek differs from the Salmon River, as it is fed primarily by groundwater rather than direct run-off from the snowfield. Seepage from the upper snow fields travels through the near surface geology and expresses itself in the springs that provide the source of perennial flow.

Still Creek flow regime is "buffered" by the constant influx of groundwater. Pulses of surface runoff during rain events occur primarily when the ground surface becomes saturated and the ephemeral reaches of Still Creek carry water.

Water Quality

A Total Maximum Daily Load (TMDL) has been established for stream temperature in the Sandy Basin. The federal Clean Water Act requires DEQ to develop a plan with goals and pollution control targets for improving water quality in the watersheds where water quality standards are not met. DEQ is doing this by establishing TMDLs for each pollutant entering the water. In this case, heat is considered a pollutant because it raises water temperature. A TMDL describes the amount (load) of each pollutant a waterway can receive while maintaining compliance with water quality standards. An important step in the TMDL process is determining how much stream heating results from natural sources and how much heat comes from human activities.

Oregon requires that a water temperature management plan (TMP) be developed and implemented by sources that contribute to stream heating. The TMP will identify the technologies, best management practices, and/or measures and approaches to be implemented by each source to limit stream heating. Stream heating and sedimentation from forestry activities will be controlled through implementation of measures in the state Forest Practices Act on private lands, the Western Oregon State Forests Management Plan in state forests, and federal Northwest Forest Plan on federal forestlands.

Sediment

The Watershed Analysis for the Zigzag Watershed identifies moderate problems with turbidity and sediment associated with highway sanding and road surface erosion in Still Creek.

The Watershed Analysis for the Salmon River Watershed also identifies sedimentation of streams in upper watershed as a process of concern. The Watershed Analysis recommends restoration priorities to reduce sediment within the watershed should focus on the greatest potential sources: highway sanding and roads. Reducing sediment from roads can be further prioritized by proximity to streams, surfacing type, cut and fill slope vegetation and landform.

Wolman pebble counts collected in the summer of 2010 quantify concerns with sedimentation in the project area in both Still Creek and the West Fork of Salmon River. In Still Creek surface fines (material less than 1 mm) were at 21% and in the West Fork Salmon River surface fines were at 44% (the Mt Hood LRMP Standard is less than 20% surface fines).

A major source of sediment input to the West Fork was observed in the vicinity of Timberline Road where an abundance of road sand and gravel was observed within and adjacent to the channel and from a natural slope failure zone that is approximately 75 feet in length and 50 feet high adjacent to the streambank approximately 500 feet upstream of the Timberline Road (SE Group, 2004d)

Below the project area the 1996 Still Creek stream survey details problems with sedimentation in the area near Still Creek Campground and in the upper portion of the Key Site Riparian area. These observations were validated with pebble counts from that survey that detail surface fines (material less than 1 mm) at 52% and 35% respectively in these reaches (the Mt Hood LRMP Standard is less than 20% surface fines).

Water Temperature

Still Creek and West Fork Salmon River are identified by the Oregon Department of Environmental Quality as core cold water habitat for salmonids with a water temperature standard of the seven-day-average of the daily maximum temperature may not exceed 16.0 degrees Celsius (60.8 degrees Fahrenheit).

In the Watershed Analysis for the Zigzag Watershed Still Creek was not identified with stream temperature problems. This was validated by temperatures taken during stream surveys.

According to Golder (2003), Still Creek at elevation 5,000 feet exhibits an average temperature of 3°C. Outside of the Study Area at 3,600 feet, the average temperature is 6.8°C. Since water temperature in streams is cumulative and temperature typically becomes higher downstream, it can be deduced that the stream temperatures within the reaches in the Study Area are between 3°C and 6.8°C (Golder, 1998), which is below the 16.0°C in-stream maximum temperature criterion mandated by ODEQ. Golder (1998) indicates that the perennial reach of Still Creek is fed by a series of groundwater seeps and springs that serve to buffer the stream from changes in the watershed. (Timberline Express FEIS)

In Still Creek temperatures taken during the 1998 survey from July 6th to August 31st varied from a maximum of 15^{0}C at river mile 2.4, 2.7, and 3.3 to a minimum of 4^{0}C from river mile 14.0 to the end of the survey at river mile 14.4. Within the analysis area water temperatures were at 4^{0}C upstream of river mile 14.0.

In the Upper Salmon River at 3,445 feet in elevation, the average water temperature is 8.0°C (Golder, 1998), which is below the 16.0°C in-stream maximum temperature criterion mandated by ODEQ. Similar to the perennial reach of Still Creek within the Study Area, the headwaters of Upper Salmon River within the Study Area are dominated by a series of springs and seeps in the vicinity of Timberline's pumphouse. As a result, the flows in downstream reaches would also be buffered from changes in the upslope watershed. (Timberline Express FEIS)

Groundwater Resources

Wetlands

Executive Order (EO) 11990, Protection of Wetlands, calls for the identification, assessment, and protection of wetlands by requiring Federal agencies to avoid, if possible and practicable, adverse impacts to wetlands and to preserve and enhance the natural and beneficial values of wetlands. Section 401 of the Clean Water Act includes provisions that ensure compliance with the Clean Water Act and state water quality laws with respect to activities that are federally permitted. Jurisdictional wetlands and streams are subject to the regulations of the Clean Water Act, in particular, Section 404, which regulates discharges of fill to wetlands and streams.

In order to satisfy conditions of EO 11990, wetlands were identified and mapped throughout the entire Study Area to assist with project design and impact analysis. Wetlands were identified and mapped using the three-parameter approach outlined in the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory, 1987). Wetlands within the Study Area were also classified using the Hydrogeomorphic (HGM) approach to wetland classification (Brinson, 1993). The wetlands in analysis area are grouped according to their HGM class: slope wetland or riverine wetland. The wetlands are further characterized by whether they are in a natural or modified (historically disturbed) condition. Wetlands in a modified condition contain modified or nonnative vegetation, modified soil profiles, and/or modified hydrology through ditching or levee construction. (Timberline Express FEIS)

The Study Area contains 22 wetlands that encompass a total area of 2.46 acres, as shown in Hydrology Table 5.

Hydrology Table 5
Wetlands in the Study Area

Watershed	Riverine Wetland	Slope Wetland	Subtotal
Still Creek	0.3	1.0	1.3
West Fork Salmon River	-	1.2	1.2
Total	**0.3**	**2.2**	**2.5**

Nineteen slope wetlands with a total of 2.15 acres are located within the Study Area, most of which are generally located in the middle to lower elevation (4,850 feet to 5,050 feet in elevation) portions of the analysis area. Two of the slope wetlands in the analysis area are adjacent to the mainstem of Still Creek, a Class II stream. The vegetation in these slope wetlands is typically dominated by herbaceous plant communities with limited shrub and tree dominated components along the margins of the wetlands. The composition of the soils observed in the slope wetlands ranges from organic soils (i.e., histosols) to mineral soils with sandy loam texture classes.

Most of the slope wetlands in the analysis area originate from a series of groundwater seeps that form the headwaters of Still Creek and unnamed tributaries of the Upper Salmon River. A review of geologic literature for the surrounding area (Wise, 1969) indicates that the flow from these seeps is relatively constant due to the groundwater flow from Palmer Snowfield.

A total of 0.32 acre of riverine wetlands are present in the analysis area. The three riverine wetlands in the analysis area are located along perennial reaches of Still Creek and tributaries to Still Creek on narrow floodplains and terraces. The primary hydrologic input to the riverine wetlands is surface water that floods out of the Still Creek channel and onto adjacent floodplains during high flow events (e.g., spring melt). Secondary hydrology sources to these wetlands include surface flow from intermittent and perennial streams from adjacent hillsides and groundwater from seeps in the inner gorge of Still Creek. Native hydrophytic shrub species dominate the vegetation communities in the riverine wetlands in the Study Area. Herbaceous communities make up a minor component of the wetland vegetation in one of the riverine wetlands and forest communities are not present in any of the riverine wetlands. The soils within the riverine wetlands are typically mucky mineral soils with loamy sand texture (SE Group, 2004a).

Direct and Indirect Effects

Hydrology Table 6
Comparison of Alternatives – Water Resources

Items of Comparison	Proposed Action	Current Condition
Flow Regime		
Channel Network Expansion by Roads and Trails	Still Creek: 24%	Still Creek: 23%
	WF Salmon: 10%	WF Salmon: 16%
	Total: 14%	Total: 15%
Changes in 2-year peak flow	Still Creek: 4.7%	Still Creek: 4.3%
	WF Salmon: 4.5%	WF Salmon: 4.3%
Changes in low flow	Still Creek: 19.8%	Still Creek: 18.2%
	WF Salmon: 19.0%	WF Salmon: 18.2%
Sediment Yield		
Number of Stream Crossings	Still Creek: 34	Still Creek: 12
	WF Salmon: 8	WF Salmon: 8
	Total: 42	Total: 20
Stream Crossings Sediment Delivery (tons/year)	Still Creek: 0.2	Still Creek: N/A
	WF Salmon: 0	WF Salmon: N/A
	Total: 0.2	Total: N/A
Road related Sediment Delivery (modeled tons/year) for properly maintained roads	Still Creek: 14.4	Still Creek: 13.3
	WF Salmon: 5.0	WF Salmon: 10.3
	Total: 20.7	Total: 23.5
Sediment Reduction from Projects not Captured in road modeling	Still Creek: 26.6	Still Creek: N/A
	WF Salmon: 8.9	WF Salmon: N/A
	Total: 35.4	Total: N/A

The effects to water resources will be addressed by two elements:

- Flow Regime, and
- Sediment Yield

Flow Regime

<u>Peak streamflows (flood events)</u>

Peak streamflows have important effects on stream channel morphology, sediment transport, and bed material size. Peak streamflows can affect channel morphology through bank erosion, channel migration, riparian vegetation alteration, bank building, and deposition of material on floodplains. The vast majority of sediment transport occurs during peakflows as sediment transport capacity increases logarithmically with discharge (Ritter 1978; Garde and Rangu Raju, 1985).

The ability of the stream to transport incoming sediment will determine whether deposition or erosion occurs within the active stream channel. The relationship between sediment load and sediment transport capacity will affect the distribution of habitat types, channel morphology, and bed material size (MacDonald, 1991). Increased size of peakflows due to urbanization have been shown to cause rapid channel incision and severe decline in fish habitat quality (Booth, 1990).

Another important consideration is the impact of bankfull flow, often described as the high flow during two out of three years, or as a stream discharge having a recurrence interval of 1.5 years (Dunne and Leopold, 1978). The shape of the channel more closely reflects the bankfull width and height than it does the less frequent floods. If the bankfull flow is raised above the range of natural conditions, excess scouring can occur. If lower, the stream may not have the power to move its natural sediment load, causing sediment deposition within the watershed.

The Aquatic Conservation Strategy (ACS) gives clear direction that "the distribution of land use activities, such as timber harvest or roads, must minimize increases in peak streamflows" (ROD B-9) to create and sustain riparian, aquatic, and wetland habitats, and to retain patterns of sediment, nutrient, and wood routing.

Peak streamflows of large magnitude in the analysis area are generally generated by rain-on-snow events. The transient rain-on-snow zone is normally considered to be from 2400 to 4800 feet. Even though the analysis area is slightly above the transient rain-on-snow zone 71% of the of the entire analysis area is below 6000; 81% of the Still Creek and 85% of theWest Fork Salmon River analysis area watersheds are also below 6000 feet. Record floods occur predominantly during November through January, caused by: accumulated snow at lower elevations followed by a rapid rise in temperature, unusually high-elevation freezing levels, and heavy rainfall. In some instances, the ground is frozen prior to snow accumulation, producing more favorable conditions for high runoff (SCS 1976).

The 2006 large peak streamflow event, estimated at a 25 year recurrence interval flood event in the Upper Sandy River Basin, was entirely rain generated. This type of event is consistent with predictions associated with climate change. A recent review of the effects of climate change on salmon (ISAB 2007) identified the following probable consequences of global warming along the Pacific coast of North America: (1) warmer temperatures will result in more precipitation falling as rain rather than snow, (2) snowpack will diminish and streamflow timing will be altered, (3) peak river flows will likely increase, and (4) water temperatures will continue to rise.

There is a class of changes in hydrologic processes that consists of those that control infiltration and the flow of surface and subsurface water. This class is dominated by the effects of forest roads. The relatively impermeable surfaces of roads cause surface runoff that bypasses longer, slower subsurface flow routes. Where roads are insloped to a ditch, the ditch extends the drainage network, collects surface water from the road surface and subsurface water intercepted by roadcuts, and transports this water quickly to streams. The longevity of changes in hydrologic processes resulting from forest roads is as permanent as the road. Until a road is removed and natural drainage patterns are restored, the road will likely continue to affect the routing of water through watersheds. (FEMAT V-20)

For this analysis it is assumed that the Mountain Bike trails are similar to roads in the way that they impact hydrologic process associated with streamflow.

The relatively impermeable surfaces of roads cause surface runoff of rain and snowmelt water to bypasses longer, slower subsurface flow routes in soils. Where roads are in-sloped to a ditch, as most of the roads in this project are, the ditch extends the drainage network, collects surface water from the road surface and subsurface water intercepted by road cuts and transports this water quickly to streams. This process increases flow routing efficiency and may result in increased magnitude of peak stream flows.

For this analysis peak flows are related to the increase in the channel lengths caused by road ditches connected to streams. Based on recent research on two basins in the Western Cascades of Oregon 57% of the road length is connected to the stream network by surface flowpaths including roadside ditches and gullies below road drainage culverts (Wemple, 1996). It is assumed that all road ditches and culverts are properly maintained.

The increase in channel length due to the ditch length as just described is expressed as a percent of the stream drainage network. For the current condition it was assumed that the stream network was expanded: 50 feet for trail stream intersections, 350 feet for paved system road stream intersections, 500 feet for gravel user roads stream intersections, and 750 feet of native use road stream intersections.

With project implementation stream network would be expanded by 50 feet for trail stream intersections, 350 feet for paved system road stream intersections, 500 feet for gravel user roads stream intersections, and 150 feet of native use road stream intersections.

Hydrology Table 7 details that roads currently in the project area increase the channel network length by 15%. Increases in stream drainage network enhancement vary from 0 to 23% based on analysis area.

Hydrology Table 7
Stream Drainage Network Enhancement All Streams

Analysis Subwatershed	Current Condition	Proposed Action
Glade	0%	0%
Sand Canyon	0%	1%
Still Creek	23%	17%
West Fork Salmon River	16%	8%
Total	**15%**	**10%**

Implementation of the proposed action would decrease the stream drainage network by 5% over the entire project area, 8% in the West Fork Salmon Watershed, and 6% in the Still Creek Watershed. The reductions are realized through decommissioning and installation of more frequent drainage structures on user roads. Results from Glade Watershed are suspect because of the very limited miles of stream in this area (0.07 mile).

There are no expected adverse effects for peak flow increases up to 10%, given the inherent error in peak flow prediction methods and the fact that changes in peak flows of up to 10% are usually below detection limits using standard stream gauging methods. Peak flow increases greater than 10% offer the possibility for adverse effects (DNR, 1993). Therefore, a 10% increase in stream drainage network enhancement is used a threshold for the potential adverse effects.

Still Creek is above the 10% threshold under both the current condition and proposed action. However, implementation of the proposed action will reduce stream drainage network enhancement by 6% in the Still Creek analysis watershed. It should be noted that the research associated with this process was completed in significantly larger watersheds than that associated with this project (15,320 to 29, 405 acres compared to 1,732 acres).

Associated with the Environmental Impact Statement for the Timberline Express Project, a custom stream flow model was created to estimate the potential changes in stream flow conditions as a result of land cover changes from the Proposed Action and other Action Alternatives in the two analysis watersheds (similar in size and position to Still Creek and West Fork Salmon River analysis areas used for this project). This model was used to assess potential changes in 2 year peak flows and low flows associated with implementation of the Timberline Express lift and trails. Hydrology Table 8 presents the change in peak streamflows predicted by the model.

Hydrology Table 8
Changes in 2 Year Peak Streamflows
Timberline Express Streamflow Model

Analysis Area	Pre-Developed	Post Development
Still Creek	4.3%	4.7%
W.F. Salmon River	4.3%	4.5%

There are no expected adverse effects for peak flow increases up to 10%, given the inherent error in peak flow prediction methods and the fact that changes in peak flows of up to 10% are usually below detection limits using standard stream gauging methods. In addition, clearing associated with the current project is not expected to have any impact on the 2 year peak flow using the customized stream model. Hydrology Table 9 shows the modeled changes in low flows from the implementation of the lift and trails.

Hydrology Table 9
Changes in Low Flows Timberline Express Streamflow Model

Analysis Area	Pre-Developed	Post Development
Still Creek	18.2%	19.8%
W.F. Salmon River	18.2%	19.0%

With respect to low flows the streamflow analysis for the Timberline Express Project concludes "The hydrographs of Still Creek and the West Fork Salmon River within the Flow Model Analysis Area are largely controlled by groundwater influx from shallow groundwater from the Palmer Snowfield (Golder, 1998 and DeRoo, Pers. Comm., July, 2004). As stated above, this stream flow model does not account for significant groundwater contributions to the hydrograph. During the summer low flow period, the dominant source of hydrology for Still Creek and the West Fork Salmon River is shallow groundwater. No effects to shallow groundwater are anticipated from the proposed project because no permanent roads would be constructed, utility trenching would be 3 to 4 feet deep, and the documented shallow groundwater table is between 50 and 150 feet below the soil surface in the vicinity of proposed grading activities (Golder, 1998)." With respect to low flows the same logic would apply to this project since any areas where groundwater is exposed are avoided or bridged by the proposed action.

Sediment Yield

Road networks are the most important sources of accelerated delivery of sediment to fish-bearing streams. Road-related landslides, surface erosion, and stream channel diversions often deliver large quantities of sediment to streams, both catastrophically during large storms and chronically during smaller runoff events. Older roads in poor locations and with inadequate drainage systems pose high risks of future sediment production. Road surfaces and ditches can also serve as extensions of the stream network, thereby increasing flood peaks and efficiently delivering road-derived sediments to streams. (FEMAT II-40)

Accelerated rates of erosion and sediment yield are a consequence of most forest management activities. Road networks in many upland areas of the Pacific Northwest are the most important source of management-accelerated delivery of sediment to anadromous fish habitats. The sediment contribution to streams from roads is often much greater than that from all other land management activities combined, including log skidding and yarding. Road related landsliding, surface erosion and stream channel diversions frequently deliver large quantities of sediment to steams, both chronically and catastrophically during large storms. Roads may have unavoidable effects on streams, no matter how well they are located, designed or maintained. Many older roads with poor locations and inadequate drainage control and maintenance pose high risks of erosion and sedimentation of stream habitats. (FEMAT V-16)

Increased levels of sedimentation often have adverse effects on fish habitats and riparian ecosystems. Fine sediment deposited in spawning gravels can reduce survival of eggs and developing alevins. Primary production, benthic invertebrate abundance, and thus, food availability for fish may be reduced as sediment levels increase. Social and feeding behavior can be disrupted by increased levels of suspended sediment. Pools, an important habitat type, may be lost due to increased levels of sediment (FEMAT V-19).

Road crossings of stream channels create a potential for sedimentation due to the immediate proximity of the road to the stream being crossed. Where roads are insloped to a ditch, the ditch extends the drainage network, collects surface water from the road surface and subsurface water intercepted by road cuts and transports this water quickly to streams. This more rapidly flowing water is moving across a ditch which may not be vegetated, picking up sediment as it erodes. After road construction, this impact lessens, but still persists during storms due to the risk of overtopping of the crossing structure, most commonly culverts. Plugging of the structure by large woody debris or boulders in the streambed can reduce its capacity, and if severe, cause overtopping of the structure and damage to the fill on the downstream side of the road. Just as in the Flow Regime section, considering the number of drainage crossings is useful in assessing the risk of erosion and sedimentation from roads.

The erosive power of water increases at the sixth power of its velocity. Therefore, reducing the concentration of runoff and thereby its velocity is important to preventing erosion and the risk of sedimentation to streams.

In a study completed by the U.S. Geological Survey that assessed variations in stream turbidity within the Bull Run Watershed (LaHusen 1994), it was determined that the most visible sites of erosion are stream channels, streambanks, and roadside ditches.

Within the analysis area the proposed action results in approximatley a 100% increase in the number of stream crossings, as showin in Hydrology Table 10. It should be noted that the number of stream crossings associated with roads decrease by 1 crossing and 2 crossings in Still Creek and West Fork Salmon River Watersheds respectively. The increase in the stream crossings is associated with the proposed mountain bike trails. Modeling results associated with the Government Camp Trails EA (USDA 2005) indicated a sediment yield of approximately 16 pounds per crossing which would result in 368 pounds of sediment delivery to Still Creek and associated tributaries, and 32 pounds of sediment delivery to West Fork Salmon River and associated tributaries and 32 pounds to the ephemeral stream in the Glade analysis watershed that is not connected on the surface to the rest of the downstream drainage network in this area. For this process the sediment yields are very small, 1 ton of sediment is approximately equal to 1 cubic yard of erosion so the total yield for the entire project is 0.2 cubic yards or 5.4 cubic feet of material

Hydrology Table 10
Stream Crossings

Subwatershed	Current Condition	Proposed Action
Glade	0	2
Still Creek	12	34
West Fork Salmon River	8	8
Total	**20**	**44**

Modeled Sediment Yield from Road Network

Sediment yield from the proposed trails and existing roads in the analysis area was assessed using the Washington Department of Natural Resource's Standard Methodology for Watershed Assessment Surface Erosion Module. Key input factors for this model include road surface type, soil erodibility, road use, age of road and proximity of the road to the stream system. It does not assess effects from unmaintained road ditches and culverts, but assumes they are functioning properly. For this analysis it was assumed that roads or trails constructed under this project within 80 feet of a stream would have the potential to deliver sediment to the stream system. This assumption was based on recommendations associated with Washington Department of Natural Resource's Standard Methodology for Watershed Assessment Surface Erosion Module that was delevoped from Idaho research (Ketcheson and Megahan unpublished) that showed that sediment flow from most cross drains extends less than 200 feet, and that 90% of the sediment volume was deposited within the first 40% of the maximum length, so for this analysis 80 feet (200 feet *40%) was used for the delivery zone.

The road based model was used because many of the trails to be build will be constructed by machine (11.4 miles of the 17.2 miles of trail construction) with these machine built trails having a tread up to 6 feet wide (not including the cut or fill slopes). In addition the machine built trails would be insloped with a ditchline much like a road system. Hydrology Table 11 shows the modeled road sediment delivery to streams.

Hydrology Table 11
Modeled Road Related Sediment Delivery to Streams (tons/year)
from DNR Sediment Model

Analysis Watershed	Current Condition	Proposed Action
Glade	0.0	0.9
Sand Canyon	0.0	0.3
Still Creek	13.3	14.4
West Fork Salmon	10.3	5.0
Total	**23.5**	**20.7**

Since the sediment yields in the Glade and Sand Canyon analysis watersheds are very small and the Glade analysis watershed that is not connected on the surface to the rest of the downstream drainage network in this area the discussion will focus on the Still Creek and West Fork Salmon analysis subwatersheds.

Based on the results of the model, implementation of the proposed action will result in a reduction of 2.8 tons of sediment delivery to the stream system per year through administrative user road decommissioning, surfacing with drainage, and road to trail conversion.

In addition, analyzing road based restoration projects that are outside the sediment delivery zone but are delivering sediment to the stream system and additional projects at the bottom of the Stormin Normin chairlift, Jeff Flood chairlift, Pucci chairlift and adjacent to Westleg road that are also delivering sediment to the stream system (using the same assumptions and methodology from the DNR Sediment Model as used with the road based modeling) there would be an additional 21.2 tons of sediment reduction in the analysis area, asa shown in Hydrology Table 12.

Hydrology Table 12
Sediment Reduction from Additional Sediment Reduction Projects

Watershed	Sediment Reduction (tons)
Still Creek	15.4
West Fork Salmon	5.8
Total	**21.2**

In the first two years after construction the trail system is predicted to yield 15.0 tons of sediment per year which would be reduced to 8.2 tons per year annually after that. For the first two years after construction 12.6 tons per year would be delivered to Still Creek and associated tributaries and 1.1 tons per year would be delivered to West Fork Salmon River and associated tributaries, after two years the yields would be reduced to 6.9 tons per year and 0.6 tons per year respectively. The sediment yield associated with the trail construction would be offset by more than a 2 to 1 ratio by improvements in the user road system and additional projects at the bottom of the Stormin Normin chairlift, Jeff Flood chairlift. Pucci chairlift, and adjacent to Westleg road. This suite of projects results in a 14.0 ton per year reduction on Still Creek and 7.8 tons per year reduction in West Fork Salmon River. Hydrology Table 13 summarizes the increases and decreases in sediment delivery resulting from the proposed action, indicating that overall, sediment delivery would be reduced by a factor of 2.6 in the analysis area.

Hydrology Table 13
Sediment Reduction from the Overall Proposed Action

Watershed	Sediment from Trails	Sediment reduction from Road Surfacing/Decom	Sediment reduction from projects	Total Sediment Reduction	Sediment Reduction Ratio
Still Creek	12.6	11.2	15.4	26.6	2.1
West Fork Salmon	1.1	3.1	5.8	8.9	8.4
Total	**13.7**	**14.2**	**21.2**	**35.4**	**2.6**

Sediment yield analysis was completed for the Timberline Express FEIS using the Water Erosion Prediction Project (WEPP) model (a physically-based soil erosion model, particularly suited to modeling the conditions common in forests). Hydrology Table 14 details sediment yield associated with anthropogenic sources. The subwatersheds analyzed are similar in size and position to Still Creek and West Fork Salmon River analysis areas used for this project

Hydrology Table 14
Predicted Sediment Yield Timberline Express Project

Analysis Area	Sediment Yield to Streams (tons/year)
Still Creek	11.5
W.F. Salmon River	3.5

The Sediment Model Technical Report associated with the Timberline Express FEIS concludes: “The Disturbed WEPP model provides accurate estimates of soil erosion and sediment yield rates for the existing and proposed conditions of the 20 hill slopes that were modeled in the Sediment Model Analysis Area. While this model provides accurate background erosion and sediment estimates for the hill slopes modeled, it does not provide any estimate of total background sediment yield to the two watersheds in the Analysis Area due in to the high erosion rates above the treeline and the unpredictability of snowmelt driven erosion on bare soils. It is difficult to put the estimated increases in soil erosion and sediment yield from the Action Alternatives into the proper context with respect to background sediment yield rates occurring throughout the Analysis Area. … Rather, soil erosion and sediment yield numbers represent condition in the modeled hillslopes only. As such, the model is used to predict the effects of development alternatives on a series of modeled hillslopes.

Based on rough extrapolation of average sediment yield rates for the Riparian Reserves modeled, the total background sediment yield for the Analysis Area may occur within the range of 114 tons/year to 526 tons/year."

Using the range of background sediment yield from the Timberline Express Project the modeled sediment associated with the implementation of the proposed action (trails contribution less restoration project reduction resulting in a 21.7 tons/year reduction) would result in a 4% to 19% decrease in sediment yield from background levels in the project area.

Compliance with the Clean Water Act, Mt Hood Land and Resource Management Plan, and Aquatic Conservation Strategy Objectives

Clean Water Act

It is the responsibility of the Forest Service as a Federal land management agency through implementation of the Clean Water Act (CWA), to protect and restore the quality of public waters under their jurisdiction. Protecting water quality is addressed in several sections of the CWA including sections 303, 313, and 319. Best Management Practices (BMPs) are used to meet water quality standards (or water quality goals and objectives) under Section 319. (Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Act Section 303(d) Listed Waters (http://www.fs.fed.us/r6/water/protocol.pdf)

Current statewide Water Quality Standards for the State of Oregon state: "Pursuant to Memoranda of Agreement with the U.S. Forest Service and the Bureau of Land Management, water quality standards are expected to be met through the development and implementation of water quality restoration plans, **best management practices** and aquatic conservation strategies. Where a Federal Agency is a Designated Management Agency by the Department, implementation of these plans, practices and strategies is deemed compliance with this Division". (Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Act Section 303(d) Listed Waters) (http://www.fs.fed.us/r6/water/protocol.pdf)

In addition the Mt. Hood Land and Resource Management Plan contains the following Standards and Guidelines with respect to the implementation of BMP's.

Compliance with State requirements shall be met through planning, application, and monitoring of Best Management Practices FEIS (Appendix H). Best Management Practices (BMPs) describe the process which shall be used to implement the State Water Quality Management Plan on lands administered by the USDA Forest Service. **FW-055, FW-056**

Individual, general Best Management Practices which may be implemented (i.e. on a project by project basis) are described in General Water Quality Best Management Practices, Pacific Northwest Region, 11/88. Evaluations of ability to implement and estimated effectiveness shall be made at the project level. **FW-057, FW-058**

The sensitivity of the project shall determine whether the site-specific BMP prescriptions are included in the environmental analysis, the project plan or the analysis files. **FW-059**

Site specific Water Quality Best Management Practices, with the express purpose of limiting non-point source water pollution, are incorporated into the proposed action and associated project design criteria for this project.

Section 303D

Section 303(d) of the CWA requires that waterbodies violating State or tribal water quality standards be identified and placed on a 303(d) list. The Environmental Protection Agency (EPA) regulations also allow States and tribes to include threatened waters (that is, waters that display a downward trend that suggests water quality standards will not be met in the near future).

For each listed waterbody, the CWA requires States to establish a Total Maximum Daily Load (TMDL) for the parameter(s) causing beneficial use impairment. A TMDL is the sum of the waste load allocation for point sources of pollution (for example, outflow from a manufacturing plant) plus the load allocation for nonpoint sources of pollution, including “natural” background levels, plus a margin of safety to allow for uncertainty.

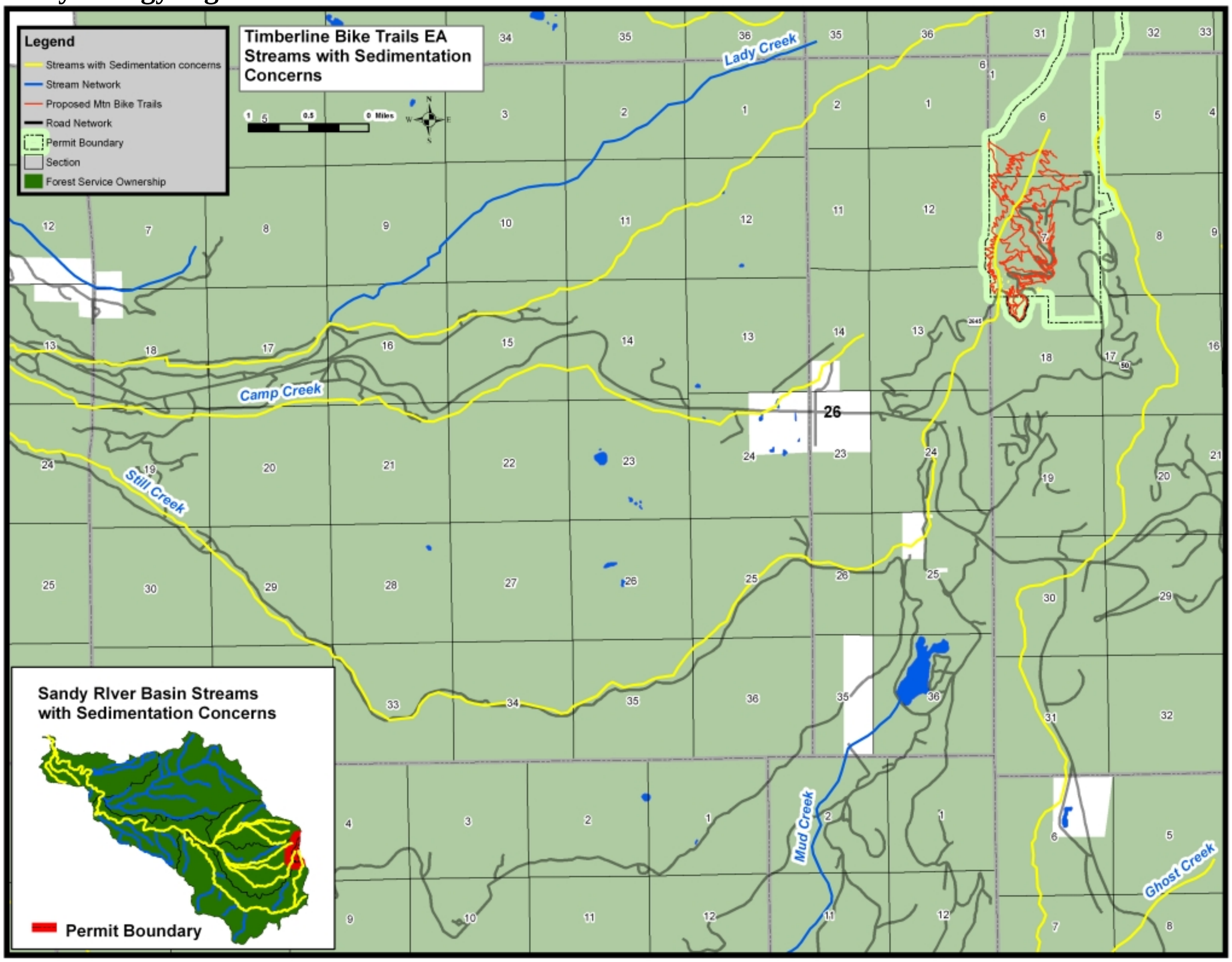
For water quality limited streams on National Forest System lands, the USDA Forest Service provides information, analysis, and site-specific planning efforts to support state processes to protect and restore water quality. Hydrology Table 15 shows listed streams in or adjacent to the analysis area, indicating that both Still Creek and the Salmon River are listed for sediment.

Hydrology Table 4
Water Quality Limited (303D) Streams in or Adjacent to the Analysis Area

Stream	River Mile	Parameter	Status
Still Creek	0 to 16	Sedimentation	Insufficient data
Still Creek	0 to 16	Temperature	Cat 2: Attaining some criteria/uses
Salmon River	0 to 33.9	Sedimentation	Insufficient data
Salmon River	0 to 33.9	Temperature	Cat 4A: Water quality limited, TMDL approved

Hydrology Figure 6 shows the location of streams with sediment concerns relative to the proposed action analysis area.

Hydrology Figure 6 – Streams with Sedimentation Concerns



Within the analysis area Still Creek and Salmon River are on the 2004/2006 State of Oregon 303(d) list for stream temperature. Sedimentation in both of these stream systems has been listed as a concern but the streams were not included on the 303D list because of insufficient data.

A temperature TMDL has been developed for the Sandy River Basin with the following requirement for federal forest lands. All management activities on federal lands managed by the U.S. Forest Service (USFS) and the Bureau of Land Management must follow standards and guidelines as listed in the respective Land Use and Management Plans, as amended, for the specific land management units. In the Mount Hood National Forest, management activities are guided by the Northwest Forest Plan (USDA Forest Service, 1994) and the Mt Hood National Forest Land and Resource Management Plan (Mt. Hood Forest Plan, USDA Forest Service, 1990). A Reconciliation Document was drafted in 1995 (USDA Forest Service, 1995). This document indicates that all standards and guidelines in the Mt. Hood Forest Plan apply unless superseded by the Northwest Forest Plan standards. When standards and guidelines from both documents apply, the one which controls is the one more restrictive or which provides greater benefits to late-successional forest related species.

ODEQ and USFS signed a memorandum of Understanding (MOU) in May 2002. The MOU defines the process by which ODEQ and the Pacific Northwest Region of the USFS will cooperatively meet State and Federal water quality rules and regulations. In its review of these management plans, ODEQ believes that they meet the requirements of a TMDL management. Although developed before the completion of this TMDL, both the Mt. Hood Forest Plan and the Northwest Forest Plan address proposed management measures tied to attaining system potential shade. As part of the public involvement process for the development and approval of both plans, most of the other requirements of a TMDL management plan have also been addressed. As they have in the past, it is expected that the Mt. Hood National Forest will continue to work with the ODEQ, NMFS, USFWS, and ODFW in best management practices, research opportunities, training, etc.

Implementation of the project (trails contribution less restoration projects) would result in a 14.0 tons per year reduction of sediment in the Still Creek Watershed and a 7.8 tons per year reduction in the West Fork Salmon River Watershed. In light of the sediment reductions associated with this project is not anticipated to have an adverse impact on stream sedimentation.

Consistency with Mt Hood Land and Resource Management Plan Standards and Guidelines

Key Mt. Hood Land and Resource Management Plan allocations with respect to protection of the aquatic environment include: Key Watersheds, Special Emphasis Watershed, Riparian Reserves and Riparian Area. Hydrology Figure 7 shows the location of Key Watersheds and Special Emphasis Watersheds in the vicinity of the analysis area.

Key Watersheds

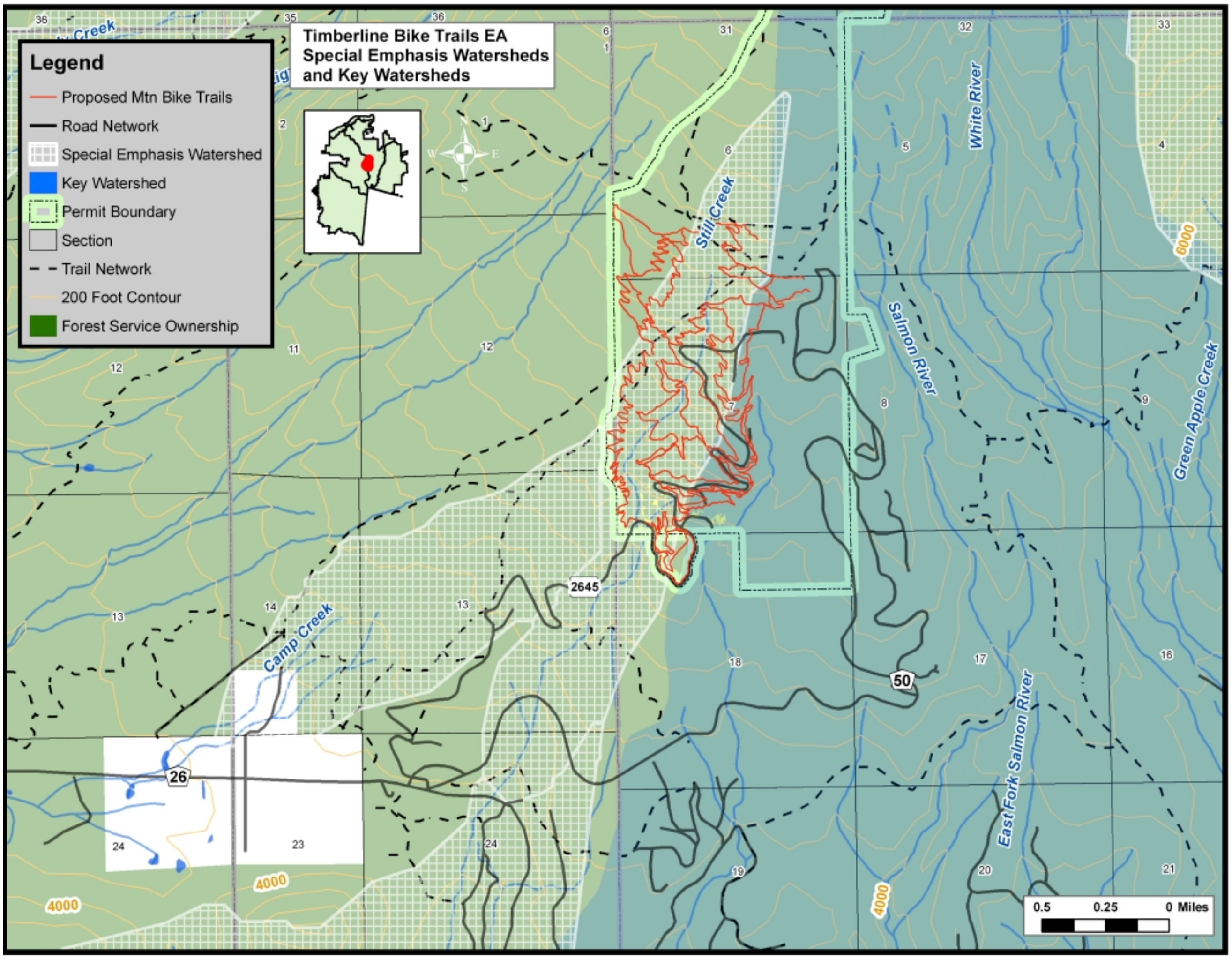
Key Watersheds are a system of large refugia comprising watersheds that are crucial to at-risk fish species and stocks and provide high quality water. The Aquatic Conservation Strategy includes two designations for Key Watersheds. Tier 1 (Aquatic Conservation Emphasis) Key Watersheds contribute directly to conservation of at-risk anadromous salmonids, bull trout, and resident fish species. They also have a high potential of being restored as part of a watershed restoration program. The network of 143 Tier 1 Key Watersheds ensures that refugia are widely distributed across the landscape. While 21 Tier 2 (other) Key Watersheds may not contain at-risk fish stocks, they are important sources of high quality water.
Standards and guidelines for Key Watersheds include:

- Reduce existing system and non-system road mileage. If funding is insufficient to implement reductions, there will be no net increase in the amount of roads in Key Watersheds.

- Key Watersheds are the highest priority for watershed restoration.

The Salmon River fifth field watershed is a Tier 1 Key Watershed so the West Fork Salmon River is included in this area. Project activities are consistent with Standards and Guidelines by reducing existing non-system road mileage by 0.5 miles.

Hydrology Figure 7 - Key Watersheds and Special Emphasis Watersheds



Special Emphasis Watersheds

The goal of Special Emphasis Watersheds is: Maintain or improve watershed, riparian, and aquatic habitat conditions and water quality for municipal uses and/or long term fish production. The Still Creek subwatershed is within this allocation. Major characteristics include that the transportation system design may be restricted to avoid sensitive watershed lands. Standards and guidelines include:

1. New developed recreation sites, or expansions to existing sites, may occur provided watershed (i.e. water, soil, and fish) values are protected.

2. The development of new or expansion of existing recreation sites facilities and trails (hiking and cross-country skiing) may occur, but should avoid or protect sensitive watershed lands

3. Developments or expansions should avoid special aquatic and terrestrial habitats (e.g. side channels, ponds, and wetlands). Interpretive facilities and trails may he an exception

4. Where existing developments (e.g. recreation sites, and trails) are not consistent with riparian and/or watershed values, modification or rehabilitation of the site or facility should occur.

The proposed action with the incorporation of site specific project design criteria was designed to protect sensitive watershed lands and avoid special aquatic and terrestrial habitats. The watershed restoration activities associated with the project address existing developments that are depositing sediment in both the Still Creek and West Fork Salmon River systems.

Riparian Reserves

Riparian Reserves are portions of watersheds where riparian-dependent resources receive primary emphasis and where special standards and guidelines apply. Standards and guidelines prohibit and regulate activities in Riparian Reserves that retard or prevent attainment of the Aquatic Conservation Strategy objectives. Riparian Reserves include those portions of a watershed directly coupled to streams and rivers, that is, the portions of a watershed required for maintaining hydrologic, geomorphic, and ecologic processes that directly affect standing and flowing waterbodies such as lakes and ponds, wetlands, streams, stream processes, and fish habitats. Riparian Reserves include areas designated in current plans and draft plan preferred alternatives as riparian management areas or streamside management zones and primary source areas for wood and sediment such as unstable and potentially unstable areas in headwater areas and along streams. Riparian Reserves occur at the margins of standing and flowing water, intermittent stream channels and ephemeral ponds, and wetlands. Riparian Reserves generally parallel the stream network but also include other areas necessary for maintaining hydrologic, geomorphic, and ecologic processes.

Consistency with Riparian Reserve Standards and Guidelines for roads within the Riparian Reserves is assessed by addressing consistency with the Aquatic Conservation Strategy objectives. However, there are Riparian Reserve Standards and Guidelines that address:

Minimizing disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow.
Closing and stabilizing, or obliterating and stabilizing roads based on the ongoing and potential effects to Aquatic Conservation Strategy objectives and considering short-term and long-term transportation needs.
Minimizing sediment delivery to streams from roads.

An assessment of consistency with the Aquatic Conservation Strategy objectives is completed later in this section. The Proposed Action with the incorporation of watershed restoration activities is designed to minimize disruption of natural, hydrologic flow paths and minimize sediment delivery.

General Riparian Area

The goal of General Riparian Area is to achieve and maintain riparian and aquatic habitat conditions for the sustained, long-term production of fish, selected wildlife and plant species, and high quality water for the full spectrum of the Forest's riparian and aquatic areas. Key Standards and Guidelines include:

1. The development of new, or expansion of existing, recreation sites, facilities, and trails (i.e. hiking and cross-country skiing) may occur and should be located to protect riparian values.

2. Trails and recreation sites should avoid special aquatic and terrestrial habitats (e.g. side channels, ponds, and wetlands).

3. Where existing developments (e.g. recreation sites and trails) are not consistent with riparian values, modification, rehabilitation, or removal of the site or facility should occur.

4. Whenever damage occurs to riparian resources, the damaged site shall be promptly restored. Rehabilitation and enhancement may be accomplished through revegetation and stabilization.

5. Drainage systems for roads should incorporate practical features to minimize or eliminate sediment and/or other pollutants from discharging directly into streams, lakes, wetlands, springs, or seeps.

6. Existing roads causing impacts to riparian values should be mitigated or relocated.

7. Unneeded and/or abandoned roads should be rehabilitated.

The proposed action with the incorporation of site specific project design criteria was designed to protect sensitive watershed lands and avoid special aquatic and terrestrial habitats. The watershed restoration activities associated with the project address existing developments that are depositing sediment in both the Still Creek and West Fork Salmon River systems. The watershed restoration activities also address nonsystem roads through decommissioning, road to trail activities and surfacing with associated drainage. These activities are designed to reduced sediment delivery and restore nature flowpaths.

Aquatic Conservation Strategy Consistency Findings

The following is a summary of the projects consistency with the Aquatic Conservation Strategy objectives (ROD B-10).

Objective 1: Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

There are approximately 13 acres of clearing associated trail construction and 6 acres of restoration with revegetation associated with watershed restoration actions. This would result in a net disturbance of 7 acres. Forest clearing in the proposed trail corridors would be reduced to the extent practical through careful trail design and layout and trails would be laid out to avoid removal of trees with a diameter at breast height (DBH) greater than six inches.

Project design criteria have been developed to maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands including:

- Salvaging whole plants from proposed trails in advance of trail construction and transplant them in disturbed areas once construction is completed
- Propagate seedlings from vegetative propagules materials in a nursery for revegetating disturbed areas when whole plants cannot be removed for transplanting
- Collect seed from native plants in the special-use permit area and propagate seedlings from this seed in a nursery for restoration of disturbed areas in subsequent years and directly sow collected seed in disturbed areas for those species for which this method is effective

With the minimal amount of trail clearing and associated criteria to minimize disturbance the project is not anticipated to impact the diversity, and complexity of watershed and landscape-scale features.

Objective 2: Maintain and restore spatial and temporal connectivity in and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

The project is designed to avoid natural water courses and sensitive riparian areas (including wetlands). Where drainage network connections cannot be avoided by the mountian bike trail system an open channel crossing (bridge or low water crossing) will be installed. All crossings will be installed with the input of Forest Service fisheries biologists and/or hydrologists to maintain the function and bedload movement of the natural stream channel. Crossings will conform to the natural channel shape and elevation where possible.

Watershed restoration activities will restore natural drainage patterns (both surface and subsurface) by decommissioning user roads, installing more frequent and effective drainage structures on user roads, and addressing drainage issues that have the potential to impact drainage network connections at the bottom terminals of Stormin Norman, Pucci and Jeff Flood ski lifts and the area on Westleg Road directly above the seep and springs area associated with Still Creek.

Objective 3: Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

The project is designed to avoid natural water courses and sensitive riparian areas (including wetlands). Where drainage network connections cannot be avoided by the mountian bike trail system an open channel crossing (bridge or low water crossing) will be installed. All crossings will be installed with the input of Forest Service fisheries biologists and/or hydrologists to maintain the function and bedload movement of the natural stream channel. Crossings will conform to the natural channel shape and elevation where possible.

Watershed restoration activities will restore the physical intergrity of the aquatic system by decommissioning user roads with associated stream crossings, installing more frequent and effective drainage structures on user roads, and addressing drainage issues that have the potential to impact the physical intergrity of the aquatic system at the bottom terminals of Stormin Norman, Pucci and Jeff Flood ski lifts and the area on Westleg Road directly above the seep and springs area associated with Still Creek.

Through input by of Forest Service fisheries biologists and/or hydrologists using stream simulation methods in designing stream crossings natural streambank and streambed configurations will be established above, though and below the existing stream crossings.

Objective 4: Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain in the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

The project has the the objective of restoring or improving water quality by reducing existing chronic sediment sources (user roads and lift terminal areas). There may be short-term impacts to water quality (increased sedimentation) when the project is implemented. All of the stream crossings associated with the new mountain bike trail network, user road decommissioning and user road surfacing and drainage improvement are on intermittent or ephemeral streams. The only area with activities planned near a perennial stream is the bottom of the Jeff Flood ski lift and project design criteria were developed to minimize these impacts and keep them to an acceptable level.

Objective 5: Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

The project has the the objective of restoring or improving water quality by reducing existing chronic sediment sources (user roads and lift terminal areas) and reducing sediment associated with the mountain bike trails by a ratio of 2 to 1 (project generated sediment will have associated restoration activies that reduce twice as much sediment as is generated by the project).

Stream crossings associated with the new mountain bike trails will be designed with input from Forest Service fisheries biologists and/or hydrologists using stream simulation methods that will allow for sediment transport through the stream system. Obstructions or pinch points where sediment transport is impeded associated by decommissioning user roads with associated stream crossings. .

Objective 6: Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

Watershed restoration activities will restore natural flowpaths by decommissioning user roads with associated stream crossings, installing more frequent and effective drainage structures on user roads, and addressing drainage issues that have the potential to impact the physical intergrity of the aquatic system at the bottom terminals of Stormin Norman, Pucci and Jeff Flood ski lifts and the area on Westleg Road directly above the seep and springs area associated with Still Creek. Restoring natural streamflow paths (surface and subsurface) will help to maintain and restore in-stream flows with respect to timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

Implementation of the proposed action would decrease the stream drainage network by 5% over the entire project area, 8% in the West Fork Salmon Watershed, and 6% in the Still Creek Watershed. The reductions are realized through decommissioning and installation of more frequent drainage structures on user roads.

Using the same analysis methodology as used for the Timberline Express EIS there are no impacts anticipated to peak or base streamflows associated with implementation of the proposed action. Since there are decreases in the stream drainage network associated with project implementation, there are no impacts to base or peak streamflows based on the methodologies from the Timberline Express EIS and restoration activities associated with proposed action are designed to restore natural flowpaths the project should maintain or restore in-stream flows.

Removal of stream crossings associated with user road decommissioning and design of decommissioned stream crossings and new stream crossing associated with the mountain bike trails using stream simulation techniques will provide for sediment, nutrient, and wood routing.

Objective 7: Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

The project is designed to avoid sensitive riparian areas (including wetlands and meadows) and was delineated in the field to avoid wetlands and indicators of wet soils in subalpine areas. Restoration activies are planned in the vicinity of the wetlands associated with Still Creek that should restore natural flowpaths in this area (by improving infiltration in this area).

Objective 8: Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

Project design criteria have been developed to maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands including:

- Salvaging whole plants from proposed trails in advance of trail construction and transplant them in disturbed areas once construction is completed
- Propagate seedlings from vegetative propagules materials in a nursery for revegetating disturbed areas when whole plants cannot be removed for transplanting
- Collect seed from native plants in the special-use permit area and propagate seedlings from this seed in a nursery for restoration of disturbed areas in subsequent years and directly sow collected seed in disturbed areas for those species for which this method is effective
- For restoration of disturbed trail segments and other areas, use only certified weed-free straw or certified weed-free wood fiber for mulch;
- Use only native plant materials (seed, seedlings, divisions, cuttings) collected locally on the Mt. Hood National Forest. If supplies of locally collected native seed (e.g., blue wildrye grass) are low and erosion control or restoration of disturbed areas is urgent, use annual ryegrass (Lolium perenne spp. multiflorum), a non-invasive, non-persistent, non-native species.
- The preferred restoration tools, however, are (a) transplants of whole plants and vegetative propagules (divisions, cuttings) collected from proposed trails before trail construction begins and (b) nursery propagation of seedlings from seed and/or vegetative propagules collected in the proposed project area.
- Aggressively treat invasive plants by manual control or with herbicides. Consult Mt. Hood National Forest botanist on which method works best for which species**.**

In addition species composition and structural diversity of plant communities will be restored associated with watershed restoration activities.

Objective 9: Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

This project is designed to minimize impacts to natural drainage patterns (both surface and subsurface), avoid sensitive riparian areas, restore vegetation and reduce sedimentation. This will allow for protection of sensitive habitats and allow unimpeded flowpaths throughout the riparian network in the project area for plant, invertebrate and vertebrate riparian dependent species

Watershed Processes - Cumulative Effects

A cumulative effects analysis was not performed for watershed processes because adverse direct and/or indirect effects associated with the alternatives were not identified.

3.3 Wildlife

Project Area

The elevation range for this project is 4,800 to 6,000 feet. The elevation is an important aspect of this project for several reasons. Many species that are typically analyzed for effects are found below this elevation. There are specialized species that prefer to utilize these high elevations such as Clark's nutcrackers and American marten. There is persistent snow at these elevations for many months making it usable for habitat only during the summer for some species. And the summer growing months are very short so restoration efforts can be difficult due to the short growing season.

The project area is in the Mixed Montane Conifer Wildlife Habitat. The area is characterized by a mixture of older conifers from Mature to Late Successional interspersed with man-made openings (ske runs) that resemble montane meadow habitat. Some of this area was recently created for ski runs and is covered in down woody debris left over from the logging of the runs. Because the area has not been part of normal forest management the forest is similar to natural forest at this elevation. The area is subject to heavy snows that sometimes create open stands of trees and there are some areas with suppression mortality due to overcrowding. The area has several small wet meadows scattered throughout the runs. The trails have been designed to avoid these habitats.

Project Design Criteria that are the Basis for the Wildlife Effects Determination

Project design criteria (PDCs) and construction details are valuable in assisting in determining the effect of a project on natural resources. Project design criteria can ameliorate the effect of a project by incorporating designs that reduce impacts. All of the PDCs listed in Chapter 2 (see section 2.1.6) were used in making a determination of the effects on wildlife by the project.

Northern Spotted Owl

No northern spotted owl habitat is located in the project area. There are no known spotted owls nesting above 4600 feet elevation. The effects determination for this project is No Effect to the Northern spotted owl or its habitat from this project. No further analysis for Northern spotted owls is necessary.

Other Wildlife

Management Indicator Species

The 2005 planning rule for National Forest System Land and Resource Management Planning addresses management indicator species. (36 CFR 219.14f) "(f) *Management indicator species.* For units with plans developed, amended, or revised using the provisions of the planning rule in effect prior to November 9, 2000, the Responsible Official may comply with any obligations relating to management indicator species by considering data and analysis relating to habitat unless the plan specifically requires population monitoring or population surveys for the species.

Site-specific monitoring or surveying of a proposed project or activity area is not required, but may be conducted at the discretion of the Responsible Official."

Management Indicator Species for this portion of the Mt. Hood National Forest include northern spotted owl, pileated woodpecker, American marten, deer, elk, salmonid smolts and legal trout (Forest Plan p. four-13).

Monitoring at the Forest scale has been documented in Annual Monitoring Reports available on the Forest's web site - http://www.fs.fed.us/r6/mthood in the Publications section. There is no requirement in the Mt. Hood Forest Plan as amended to survey for or gather project-scale population data for management indicator species prior to implementing a site-specific project. The Mt Hood Forest Plan as amended by the Northwest Forest Plan provides habitat to maintain viable populations of these species. Land allocations that provide habitat for these species include Pileated Woodpecker and American marten Habitat Areas (B5), Late-successional Reserves (LSR), and Riparian Reserves (RR) for American marten, pileated woodpecker and the northern spotted owl; Winter Range (B10) and Summer Range (B11) for deer and elk; and Riparian Reserves (RR) for fish. Of these land allocations, the project overlaps Summer Range (B11), Late-successional Reserves and Riparian Reserves. There are also numerous Forest-wide standards and guidelines that pertain to these species. This project has been designed to reduce the impact that wildfires would have on management indicator species.

Effects to Sensitive Species and Other Rare or Uncommon Species

Wildlife Table 1 summarizes effects to species from the Biological Evaluation, which is incorporated by reference.

Wildlife Table 1
Sensitive Species and Other Rare or Uncommon Species

Species	Suitable Habitat Presence	Impact of Action Alternatives	Comment and Habitat Needs
Johnson's Hairstreak	Yes	MII-NLFL	Dwarf Mistletoe Habitat -no habitat alteration
Mardon Skipper	No	No Impact	No Locations detected on Forest
Oregon Slender Salamander	Yes	MII-NLFL	Up to 5570 feet potentially
Larch Mountain Salamander	No	No Impact	No know locations above 4000ft
Cope's Giant Salamander	Yes	MII-NLFL	Small cold water streams
Oregon Spotted Frog	No	No Impact	Larger wetlands required
Lewis's Woodpecker	No	No Impact	Lower elevation, eastside
White-Headed Woodpecker	No	No Impact	Ponderosa Pine Habitat
Bufflehead	No	No Impact	Open water ponds
Harlequin Duck	No	No Impact	Larger Fastwater Streams
Bald Eagle	No	No Impact	Large Bodies of Water
American Peregrine Falcon	No	No Impact	Cliff Sites
Red Tree Vole	No	No Impact	No removal of potential trees
Townsend's Big-eared Bat	No	No Impact	Cave Habitats
Fringed Myotis	Yes	No Impact	No habitat altering effects
California Wolverine	Yes	MII-NLFL	High Elevation Habitats

Malone's jumping slug	Yes	MII-NLFL	No threat to persistence at site
Oregon Megomphix	No	No Impact	Habitat below 3000ft
Puget Oregonian	No	No Impact	Low to Mid Elevations
Columbia Oregonian	Yes	No Impact	Known locations below 4000ft
Evening Fieldslug	No	No Impact	Wetlands and Moist Forest
Dalles Sideband	Yes	No Impact	Outside the range
Crater Lake Tightcoil	Yes	No Impact	Surveys were negative

"NI" = No Impact
"MII-NLFL" = May Impact Individuals, but not likely to Cause a Trend to Federal Listing or Loss of Viability to the Species
Effects to the species listed above include changes to habitat as well as potential harm to individuals caused by physical impacts of logging equipment, falling and dragging trees, noise, fuels treatment, road repair, and log haul.

Johnson's Hairstreak Butterfly
This butterfly is present in areas of dwarf mistletoe and utilizes nearby openings. The project area has some potential for dwarf mistletoe in western hemlock. There should be no significant effect to the habitat for this species from the trail construction.

Oregon Slender Salamander (Batrachoseps wrighti or wrightorum)
Oregon slender salamander occurs on both the east and west side of the Cascades primarily in older more mature stands of conifers. They can be found living under bark piles, down logs, or in rotten moist logs. The bike trail project would add to the habitat for this species by dropping small trees. There could be some alteration of the existing down wood to clear for the trail and some individual could be harmed but it there would be no affect to the persistence at the site from the proposed treatment. No Oregon slender salamanders were found during mollusk surveys so there is a small chance that this species is present in the project area. There would be no removal of coarse woody debris. If there are any undetected Oregon slender salamanders there would be substantial habitat for them following the project.

Cope's giant salamander
There are no stream crossings that would affect this species if present (PDC R-1 & 2). No surveys were done for Cope's giant salamander because there were no anticipated impacts from the trails since they stay more than 10 yards from streams or would have hardened crossings to reduce impact.

Oregon Spotted Frog
Oregon spotted frogs are only known from one location on the Mt. Hood National Forest, that is outside of the project area on the southeast part of the Forest. This species requires larger wetlands than exist in the project area.

Fringed Myotis
There is a potential for fringed myotis to utilize the project area for foraging. There would be no substantial impact to the habitat that would alter the use by these bats.

Terrestrial Mollusk (Puget Oregonian, Columbia Oregonian, evening fieldslug and Crater lake tightcoil, Malone's jumping slug)
The Puget Oregonian, Columbia Oregonian, evening fieldslug and Crater lake tightcoil are the mollusk species with ranges that include the Zigzag Ranger District. <u>Please see the section on</u>

Northwest Forest Plan Mitigation for details of this analysis.

California Wolverine (*Gulo gulo* **–** Sensitive**)**

Habitat
Populations in the Cascade Mountains are small and scattered. Keith Aubrey, Lead Wildlife Biologist for the Pacific Northwest Research Staion, has reviewed wolverine records from the Oregon Cascades. Current records (1995–2005) are limited to north-central Washington, northern and central Idaho, western Montana, and northwestern Wyoming(Aubrey 2007). Wolverines are usually found in high temperate coniferous forests, from mid-elevation (around 4000 feet) to moderately high elevation (above timberline), depending on the season. Common tree species are subalpine fir and lodgepole pine. They prefer to feed along rivers and streams and in wet meadows. The den is usually in a rock crevice, cave, or beneath a talus slope. Territories may encompass 10 to 80 square miles. Wolverines are believed to prefer areas of minimal people presence and high levels of solitude and seclusion. They are usually associated with wilderness, chiefly because they are so vulnerable to the activities of humans and their association with persistent snow cover.

Pre-Field Review

Habitat available within the project area: Wolverines have no real habitat preference but instead appear to seek high elevations for denning and solitude. Wolverines are dependant on carrion for a large part of their diet and key in on big game populations rather than on specific habitats. Historic sightings of wolverines both verified and unverified are within a few miles of the project area. Snow Bunny Snow Park had one verified track sighting in 1990. However, current thinking on wolverine distribution is that individual wolverines may invade the Oregon Cascades on occasion but that there is no breeding population this far south (Aubry 2007). It is unlikely but possible that a wolverine would be present in the project area.

Recent field surveys in the project area have not been accomplished. The last time broad based surveys were conducted over the watershed was during the winter of 1993-1994 and 1994-1995. Some survey efforts have been ongoing centered around Mt. Hood but at this point in time there have been no verifiable sightings of wolverine or sign of presence. A group of volunteers led by Cascadia Wild have performed tracking surveys and some remote camera work for the Forest since 2001. No wolverine tracks or photos have been located anywhere on the Mt Hood NF during that time. There are also no verified sightings in the Oregon Cascades for the last decade. The last verified sighting of a wolverine in the Oregon Cascades was a wolverine killed on Interstate 84 near Hood River in 1994. The specimen is housed at the Oregon Department of Fish and Wildlife in The Dalles.

Field Reconnaissance: No direct surveys were conducted based on a low potential for detecting species occurrence. No observations were made of wolverine or their tracks during field reconnaissance. The lack of sightings of this species is not a reliable indicator or species presence or absence. The home range of wolverines is documented to be in the hundreds of miles. Therefore any wolverine that is present in the Cascades of Oregon may potentially travel or forage in the project area.

Some survey efforts have been ongoing centered on Mt. Hood but at this point in time there have been no verifiable sightings of wolverine or sign of presence. A group of volunteers led by Cascadia Wild have performed tracking surveys and some remote camera work for the Forest since 2001. No wolverine tracks or photos have been located during that time.

Analysis of Effects/ Cumulative Effects

No Action: No effects to the Wolverine would occur with implementation of this alternative. The existing human use of this area would continue to limit opportunities for wolverines to utilize the area. However the area would continue provide potential habitat for the species for possibly far into the future.

Proposed Action:

Effects to Habitat and Individuals
There is a potential for disturbance and loss of utilization of some of the potential wolverine habitat by implementing the bike trail proposal. Increasing human presence in currently unutilized areas would degrade the habitat for this species if the species in fact still exist on the Mt. Hood National Forest.

Cumulative Effects
The primary cumulative effect predicted for this species is to increase both the number of visitors to this area and expand the area of human impact in the proposed action area. An increase in human use in this area could cause wolverines to discontinue utilizing the area. That is assuming that the current level of use has not already had that impact.

Currently, there are no planned foreseeable future actions within the watersheds that are predicted to impact wolverines and their habitat. However, the Ski Areas, Timberline, Ski Bowl, and Mt Hood Meadows combined with Government Camp increases in rental properties have increased human activity in the area and would add to the effect of disturbance ongoing in the area. Because there is already a high amount of human activity in the area from ski areas, businesses, a major highway, recreational uses and homes the effect of this project is not considered to be a sizeable increase in the summer activity.

Effects Determination

The effects determination for a species that is thought to be extirpated from an area but may still occur as a vagrant is more difficult to describe. The wolverine is a species that is uncommon in the areas where it still occurs. It is a specialist that lives at high elevations or areas with cold temperatures and good amounts of snowfall. Wolverines tend to use areas that are not associated with high concentrations of people. We know that wolverines used to occur down into California in the Sierras and throughout the Cascades at one time. It appears that trapping, hunting, and human presence may have reduced their populations in these areas and may have eliminated any sustainable populations in the Oregon Cascades and the California Sierras. With the current trends in climate change and reduction in persistent snow it is likely that these conditions will make reestablishment of wolverine populations in these areas highly unlikely. The huge increase in human population and human use of back country areas makes it even more unlikely that wolverines would persist in the Oregon Cascades. These factors are part of the effects determination for this species. It is important to consider that with what we understand about the wolverine population in the Cascades the chance that a wolverine would ever enter the project area is highly unlikely. It is also unlikely that a sustainable population exists on the Mt Hood but with a recent discovery of a wolverine at Mt Adams in Washington the concept that a wolverine could wander to the project area has to be considered. However, there is a high amount of activity currently on the south side of Mt Hood so this proposed bike trail is just additive to the high human presence that would discourage a wolverine from occupying habitat on the south side of Mt Hood.

Considering the above discussion on wolverines, the effects determination for the Government Camp Trails project is, "**May Impact Individuals but not likely to cause a trend to federal listing",** for wolverine or its habitat due to the low amount of potential for breeding wolverine populations in the Oregon Cascades and around Mt Hood and the low potential that a wolverine would enter the project area.

Conflict Determination

The action alternatives of the Timberline Bike Trails project would have "may impact individuals but not likely to cause a trend to federal listing or loss of viability" on the wolverine or their habitat.

Northwest Forest Plan Mitigation

Survey and Manage Species
The Northwest Forest Plan incorporated mitigation for activities that might impact species that may not be adequately protected for persistence by the system of late successional reserves and other land allocations that would limit impacts to the species. The mitigation was called "Survey and Manage". This mitigation required the agencies to conduct protocol surveys to determine to the best of their ability if a species was present and would be affected by the project. If persistence at the site would be jeopardized by the project then protection measures would need to be taken to manage the species at that site. Since many of these species were not well known by agency biologist and botanist there were training courses provided, voucher requirements, and management recommendations developed for the species. Because the knowledge of the extent of these species was not great even among taxa experts there was a process developed for annual species reviews to incorporate new knowledge and to remove species that were found to be more common or not dependant on late successional habitats.

Several Records of Decision have been signed since the Northwest Forest Plan the modified the original language and management of the species. Currently, the agency is implementing the 2001 Record of Decision. Wildlife Table 2 shows the species that fall into the category of Survey and Manage for terrestrial wildlife that occur on the Mt Hood National Forest.

Wildlife Table 2
Summary of effects to Rare or Uncommon Species

Species	Suitable Habitat Presence in an area that would be affected by proposed new trails	S&M Protocol	Surveys required or further analysis needed	Comments
Oregon Red Tree Vole (*Arborimus longicaudus)*	No	Red Tree Vole - Version 2.1 - Protocol Revisions to the "Survey Protocol for the Red Tree Vole", Version 2.0 IM OR 2003-003	No	No habitat. Project above protocol elevation
Great Gray Owl (*Strix nebulosa)*	No	Great Gray Owl-Version 3.0, March 2004 IM OR-2004-050	No	No habitat. No natural meadows 10 acres or greater at the site.
Larch Mountain Salamander (*Plethodon larselli)*	No	Amphibians - Version 3.0 IM OR 2000-004 and Conservation Assessment for the Larch Mountain Salamander (*Plethodon larselli*)Version 1.0 October 28, 2008	No	No habitat present and no known locations above 4200 feet.
Malone's Jumping Slug (*Hemphilia malonei)*	Yes	Mollusks - Terrestrial - Version 3.0 IM OR 2003-44	No	No impact to persistence at the site.
Oregon Megomphix (*Megomphix hemphilli)*	No	Mollusks - Terrestrial - Version 3.0 IM OR 2003-44	No	Project above protocol elevations of below 3000 ft
Puget Oregonian (*Cryptomastix devia*)**	No	Mollusks - Terrestrial - Version 3.0 IM OR 2003-44 Conservation Assessment for *Cryptomastix devia*, Puget Oregonian**.** September 2005.	No	Project above protocol elevations of 0-1500 feet.
Columbia Oregonian (*Cryptomastix hendersoni*)**	No	Mollusks - Terrestrial - Version 3.0 IM OR 2003-44 Conservation Assessment for *Cryptomastix hendersoni* Columbia Oregonian September 2005	No	No known locations above 4000 feet. (2600 and 3280 feet)

				elevation
Evening Fieldslug (*Deroceras hesperium*)**	No	Mollusks - Terrestrial - Version 3.0 IM OR 2003-44 Conservation Assessment for *Deroceras hesperium*, Evening fieldslug September 2005	No	No habitat
Dalles Sideband (*Monadenia fidelis minor*)**	No	Mollusks - Terrestrial - Version 3.0 IM OR 2003-44 Conservation Assessment for *Monadenia fidelis minor*, Dalles Sideband August 2005	No	Outside the range of this species
Crater Lake Tightcoil (*Pristiloma arcticum crateris*) **	Yes	Mollusks - Terrestrial - Version 3.0 IM OR 2003-44 Conservation Assessment for *Pristiloma arcticum crateris*, Crater Lake Tightcoil September 2004	Yes	Protocol surveys completed

Terrestrial Mollusks

Surveys for Terrestrial Mollusk were completed for *Pristiloma arcticum crateris*. The entire bike trail area was walked by wildlife biologist from the Forest Service Enterprise Team in the fall of 2010. The Enterprise team acts much like an independent contractor. The enterprise team wildlife biologist used the established interagency protocols listed in Table 2. The following species were identified as species to survey to protocol.

SNAILS:

Latin name	Common name
Pristiloma arcticum crateris	The Crater Lake Tightcoil

No target species were located during protocol surveys by the enterprise team wildlife biologist. However, the enterprise team biologist and the Forest wildlife biologist did locate a number of locations for Malone's jumping slugs near the trail location.

The Puget Oregonian, Columbia Oregonian, evening fieldslug and Crater lake tightcoil are the mollusk species with ranges that include the Zigzag Ranger District. The Puget Oregonian and Columbia Oregonian are found at low to mid-elevations in old-growth forests. No known sites for the Puget Oregonian or Evening fieldslug are present on the district. However, several known sites exist for the Columbian Oregonian at elevations ranging from 2600 to 3280 feet in elevation. The project area's elevation ranges from 4800 to 6000 feet in elevation and is considered too high an elevation to be potential habitat for the Puget Oregonian, Columbia Oregonian, and Evening fieldslug. In addition, there is no habitat for these species in the project area.

Crater lake tightcoil: This snail is generally found in mid to high elevation habitat adjacent to perennial wet areas. Surveys were completed for this species between September 15 and October 15, 2010. This snail was not located in the project area during surveys for rare and uncommon species.

Malone's jumping slug: The Malone's jumping slug was not a target species for surveys for the Timberline Bike Trails Project. The project area was above the known location for this species and above the protocol elevation. The abundance of this species and its use of many habitats types and seral stages means that a trail project would not affect the persistence of this species at the site. During surveys for Crater lake tightcoil several locations of Malones jumping slugs were found. In a few of these locations 3-4 specimens were found under down wood. One location was 18 feet inside of the ski run under down wood created when the run was cut. At another location the specimens were found under rounds of wood on the edge of the ski run. Again, the rounds were created when the ski run was cut 2-3 years ago. There is an abundant supply of down wood both created naturally and from the process of creating the ski runs. The specimens were found near the proposed trail and away from the trail.

The 2001 Record of Decision and Standards and Guidelines for the Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (hereafter referred to as the S&M ROD)(USDA Forest Service and USDI BLM 2001), states that, " Management Recommendations describe the habitat parameters (environmental conditions) that would provide for a reasonable likelihood of persistence of the taxon at the site". The S&M ROD also states that, "Management may range from maintaining one or more habitat componenets (such as down logs or canopy cover) to complete exclusion from disturbance for many acres, and may allow loss of some individuals, areas, or elements not affecting continued site occupancy."

The Management Recommendations for Terrestrial Mollusk states, "USDA, Forest Service, and USDI, Bureau of Land Management (1974: J2-349) under "Natural History" said, "Habitat is moist forest, not necessarily riparian areas." It is found under rotting logs, from approximately 60-1200 meters (200-4000 feet) elevation (Kozloff and Vance 1958). Branson and Branson (1984) found it at 180-1372 meters (590-4500 ft.) elevation, in Douglas-fir to
Hemphillia sp. - Page 17 subalpine fir forests, among decaying wood, wood sorrel, ferns, and mosses. It is "Generally in open but uncut forest, at low to high elevations . . . . This species may co-occur with the Larch Mountain salamander . . ." (Frest and Johannes 1993). We have also found it on skunk cabbage and on the underside of bigleaf maple bark lying on the ground (Burke, personal observations).

At the time that the management recommendations were written there was very little known about the Malone's jumping slug. Habitat information was just unfolding as survey efforts continued. It is now understood that this species is locally abundant and can live in a variety of sites and habitats including very young stands, openings, disturbed sites and is most associated with dead and down wood. The species has been found extensively across the west side of the Forest in many seral stages. In doing surveys for the Crater Lake tightcoil, the Malone's jumping slug was found in the open and on the edge of the ski run. This demonstrates that the species is able to live in a much wider range of habitats than was found during the development of the Management Recommendations for the species. This species was found to be more common and not dependant on late successional habitat during the annual species reviews.

Due to the abundance of habitat and the quantity of Malone's jumping slugs both near the trail and away from the trail it is the wildlife biologist determination that the trails would not impact the persistence of Malone's jumping slugs at the site. The falling of small trees for trail construction would add down wood habitat that appears to be the most important factor in the species persistence.

Red-tree vole: Habitat for this species consists of conifer forests containing Douglas-fir, grand fir, Sitka spruce, western hemlock and white fir. Optimal habitat for the species occurs in old-growth Douglas-fir forests. Large, live old-growth trees appear to be the most important habitat component. Although part of the project area does contain mature old-growth stands, the species composition is different than what is preferred by the species. The mature stands in the project area are dominated by primarily mountain hemlock, western hemlock and pacific silver fir; with lesser amounts of Douglas-fir and Engelmann spruce. In addition, the lowest elevation of the project area is 4200 feet in elevation. Red-tree voles are relatively uncommon in the North Cascades Region, with most records of species located at the lower elevations along the Columbia River and the western foothills of the Cascades. The species appears to be uncommon at elevations above 2,500 feet and extremely rare above 4,260 feet in the Cascades. It is believed that red tree voles are rare in high elevation true fir forests because their arboreal nests do not provide adequate insulation against cold winter temperatures. It is also thought that tree voles find it difficult to forage in high elevation forests during winter, when tree branches are frequently covered with snow and ice for extended periods (Forsman 2004).

The project area occurs in high elevation true fir forests ranging in elevation from 4500 to 6000 feet in elevation. This area has long winters with abundant snowpacks. It is on the crest of the Cascades and has habitat more similar to the east side of the Cascades. There has not been a red tree vole documented in this area. For these reasons it is highly unlikely a red tree vole would be nesting in the project area. Surveys were not conducted due to lack of habitat and the fact that no trees large enough for tree vole nesting would be removed.

Great gray owl: There are no natural meadows larger than 10 acres in the project area. All of the larger meadows are manmade ski runs. Therefore, no surveys are necessary for great gray Owls. There have been no documented occurrences of great gray owls on the Mt Hood National Forest.

Larch Mountain salamander: The Conservation Assessment (Crisafulli, Charles et al 2008) states, "The Larch Mountain salamander occurs in an area of 11,740 km^2 (4,550 mi^2) in the Cascade Range of Washington and Oregon (Figure 1, Crisafulli 1999, Nauman and Olson 1999). It has been found from 50-1280 m (~160-4200 ft) in elevation." This project is above that elevation. No habitat would be adversely affected by the trails or construction that would affect the persistence at the site. The Conservation Assessment cautions about trails requiring blasting and excavation. Some ground disturbance would take place as part of making these bike trails but the footprint is very narrow and would not affect the persistence at the site if a population appeared above the known elevation. Therefore no surveys were conducted for Larch Mountain salamanders. No salamanders were found while conducting surveys for mollusk.

Black-backed woodpecker: The Forest Plan has standards and guidelines for the white-headed woodpecker, black-backed woodpecker, pigmy nuthatch, flammulated owl, Canada lynx and bats. Of these species, the black-backed woodpecker is the only species potentially affected by the project. Habitat for this species is found in mixed conifer and lodgepole pine stands in the higher elevations of the Cascade Range. The project area is west of the potential habitat for the species. A standard and guideline requires an adequate number of large snags and green-tree replacements for future snags be maintained in sufficient numbers to maintain 100 percent potential population levels. The 100 percent population potential for black-backed woodpeckers is 0.12 conifer snags per acre in the hard decay stage. These snags would be at least 17 inches diameter or largest available if 17 inch diameter snags are not available. The black-backed woodpecker also requires beetle infested trees for foraging. With the action alternatives, snags would be removed for a safety to a limited degree. There has already been some hazard tree removal for the ski runs. Some snags would be retained in riparian areas. Within the bike trail project area the 100 percent potential population level for black-backed woodpecker would be met and there would be an abundance of snags. The project area is west of the normal distribution of black-backed woodpeckers but there is still potential for this species to invade into the project area if there is a large bark beetle outbreak or fire.

Snags and Down Wood

Existing Situation – The snag and down woody debris density data in the Zigzag River watershed analyses was based on Gradient Nearest Neighbor Analysis completed by Ecologist, Cindy McCain and summarized by Ecologist Jeanne Rice in unmanaged stands (late seral and naturally regenerated mid-seral stands) in the 2008-2010 Deadwood analysis project. This information is summarized below to give an idea of the levels of snags and down woody debris that can be expected in these types of stands.

Within the Timberline Bike Trail Project Area itself, it is apparent that there is a wide variation in the amount and size of snags and down wood. Many of the un-managed small diameter montane mixed conifer stands have been affected by insects and disease and currently have moderate to high levels of large and small-diameter conifer snags and down woody debris. Other stands have had hazard tree removal and have lower levels of snags but a high amount of downwood. The mature stands have medium to high levels of large diameter snags and down wood. The ski runs have varying levels of down wood based on the creation of the run. The newest runs that were built as part of the timberline lift express project have a high degree of downwood in various conditions. Some of the wood is small diameter trees and some is slabs and rounds that are fine for mollusk but not high quality for woodpeckers.

The primary and secondary cavity nesting species for the montane mixed conifer stands are: pileated woodpecker, northern flicker, hairy woodpecker, red-breasted nuthatch, black-backed woodpecker, and northern three-toed woodpecker. The 100% biological potential level is 3.7 snags per acre (Austin 1995).

Many species in the Pacific Northwest evolved to use large snags and logs that were historically abundant in the landscape. The loss of snag and log density from managed stands affects biodiversity and potentially could cause a loss of critical function in the landscape such as control of forest insects.

<u>DecAID Advisor</u>

DecAID is a planning tool intended to help advise and guide managers as they conserve and manage snags, partially dead trees and down wood for biodiversity (Mellen 2003). It also can help managers decide on snag and down wood sizes and levels needed to help meet wildlife management objectives. This tool is not a wildlife population simulator nor is it an analysis of wildlife population viability.

A critical consideration in the use and interpretation of the DecAID tool is that of scales of space and time. DecAID is best applied at scales of subwatersheds, watersheds, subbasins, physiographic provinces, or large administrative units such as Ranger Districts or National Forests. DecAID is not intended to predict occurrence of wildlife at the scale of individual forest stands or specific locations. It is intended to be a broader planning aid not a species or stand specific prediction tool. Modeling biological potential of wildlife species has been used in the past. DecAID was developed to avoid some pitfalls associated with that approach. There is not a direct relationship between the statistical summaries presented in DecAID and past calculations or models of biological potential. Refer to the DecAID web site listed in the References section for more detail and for definition of terms. This advisory tool focuses on several key themes prevalent in recent literature:

- Decayed wood elements consist of more than just snags and down wood, such as live trees with dead tops or stem decay.
- Decayed wood provides habitat and resources for a wider array of organisms and their ecological functions than previously thought.
- Wood decay is an ecological process important to far more organisms than just terrestrial vertebrates.

<u>Snags and Down Wood Levels Compared to DecAID Data</u>

The Timberline Bike Trail project area is located within the habitat type identified in DecAID as the Montane Mixed Conifer Forest. The vegetation conditions are primarily *large trees stands* with mixtures of *open canopy* and *small trees*. Because of the high elevation high amounts of snow, the stands best fit the *large trees* category. DecAID offers several tolerance levels (30%, 50% and 80%) to give managers a range of options.

For snags in large tree stands in Montane Mixed Conifer stands (From DecAid):

<u>80% tolerance level</u>: To manage snag habitat for American Marten at the 80% tolerance level, provide for snag densities of at least 36.0 snags/ha (14.4/acre) of which 11.2 snags/ha (4.5/acre) are larger than 50 cm (20 in. dbh). To provide den sites for American Marten areas of higher snag densities on part of the landscape. Data from Wyoming indicate the 80% tolerance level for American Marten den sites is 115 snag/ha (46/acre) > 20 cm (8 in) dbh of which 38/ha (15/acre) are > 40 cm (16 in) dbh. Unharvested stands in the MMC_L vegetation condition in Oregon and Washington provides snag densities at or above this level on up to 12% of the landscape. To

manage densities of snags at the 80% tolerance level based on inventory data provide for densities of about 66 snags/ha ≥ 25.4 cm dbh (27/acre ≥ 10 in)), of which 38 snags/ha (15/acre) are ≥ 50.0 cm (19.7 in) dbh on parts of the landscape.

<u>50% tolerance level</u>: To manage densities of snags at the 50% tolerance level based on inventory data provide for densities of about 38 snags/ha ≥ 25.4 cm dbh (15/acre ≥ 10 in)), of which 22 snags/ha (9/acre) are ≥ 50.0 cm (19.7 in) dbh, should be maintained on parts of the landscape. These snag densities are also similar to data for American marten from NE Oregon (Bull et al. 2005) for smaller snags but lower for the larger snags. The MMC_L vegetation condition provide snag densities above 60 snags/ha (24/acre) ≥ 25.4 cm (10 in) dbh of which 15 snags/ha (6/acre) are ≥ 50.0 cm (19.7 in) dbh on a significant proportion of the uharvested landscape. This level provides denning habitat for American Marten at the 50% tolerance level based on data from Wyoming.

<u>30% tolerance level</u>: To manage densities of snags at the 30% tolerance level based on inventory data provide for densities of about 27 snags/ha ≥ 25.4 cm dbh (11/acre ≥10 in)), of which 16 snags/ha (6.5/acre) are ≥ 50.0 cm (19.7 in) dbh, should be maintained on the landscape. These levels are fairly similar to the 30% tolerance level for American Marten from NE Oregon, with densities of 29.4 snags/ha (11.8/acre) for snags ≥ 25 cm (10 in) dbh, and 9.2 snags/ha (3.7/acre) for snags ≥ 50 cm (20 in) dbh.

For down wood in large tree Montane Mixed Conifer stands from DecAid (only wood greater than or equal to 4.9 inches diameter in all decay classes):

<u>80% tolerance level</u>: To manage down wood cover at the 80% tolerance level based on inventory data provide 10 percent cover of down wood ≥12.5 cm diameter (4.9 in) should be maintained on parts of the landscape. Even higher levels of down wood are likely to benefit and attract some species such as three-toed woodpecker; these high levels can be left opportunistically, but are likely not sustainable over the long-term.

<u>50% tolerance level</u>: To manage down wood cover at the 50% tolerance level based on inventory data provide 5 percent cover of down wood ≥12.5 cm diameter (4.9 in) should be maintained on parts of the landscape. Clumps of down wood of 10% to 18% cover would benefit species such as three-toed woodpecker. About 12% of the unharvested area in the MMC_L vegetation conditions has down wood cover above 10%.

<u>30% tolerance level</u>: To manage down wood cover at the 30% tolerance level based on inventory data provide 3.3 percent cover of down wood ≥12.5 cm diameter (4.9 in) should be maintained on parts of the landscape. Clumps of up to 6% cover would benefit species such as three-toed woodpecker. Approximately 1/4 of the unharvested area has above 6% down wood cover.

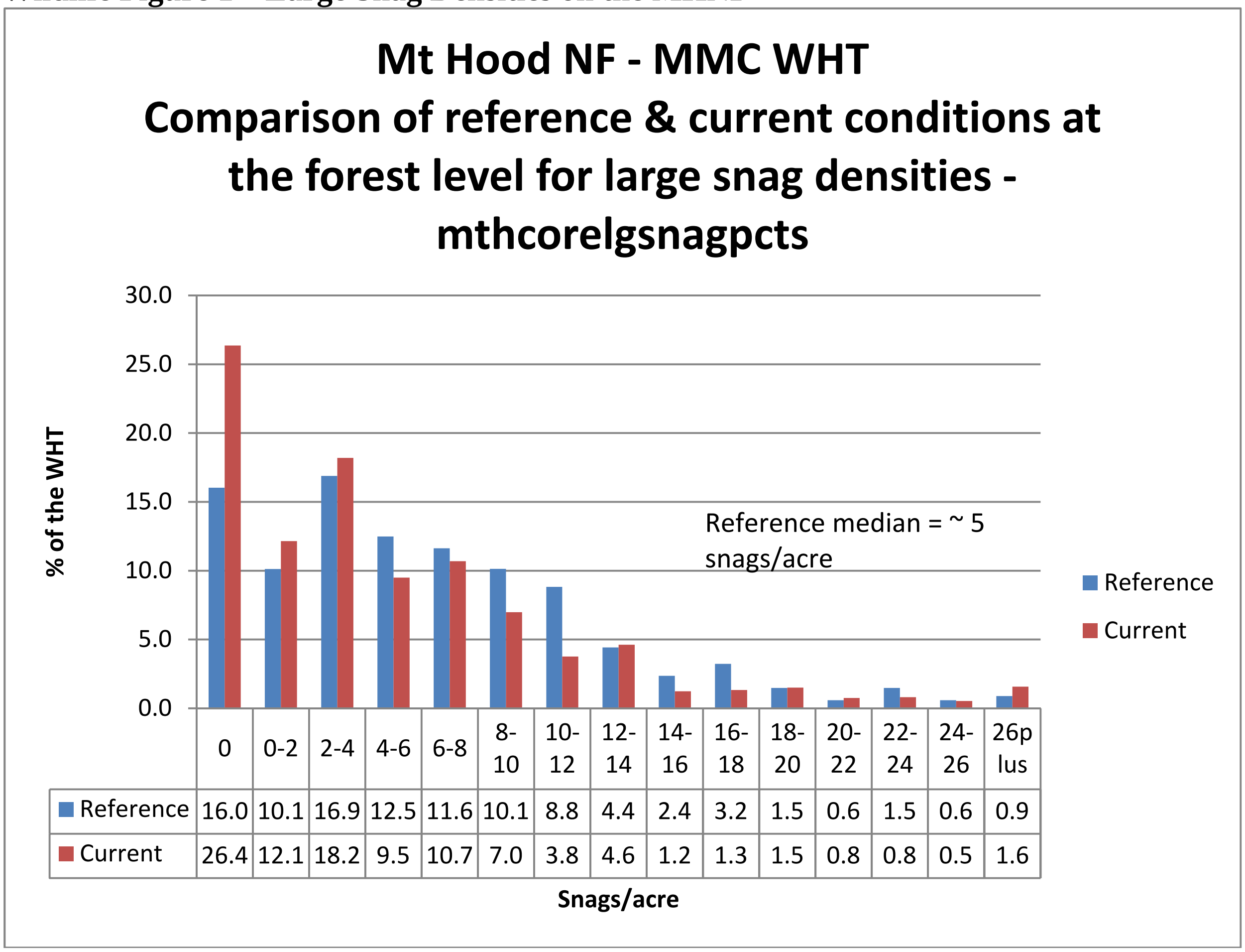
Wildlife Table 3 shows the percentage of the Zigag Watershed that is at the given tolerance Thresholds.

Wildlife Table 3
Percent of the Zigzag Watershed at the Given Tolerance Levels

Watershed Vs DecAID	30% Tolerance Level (limit)	50% Tolerance Level (limit)	80% Tolerance Level (limit)	100% Tolerance Level (limit)	No Data	Total Percent
% Zigzag Watershed	29%	21%	19%	14%	17%	100

Wildlife Figure 1 shows the relationship of the reference condition for the Montane Mixed Conifer habitat type to the current condition across the Mt Hood National Forest.

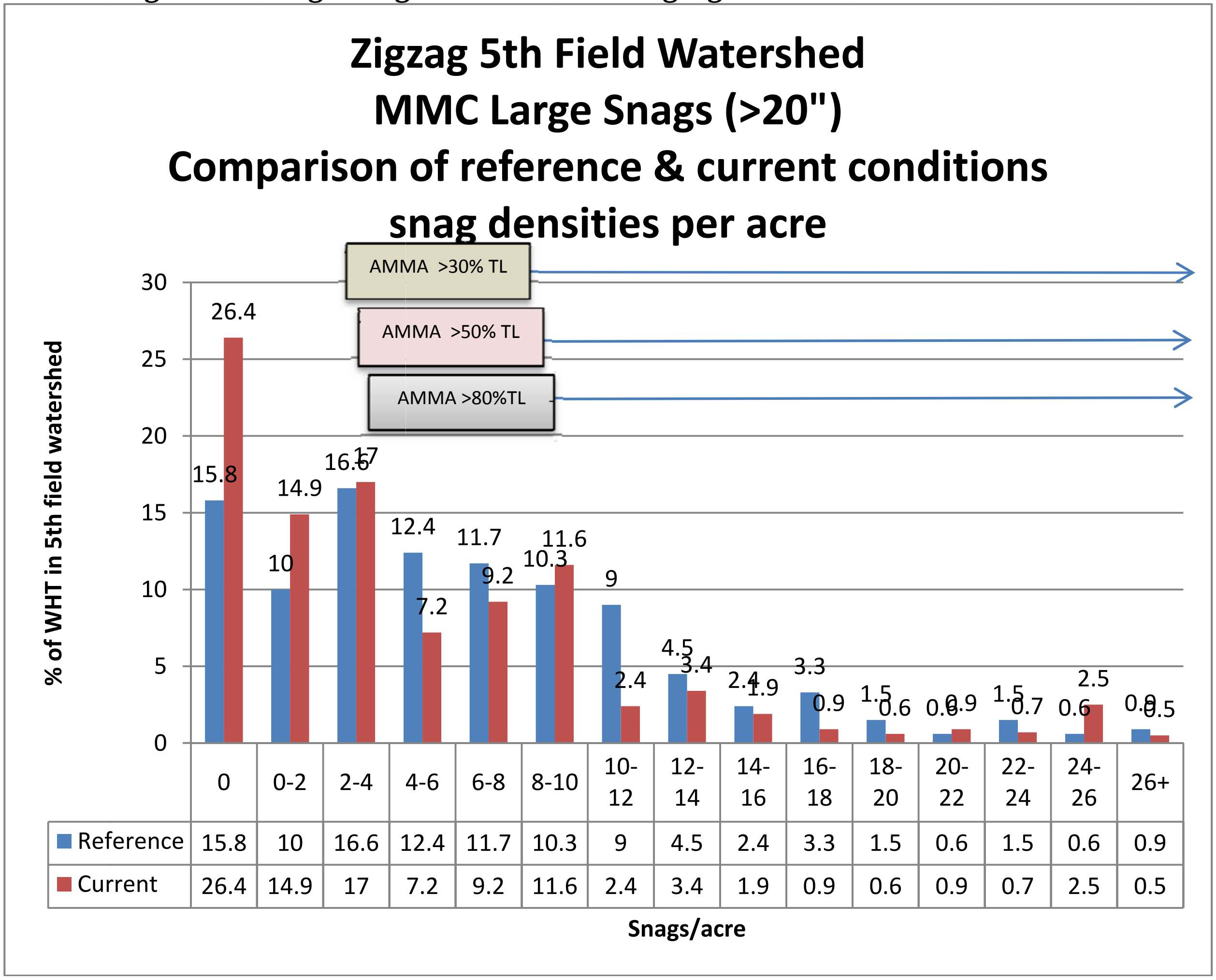
Wildlife Figure 1 – Large Snag Densities on the MHNF



Comparing the condition of this habitat type across the Forest to the Zigzag watershed (in the chart below) where the Timberline bike trails proposed project would occur it is evident that the conditions are very similar.

Wildlife Figure 2 shows the relationship of the reference condition of large snags for the Montane Mixed Conifer habitat type to the current condition in the Zigzag 5th field watershed.

Wildlife Figure 2 – Large Snag Densities on the Zigzag Watershed



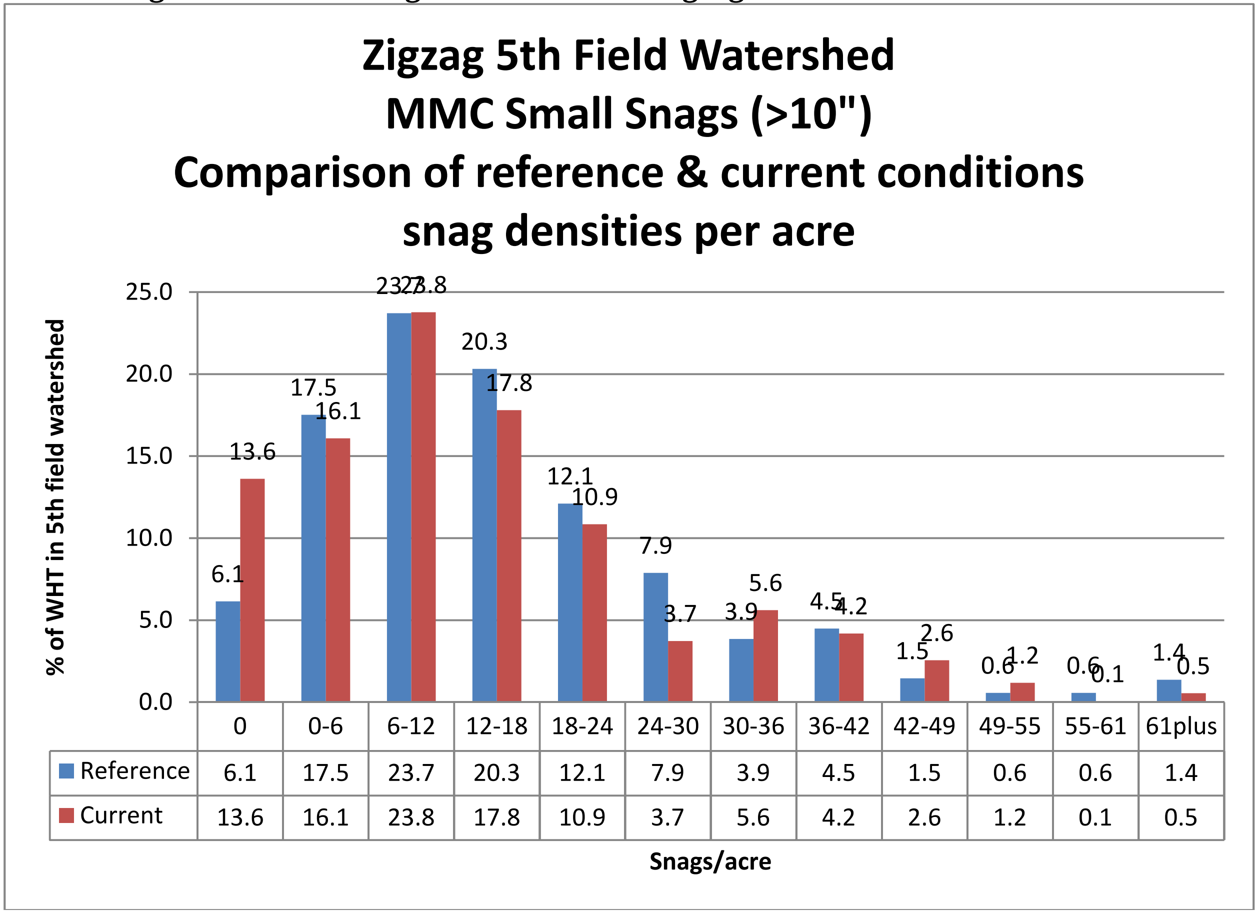
Note: AMMA = American marten.

For large snags it is apparent that the amount of the stands with 0 or 0-2 snags per acre is higher than the reference condition by about 15.5%. That 15.5% reduction in snags is spread across all of the density classes. The chart shows that approximately 50 percent of the watershed would meet the 80% tolerance level for American marten. That is an acceptable amount of the watershed compared to the approximately 70% for the reference condition. Especially since snags are only an indicator of denning sites and not an indication of less population potential for martens.

The project proponents have indicated that they do not intend to remove trees larger than 6 inches or remove snags unless absolutely necessary. Therefore, there is no indication that snag resources would be impacted to a degree that would cause concern for snag and cavity users.

Wildlife Figure 3 shows the relationship of the reference condition of small snags for the Montane Mixed Conifer habitat type to the current condition in the Zigzag 5th field watershed.

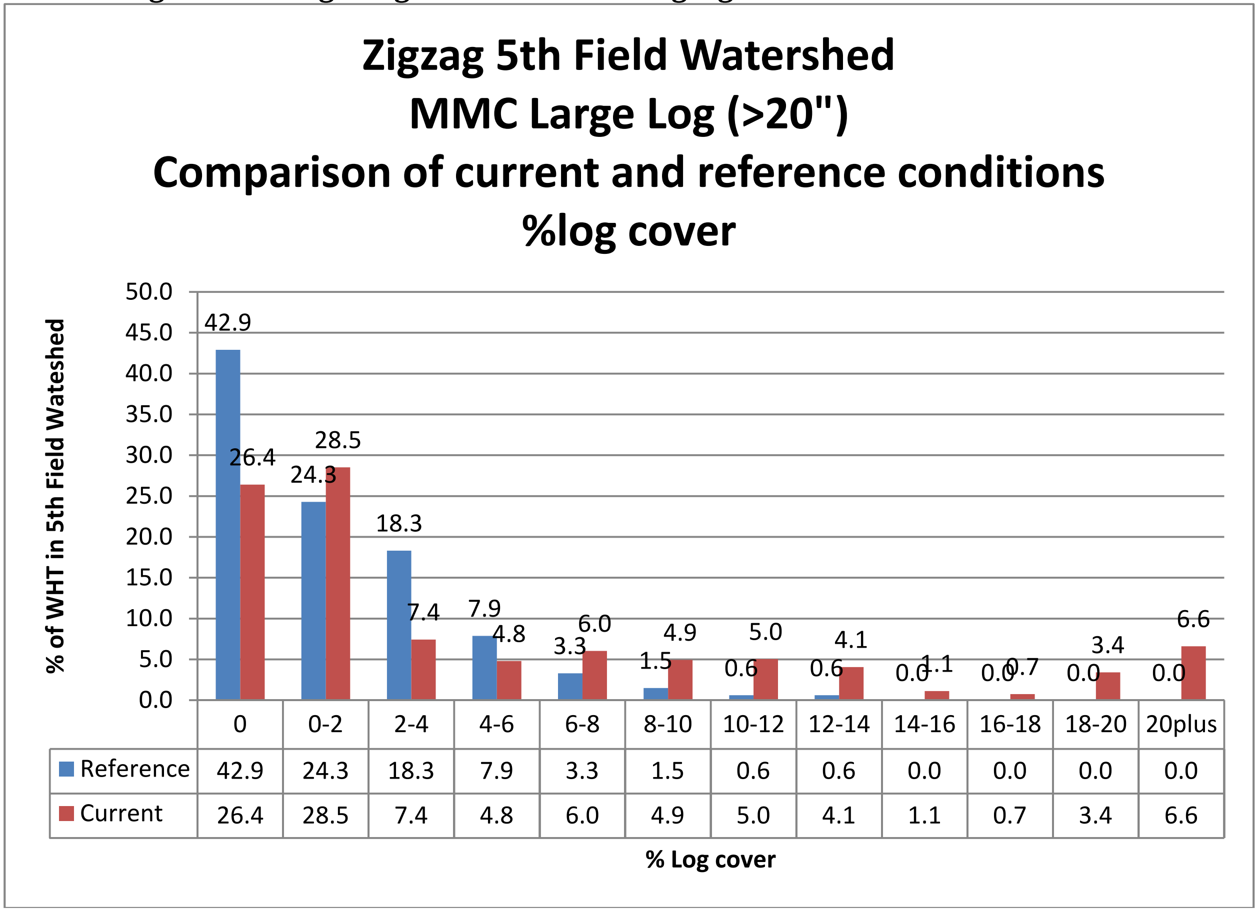
Wildlife Figure 3 – Small Snag Densities on the Zigzag Watershed



Looking at the comparison of the reference condition to the current condition for small snags in the Zigzag watershed the current condition is 6.1 percent higher for area with 0 to 0-2 snags per acre. That indicates there are about 6 percent less area with snags than the referrence condition would indicate. The chart also indicates that there are some instances of higher than referrence densities in the landscape. This would be good for species such as three-toed woodpeckers that prefer high densities of snags for foraging.

The following chart shows the relationship of the reference condition of large logs for the Montane Mixed Conifer habitat type to the current condition in the Zigzag 5th field watershed.

Wildlife Figure 4 – Large Log Densities on the Zigzag Watershed



	0	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20plus
Reference	42.9	24.3	18.3	7.9	3.3	1.5	0.6	0.6	0.0	0.0	0.0	0.0
Current	26.4	28.5	7.4	4.8	6.0	4.9	5.0	4.1	1.1	0.7	3.4	6.6

The large log cover analysis shows that the current condition for down wood is higher than the reference condition. This could account for the reason that the snag levels are below reference. Because this area is not in an area of the Forest where there is any timber harvest the lack higher density of down wood or logs indicates that the snags have merely fallen and become logs. This condition is excellent for woodpecker foraging, small mammals and mollusk habitat. The current condition for down wood is better than referrence. This would not change due to this project. There may be some moving of logs and cutting gaps for the trail but there is no anticipation that there would be any removal of downwood. The area would continue to provide above average habitat for species that utilize this resource.

The proposed action involves very little snag removal. It is not part of the proposal but it is anticipated that some hazard trees would be removed as the need presents itself. The project proponents stated that hazard tree removal is not a large part of this proposal but acknowledge that safety would drive the need to remove snags when necessary. These snags would be left in place and still serve as forage for woodpeckers and down-wood for small mammals and mollusk and other am

Direct and Indirect Effects –

No Action **–** With no action, the mountain bike trails would not be constructed. There would continue to be some hazard tree removal for the ski runs. So some reduction in snag levels near the runs would continue.

Proposed Action **-** The proposed action does not have a great effect on the snag resource. There is a high amount of tree mortality evident in the area from insect and disease and suppression since there is no man made thinning occurring in the project area. The small amount of hazard trees that would be removed as a result of the bike trail contruction and maintenance would have a small effect on the resource but the effects would be minor. The DecAid analysis indicates that this watershed is in fairly good shape from a snag and down wood perspective. A high degree of the area is at the 80 percent tolerance level for American marten. This project would not affect that relationship.
The current snag and down wood analysis show that the snag levels are and would continue to be above the 100 percent biological potential.

Cumulative Effects **–** Snags are utilized by species that have medium size home ranges so appropriate size analysis areas using topographic features have been developed to calculate cumulative effects for snags. Approximately one mile would be the action area for snag effects. Wildlife Table 4 lists the cumulative actions and their cumulative effect on snags.

Wildlife Table 4
Past, Present and Foreseeable Future Projects and Actions

Project Name	**Extent, Size, Type, & Distance**	**Overlap In Time Or Space**	**Alteration of snags**	**Meaning-ful Effect**	**Rationale For Inclusion Or Exclusion From Analysis Below**
Ski Bowl and Summit Ski Areas and associated ski trails.	Entire ski area	Nearby and within range of woodpecker and marten utilization area	Hazard tree removal and the permanent removal of snags.	Yes	Included due to similar range, scope and effect on woodpeckers and marten
Government camp construction	Throughout woodpecker and marten home range	Yes.	Permanent loss snags and down wood cover	Yes	Include. New buildings in the area reduces snags and down wood cover
Government Camp Land Exchange	Throughout woodpecker and marten home range	Yes.	Loss of snags and down wood cover	Yes	Include. Potential construction in the area would reduce snags and down wood cover

Timberline roads[1]	Throughout Analysis Area	Yes. Roads require maintenance and hazard tree removal on the way to Timberline.	High traffic requires higher than average hazard tree removal.	Yes	Include. Hazard tree removal in the area affects snags.
Mt Hood Hiking trails[1]	Throughout Analysis Area	Yes. Some hazard tree removal reduces snag resources along hiking trails.	Removal for human safety.	Yes	Include. Reduces snag resource to a small degree.
Past – Power Line	Portions of Analysis Area	Yes. Power lines require some snag removal.	A loss of snags in all size classes has occurred.	Yes	Include. Some loss to reduce power outages so snags are removed along the lines.
Jeff Flood Project (Timberline Lift Express EA)	77+ acres of forest removed	Yes. A recent project that has long term effects.	Loss of snags on 77+ acres	Yes	Include. Loss of snags over a large area that would not be allowed to reestablish.
Govt Camp Fuels Reduction	Approx. 100 acres of fuels reduction consulted on in 2005-2006	Yes. A recent project to reduce fuels around Government camp to reduce the effect of wildfire.	Loss of snags on approximately 100 acres	Yes	Include. Loss of snags over a large area that would not be allowed to reestablish.
Ski Area Removal of trees for ski runs	Approx. 103 acres of forest removal since 1952.	Yes. This is forest removal for the ski runs since 1952 to present.	Loss of snags by creating the ski runs and maintaining them as openings.	Yes	Include. Removal of trees for ski runs has removed foraging and nesting areas for cavity users.

Wildlife Table 5 shows the length of roads and trails within a half-mile of the proposed bike park.

Wildlife Table 5
Quantitative Cumulative Effects of Roads and Trails
Within a Half Mile of the Proposed Bike Trails

Type	Feet	Miles
Trails	58,486	11.1
User Roads	31,048	5.9
System Roads	39,013	7.4
Timberline to Town Trail	17,244	3.3

The current snag and down wood analysis show that the snag levels are and would continue to be above the 100 percent biological potential.

Forest Plan Goals, Standards and Guidelines

Snags

FW-215 - For timber harvest units the goal is to have 60% of the full biological potential, which translates into 2.0 snags per acre in the lodgepole pine stands and 2.3 snags per acre in the Engelmann spruce/mountain hemlock stands. There are other snag related standards and guidelines such as FW-163, 164, 165, 169, 218, 230 and 231.

This standard address timber harvest units (e.g. regeneration harvest and commercial thinning). The proposed mountain bike trail system is not a traditional timber harvest and is neither regeneration harvest nor commercial thinning. There are sufficient snags at the landscape scale to meet the needs of snag dependent species.

FW-216 indicates that snags at the landscape scale be at 40% of biological potential, which equates to about 1.4 snags in the lodgepole pine stands and 1.6 snags per acre in the Engelman Spruce/mountain hemlock stands. The table in s. 4.5.2.9 above shows that this level is currently being met throughout the entire planning area.

Down Wood

FW-219 indicates that project activity areas should have 6 down logs per acre in decomposition class 1, 2, and 3. There are other down wood related standards and guidelines such as FW-166, 167, 169, 221-229.

The Northwest Forest Plan standard and guideline for the Matrix indicates that the amount of down logs left should reflect the timing of stand development cycles and that existing wood on the ground should not be disturbed to the extent possible. However subsequent watershed analysis and the LSR Assessment recommended fuel treatments in this area.

There is sufficient down wood at the landscape scale to meet the needs of dependent species.

Management Indicator Species

Deer and Elk Habitat (Management Indicator Species)

Habitat Characteristics **–** Elk herds on the Mt Hood exhibit a close association with riparian habitat in areas of gentle terrain and low road density. A study within the Clackamas River Ranger District from 1987 to 1992 recorded location and habitat type being utilized by radio-collared elk (Fiedler 1994). Seventy percent of all observations on these elk occurred within 100 meters of a stream or wetland. It was also noted that shrub/seedling stage clearcuts received more than twice as much use than they were proportionally available to elk as a habitat type. Also, elk were observed to browse on a wide range of native shrubs, trees, forbs and grasses as well as utilizing non-native grasses (Fiedler 1994). Ski runs mimic the open meadows and wetlands and have similar forage and are utilized by elk in the summer and fall.

The effect of mountain bike trails designed for high levels capacity of users would in effect be much like high traffic roads. Research has shown that high open-road densities lead to harassment of elk herds. Harassed elk move more often than elk left alone and use of habitat decreases as open-road density increases (Witmer 1985). The study mentioned above also reported that elk within or moving through areas of high open-road densities moved longer distances; several miles per day was not uncommon.

Recreational activity can affect wildlife in three main ways (Liddle 1997):

1. Stress/Disturbance: Wildlife becomes aware of human activity, and respond by becoming stressed, altering their behavior, avoiding (fleeing) areas of activity, or confronting/attacking humans. Such responses may detrimentally affect the fitness of an individual or a population.
Displacement of animals by recreational disturbance may be short term (i.e., minutes or hours) or permanent.

2. Alteration of Habitat: The presence of human activity and/or infrastructure serves to remove or fragment habitat for wildlife, or can create artificial habitat which elicits change in population
dynamics or encroachment of new species/populations.

3. Collision/Mortality: Wildlife is struck by humans or their vehicles, resulting in injury or death.

In an attempt to understand the comparative effects of different types of use, Taylor & Knight (2003) examined the response of bison (Bison bison), mule deer (Odocoileus hemionus), and pronghorn antelope (Antilocapra americana) to hikers and mountain bikers at Antelope Island State Park, Utah, by comparing alert distance, flight distance, and distance moved. The study did not reveal a significant difference between hikers and mountain bikers with respect to the reaction of any of the three species to their presence. A recent study by Naylor & Wisdom (2009), however, produced contrary results, albeit for a different species. In a controlled experiment, the behavioral changes by 13 female elk (Cervus elaphus) were monitored in response to four types of recreational disturbance: all-terrain vehicle riding, mountain biking, hiking, and horseback riding. Compared to control periods when elk spent most of their time feeding and resting, travel time increased in response to all recreational disturbance, but decreasing in the order listed above (i.e. ATV use eliciting the greatest increase in travel time, horseback riding eliciting the least). Both mountain biking and hiking activities were found to significantly reduce resting time for elk.

For this proposal, the following actions have the potential to affect deer and elk (negatively): actions that increase human presence would negatively affect deer and elk populations. Due to the major increase in human use along the proposed trail system during the summer deer and elk would most likely be displaced from the project area. Unlike some of the studies cited above where a small amount of mountain bike traffic was similar to hiking levels the proposed action would substantially increase human presence on a daily basis that would most likely reduce deer and elk use if not eliminate it entirely. Most use if it occurs would only be nocturnal. There is high quality forage for these species within the ski runs. So some use may still occur at night as the animals learn the pattern of use from the mountain bikers. There would be some reduction in forage opportunities at a time when forage is limiting for deer and elk on the Forest.

<u>Existing Situation</u> **–** The entire proposed project area is located within summer range (SR). Thermal cover for elk is defined as a stand of coniferous trees at least 40 feet tall with an average crown closure of 70 percent or more. Thermal cover for deer may include saplings, shrubs, or trees at least 5 feet tall with a 75 percent crown closure. Optimal cover is found mainly in multi-storied mature and old-growth stands. Hiding cover is present when there is vegetation capable of hiding 90 percent of a standing deer or elk from the view of a human at a distance of 200 feet. Forage includes all browse and non-woody plants available to wildlife for grazing. Thermal cover has not been found to be a significant issue for elk as previously thought. Openings are more limiting and elk use is more dependent on forage openings than cover.

The proposed bike trail project areas contain various levels of optimal, thermal, and hiding cover; as well as forage areas. The elk herds residing in the vicinity of the project area during the summer usually spend the winter in lower elevation areas off the Mt. Hood National Forest.

Deer have not been studied intensively on the Forest, but are generally considered to be wider ranging, more tolerant of human disturbance, and less dependent on riparian areas. Deer are more likely to be involved in bike/animal collisions during due to their higher tolerance levels.

Direct and Indirect Effects

No Action **–** There would be no change in forage utilization since there would be no increase in human presence. Deer and elk would continue to use the area at a moderate density.

Proposed Action **-** The proposed action includes heavy human use within summer range for deer and elk. Elk and to some degree deer would shift use away from the project area and would reduce the amount of time they could forage in the area. Some shift to nocturnal use of the project area might occur to forage when bikers are not using the area. No proposal to use the area at night as been planned and so the deer and elk would utilize this area during non-operations times. A Project Design Criteria (WILD-1) was incorporated to reduce impacts to deer and elk by restricting trail use during peak big game forage times at sunrise and sunset. The bike trails travel through the main stand of timber that would be used as hiding cover so animals would have to travel further to access the forage. The stream protection buffers would maintain their forest structure and continue to provide cover to some degree.

Cumulative Effects **-** Analysis areas for deer and elk were established using subwatershed boundaries and the winter/summer boundary. The effects of disturbance to a variety of elk and deer is approximately 0.5 miles so this is the action area for trails and roads for use in determining the extent of the disturbance issues for the bike trails. Wildlife Table 6 lists the cumulative actions and their cumulative effect on deer and elk habitat.

Wildlife Table 6
Past, Present and Foreseeable Future Projects and Actions

Project Name	Extent, Size, Type, & Distance	Overlap In Time Or Space	Type Of Potential Effect	Measurable Effect?	Rationale For Inclusion Or Exclusion From Analysis Below
Ski Bowl summer operations	Entire ski area	Nearby and inside the range of the elk utilization area	Human disturbance	Yes	Included due to similar range, scope and effect on deer and elk
Government camp construction	Throughout Elk Range Analysis Area	Yes.	Permanent loss forage, cover, and increase in human disturbance	Yes	Include. New buildings in the area reduces forage and cover for deer and elk.
Government Camp Land Exchange	Nearby in elk forage and adjacent to other ski runs.	Yes.	Loss of forage and cover	Yes	Include. Potential construction in the area would reduce deer and elk forage and would disrupt use of the area.
Timberline Lodge Visitors	Throughout Analysis Area	Yes. Constant use by vehicles and human disturbance	High quantity of human disturbance	Yes	Include. Constant traffic and people using the upper part of the trail area reduces elk and deer forage

					opportunities.
Timberline roads[1]	Throughout Analysis Area	Yes. Roads require maintenance and hazard tree removal on the way to Timberline.	High traffic requires higher than average hazard tree removal.	Yes	Include. Hazard tree removal in the area affects snags.
Mt Hood Hiking trails[1]	Throughout Analysis Area	Yes. Constant use during summer and fall utilization times.	High quantity of human disturbance.	Yes	Include. Constant use by hikers reduces elk and deer forage opportunities.
Past – Power Line	Portions of Analysis Area	Yes. Power lines require some snag removal.	The area maintained provides continuous forage opportunity.	Yes	Include. Forage that would be permanently maintained and would improve with time.
Jeff Flood Project (Timberline Lift Express EA)	77+ acres of forest removed	Yes. A recent project that has long term effects.	Addition of 77+ acres of forage area	Yes	Include. Increase in the amount of forage that would be permanently maintained and would improve with time.
Govt Camp Fuels Reduction	Approx. 100 acres of fuels reduction consulted on in 2005-2006	Yes. A recent project to reduce fuels around Government camp to reduce the effect of wildfire.	Increase in forage of approximately 100 acres	Yes	Include. Increase in forage near the project area due to opening the canopy.
Ski Area Removal of trees for ski runs	Approx. 103 acres of forest removal since 1952.	Yes. This is forest removal for the ski runs since 1952 to present.	Creation of forage openings used by deer and elk.	Yes	Include. The increase in forage has attracted a higher population of deer and elk to the area.

American Marten (*formerly Pine Marten*) & **Pileated Woodpecker** (Management Indicator Species)

The status and condition of management indicator species are presumed to represent the status and condition of many other species. This EA focuses on the habitat of certain key species and does not specifically address common species except to the extent that they are represented by management indicator species.

The pileated woodpecker was chosen as an MIS because of its need for large snags, large amounts of down woody material, and large defective trees for nesting, roosting and foraging. The American marten is an indicator species to mature or older forests with dead and defective standing and down woody material. It has a feeding area that utilizes several stand conditions that range from poles to old growth (USDA 1990a).

Existing Situation **–** The pileated woodpecker is associated with forest habitats that have large trees, especially snags for nesting and foraging. It would use both coniferous and deciduous trees, but tends to be most common in old-growth Douglas-fir forests in western Oregon (Csuti 1997).

American martens are associated with forested habitats at any elevation, but tend to prefer higher elevations similar to the project area. They prefer mature forests with closed canopies, but sometimes use openings in forests if there are sufficient downed logs to provide cover (Csuti 1997). American marten are observed regularly in the project area.

The project area provides potential habitat for both the American marten and pileated woodpecker. Both species are more likely to be found in the unmanaged stands that have a mature stand structure with abundant snags and down woody debris. Quality habitat exists for the American marten in these stands, and to a lesser extent the pileated woodpecker. The pileated woodpecker prefers stands with a heavy component of Douglas-fir. Although some of the stands have some Douglas-fir, most of them have various other species, such as pacific silver fir, mountain hemlock and lodgepole pine.

Both American Marten and Pileated woodpeckers have a high tolerance for human disturbance. Pileated woodpeckers often forage in people's backyards. Although they would flush if approached to closely they continue to use the area. They may however choose not to nest in high traffic areas.

American marten have been seen inside Silcox Hut, the Timberline Amphitheater, and in Meadows Ski Area Lodge. They may shy away if approached but they regularly travel through areas where people congregate. They may be attracted to areas of human use where people feed golden mantled ground squirrels since they prey on this species.

Direct and Indirect Effects

No Action Alternative No effects to the American marten or pileated woodpecker habitat would occur with this alternative. With no action there would be no human disturbance to these species.

Proposed Action The proposed bike project would have little effect on these two management indicator species. The impact of human use in the area may shift the areas selected for nesting and denning but would have little overall use of the area by pileated woodpeckers or American marten.

Migratory Birds

A Memorandum of Understanding (MOU) between the USDA-Forest Service and USDI – Fish and Wildlife Service has been developed to promote the conservation of migratory birds (USDA-USDI 2008). The MOU meets the requirements of the Executive Order 13186, January 17, 2001 on the responsibilities of federal agencies to protect migratory birds. The purpose of the MOU is to strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and minimize the take of migratory birds through enhanced collaboration between the Forest Service and the Fish and Wildlife Service, in coordination with state, tribal, and local governments. This MOU directs the Forest Service to protect, restore, enhance, and manage habitat of migratory birds, and prevent the loss or degradation of remaining habitats on National Forests land.

Existing Situation **–** Close to 30 species of migratory birds occur within the project, some of which are likely present within the project area during the breeding season. Some species favor habitat with late-successional characteristics while others favor early-successional habitat with large trees. Some of the species that prefer late-seral habitats are as follows: Hermit/Townsend's warbler complex, pine siskin, hermit thrush, golden-crowned kinglet, Pacific-slope flycatcher, rufous and calliope hummingbirds, olive-sided flycatcher, Hammond's flycatcher, etc. There are no known Important Bird Areas such as nesting, wintering or stop-over areas within the project area.

Direct and Indirect Effects

No Action **-** There would be no alteration of habitat for migratory birds unless a wildfire was to burn through the area.

Proposed Action **-** The proposed action would have little effect on habitat for birds. The greatest impact to birds would be disruption of nesting for ground nesters such as juncos, chipping sparrows, blue and ruffed grouse, and shrub nesting species such as MacGillvary's warbler. The constant traffic of mountain bikes would disrupt nesting of birds within 10 yards of the trail or possibly more. This would reduce nest habitat along the trails.

In general, viability of species dependent upon National Forest System lands is considered in determining if a species should be managed as a sensitive species. Current management guidelines are designed to provide for a diversity of habitats. Management direction is not specific to individual bird species, except for those designated as threatened, endangered or sensitive, and management is generally focused on habitats rather than individuals.

3.4 Botany

Project Area

The proposed project area is located on the Zigzag Ranger District in T.3 S., R.9 E., Section 7, Willamette Meridian, and consists of subalpine parklands and meadows and high montane forest. The upper portion of the proposed mountain bike is in subalpine parkland. Subalpine parkland occurs above the forest zone and is characterized by a mosaic of individual trees, tree clumps, and meadows (Henderson 1974, Franklin & Dyrness 1987). Vegetation within the subalpine zone of the proposed mountain bike park consists of the following plant associations: mountain hemlock-whitebark pine/Hitchcock's smooth woodrush (TSME-PIAL/LUGLH [Old Code: TSME-PIAL/LUHI CAG313]), mountain hemlock/Hitchcock's smooth woodrush (TSME/LUGLH [Old Code: TSME/LUHI CAG314]), and mountain hemlock-subalpine fir/Cascade aster (TSME-ABLA/EULE14 [Old Code: TSME-ABLA2/ASLE3 CAF312]) (McCain & Diaz 2002). Below the subalpine zone is high montane forest consisting of old-growth mountain hemlock and mature Pacific silver fir stands: Pacific silver fir/big huckleberry/beargrass (ABAM/VAME/XETE CFS251) and mountain hemlock/big huckleberry/beargrass (TSME/VAME/XETE-NWO CMS224) (McCain & Diaz 2002). The majority of the proposed project area consists of high montane forest.

Pre-field Review of Existing Information

Management proposals are investigated to determine if potential habitat for special status species may exist within or adjacent to the project area. Sources include the Mt. Hood National Forest TES plant database, the Natural Resources Inventory System (NRIS) TES Plants database, species habitat and range information, scientific literature, technical manuals, species fact sheets, plant atlases, herbarium records, topographic maps, aerial photos, and knowledge provided by individuals familiar with the project area. Special status species that are known or suspected to occur on the Mt. Hood National Forest and that may have potential habitat in areas open to special forest products use/harvest are displayed in Botany Table 1.

Botany Table 1
Special Status Species Documented or Suspected to Occur on the Mt. Hood National Forest

Vascular Plants	Common Name	Documented or Suspected	Habitat in Proposed Project Area?
Agoseris elata	tall agoseris	Documented	No
Arabis sparsiflora var. *atrorubens*	sicklepod rockcress	Documented	No
Astragalus tyghensis	Tygh Valley milkvetch	Documented	No
Botrychium lunaria	common moonwort	Suspected	**Yes**
Botrychium minganense	gray moonwort	Documented	No
Botrychium montanum	mountain grape fern	Documented	No
Calamagrostis breweri	Brewer's reedgrass	Documented	**Yes**
Carex abrupta	abrupt-beak sedge	Suspected	**Yes**
Carex capitata	capitate sedge	Suspected	No
Carex diandra	lesser panicled sedge	Suspected	No
Carex lasiocarpa var. *americana*	slender sedge	Documented	No
Carex livida	pale sedge	Documented	No

Carex retrorsa	retrorse sedge	Suspected	No
Carex vernacula	native sedge	Documented	**Yes**
Castilleja thompsonii	Thompson's paintbrush	Documented	No
Cimicifuga elata var. *elata*	tall bugbane	Documented	**Yes**
Coptis trifolia	three-leaf goldthread	Documented	No
Corydalis aquae-gelidae	coldwater corydalis	Documented	No
Delphinium nuttallii	Nutall's larkspur	Documented	No
Diphasiastrum (=Lycopodium) complanatum	ground cedar	Documented	**Yes**
Elatine brachysperma	short-seeded waterwort	Suspected	No
Erigeron howellii	Howell's daisy	Documented	No
Eucephalus gormanii	Gorman's aster	Documented	**Yes**
Fritillaria camschatcensis	black lily	Documented	No
Lewisia columbiana var. *columbiana*	Columbia lewisia	Suspected	No
Lomatium watsonii	Wastson's desert parsley	Documented	No
Luzula arcuata ssp. *unalaschcensis*	Alaska curved woodrush	Documented	No
Lycopodiella inundata	bog clubmoss	Documented	No
Ophioglossum pusillum	adder's-tongue	Documented	No
Phlox hendersonii	Henderson's phlox	Documented	**Yes**
Potentilla villosa	villous cinquefoil	Documented	**Yes**
Ranunculus triternatus (=R. reconditus)	Dallas Mt. buttercup	Suspected	No
Romanzoffia thompsonii	Thompson's mistmaiden	Suspected	No
Rorippa columbiae	Columbia cress	Suspected	No
Rotala ramosior	lowland toothcup	Suspected	No
Scheuchzeria palustris var. *americana*	scheuchzeria	Documented	No
Sisyrinchium sarmentosum	pale blue-eyed grass	Documented	**Yes**
Streptopus streptopoides	kruhsea, small twistedstalk	Documented	**Yes**
Suksdorfia violacea	violet suksdorfia	Documented	No
Sullivantia oregana	Oregon sullivantia	Suspected	No
Tauschia stricklandii	Strickland's tauschia	Documented	**Yes**
Utricularia minor	lesser bladderwort	Documented	No
Utricularia ochroleuca	northern bladderwort	Documented	No
Wolffia borealis	dotted water-meal	Suspected	No
Wolffia columbiana	Columbia water-meal	Documented	No
Bryophytes	**Common Name**	**Documented or Suspected**	**Habitat in Proposed Project Area?**
Barbilophozia lycopodioides	giant fourpoint, maple liverwort	Suspected	No
Brachydontium olympicum	Olympic brachydontium moss	Documented	**Yes**
Bryum calobryoides	beautiful bryum	Suspected	**Yes**
Calypogeia sphagnicola	bog pouchwort	Documented	No
Chiloscyphus gemmiparus	alpine waterwort	Suspected	**Yes**
Conostomum tetragonum	ribbed mountain moss, helmet moss	Documented	**Yes**
Encalypta brevicollis	extinguisher moss	Suspected	No
Encalypta brevipes	candle snuffer moss, stubby extinguisher moss	Suspected	No

Gymnomitrion concinnatum	braided frostwort, pointy whiteworm	Documented	**Yes**
Helodium blandowii	Blandow/s feather moss	Suspected	No
Herbertus aduncus	common scissorleaf	Suspected	**Yes**
Lophozia laxa	bog palewort	Suspected	No
Polytrichum sphaerothecium	dwarf rock haircap	Documented	**Yes**
Rhizomnium nudum	moss	Documented	**Yes**
Rhytidium rugosum	crumpled leaf moss, pipecleaner moss	Suspected	**Yes**
Schistostega pennata	green goblin moss	Documented	**Yes**
Scouleria marginata	margined streamside moss	Suspected	**Yes**
Splachnum ampullaceum	purple-vased stink moss, small capsule dung moss	Suspected	No
Tayloria serrata	broad-leaved stink moss, serrate dung moss	Documented	**Yes**
Tetraphis geniculata	four-tooth bent knee moss	Documented	No
Tetraplodon mnioides	black-fruited stink moss, entireleaf nitrogen moss	Suspected	**Yes**
Tomenthypnum nitens	tomenthypnum moss, fuzzy hypnum moss	Suspected	No
Trematodon boasii (= *T. asanoi*)	Asano's trematodon moss	Suspected	**Yes**
Tritomaria exsectiformis	little brownwort	Suspected	No
Lichens	**Common Name**	**Documented or Suspected**	**Habitat in Proposed Project Area?**
Chaenotheca subroscida	pin lichen	Suspected	**Yes**
Dermatocarpon meiophyllizum	brook lichen	Suspected	No
Hypogymnia duplicata	ticker-tape lichen	Documented	**Yes**
Leptogium burnetiae	jellyskin lichen	Suspected	**Yes**
Leptogium cyanescens	blue jellyskin lichen	Suspected	**Yes**
Lobaria linita	cabbage lungwort	Suspected	**Yes**
Nephroma occultum	cryptic kidney lichen	Documented	**Yes**
Pannaria rubiginosa		Documented	**Yes**
Peltigera pacifica	fringed pelt lichen	Documented	**Yes**
Pilophorus nigricaulis	matchstick lichen	Suspected	No
Pseudocyphellaria rainierensis	specklebelly lichen	Documented	**Yes**
Ramalina pollinaria	chalky ramalina	Suspected	No
Stereocaulon spathuliferum	chalk foam, snow lichen	Suspected	**Yes**
Tholurna dissimilis	urn lichen	Documented	**Yes**
Usnea longissima	Methuselah's beard lichen	Documented	No
Fungi	**Common Name**	**Documented or Suspected**	**Habitat in Proposed Project Area?**
Alpova alexsmithii		Documented	**Yes**
Bridgeoporus nobilissmus	noble polypore	Documented	**Yes**
Choiromyces venosus		Suspected	**Yes**
Chroogomphus loculatus		Suspected	**Yes**
Cortinarius barlowensis		Documented	**Yes**

Cudonia monticola		Documented	**Yes**
Cystangium idahoensis		Suspected	**Yes**
Gastroboletus imbellus		Suspected	**Yes**
Gomphus kauffmanii		Documented	**Yes**
Helvella crassitunicata		Documented	**Yes**
Hygrophorus caeruleus		Suspected	**Yes**
Leucogaster citrinus		Documented	**Yes**
Macowanites mollis		Documented	**Yes**
Mythicomyces corneipes		Documented	**Yes**
Octaviania macrospora		Documented	**Yes**
Otidea smithii		Documented	**Yes**
Phaeocollybia attenuata		Documented	**Yes**
Phaeocollybia californica		Documented	**Yes**
Phaeocollybia olivacea		Documented	**Yes**
Phaeocollybia oregonensis		Documented	**Yes**
Phaeocollybia piceae		Suspected	**Yes**
Phaeocollybia pseudofestiva		Documented	**Yes**
Phaeocollybia scatesiae		Documented	**Yes**
Pseudorhizina (=Gyromitra) californica		Documented	**Yes**
Ramaria amyloidea		Documented	**Yes**
Ramaria aurantisiccescens		Documented	**Yes**
Ramaria gelatiniaurantia		Documented	**Yes**
Ramaria spinulosa var. *diminutiva*		Suspected	**Yes**
Rhizopogon exiguus		Suspected	**Yes**
Rhizopogon inquinatus		Suspected	**Yes**
Sowerbyella rhenana		Documented	**Yes**
Stagnicola perplexa		Documented	**Yes**

Field Reconnaissance

Field surveys were conducted along the proposed mountain bike trails for two-and-a-half months (from August through October 2010). The proposed trails were marked with pin flags placed in the ground. Most of the trails were hiked three or, in some cases, more times looking for special-status (rare) botanical species, including Survey and Manage species (ROD 2001). Habitats surveyed included live tree and shrub boles and branches, downed branches, the forest floor, litter, large downed logs, snags, and rock.

The surveys were designed to detect epigeous (aboveground fruiting), but not hypogeous (belowground fruiting), fungi of the 31 special-status fungi identified as having potential habitat in Step 1 even though surveys for a number of these species, particularly the hypogeous fungi, are not considered practical. Positive identification of these species requires findng their aboveground fruiting bodies (mushrooms) or belowground fruiting bodies (truffles and false truffles) that do not fruit each year. Sporocarp (fruiting body) production is variable and unpredictable from year to year for all fungi (Vogt et al. 1992), so a one-time (e.g., 2010 fall) survey cannot reliably determine species presence or absence. Searching for truffle or false truffle species involves removing soil, duff, and litter by digging in the ground or raking the ground. Because of the challenges associated with surveys for fungi, surveys for many fungal species are considered to be impractical. Presence of a special-status fungal species is assumed if there is a documented site or if suitable habitat for a species was found in the proposed project area.

Vegetation Effects

Compared to the clearing of forest and glades (a total of about 79 acres) in 2006-2007 for the Timberline Express ski runs, the proposed construction of about 17.2 miles of trails (totaling about 14 acres of ground disturbance) for a Timberline mountain bike park constitutes a much smaller environmental impact on forests and meadows in RLK & Company's special-use permit area (1,415 acres). As seen from a bird's-eye view, the proposed mountain bike trails would be comparable to narrow corridors threading their way across the landscape. Direct impacts from trail construction and subsequent mountain bike traffic on vegetation, soils, and soil biota (including mycorrhizal fungi that benefit trees and other plants) would be limited, for the most part, to trails, so long as mountain bike riders remain on designated trails and do not widen them. Trails have been laid out to avoid cutting any trees greater than 6 inches in diameter-at-breast-height during trail construction. Larger and older trees would not be impacted. All of that said, however, there are vegetation and habitat impacts associated with the proposed project that are of concern:

1. Disturbance of subalpine, meadow, and forest habitats
   - Incursion and disturbance in subalpine meadows and openings, high montane meadows, and high montane forest
   - Clearing of native plant cover, particularly sensitive subalpine vegetation
   - Potential for trail widening and damage (e.g., the formation of ruts, grooves, gullies, and berms)
   - Potential for the creation of informal (unauthorized) trails or shortcuts between designated trails
2. Alteration of forest structure
   - Removal of snags considered a potential hazard to mountain bike riders along trails
3. Damage to tree roots
   - Creation of entry wounds for disease pathogens
   - Increased tree mortality
4. Introduction of invasive non-native plants and disease pathogens by mountain bike riders
   - Presently there are only a few invasive non-native species (bird's-foot trefoil, oxeye daisy, prostrate knotweed, white clover) in the proposed project area. The likelihood that mountain biking will introduce more invasive plant species is moderate to high.
   - Invasive plant species that could be introduced include hawkweeds (orange, meadow, and common), knapweeds (spotted, diffuse, and meadow), garlic mustard, St. John's-wort, herb Robert, shining geranium, Canada thistle, tansy ragwort, oxeye daisy, and hairy cat's-ear.
   - Shift in composition of native plant communities and decrease in native plant diversity
   - Removal of rocks to line trails risks creating opportunities for invasive plants to establish

- Risk of introducing native or exotic plant pathogens (e.g., root rots) leading to increased tree mortality

5. Increase in human detritus (litter and lost or discarded items)

Incursion by mountain bike trails in subalpine habitat (meadows and openings) and high montane forest in the proposed project area would add another layer of disturbance to these habitats following on the heels of a network of downhill ski runs (79 acres) cleared in the special-use permit area in 2006-2007. Trail construction would remove sensitive subalpine and high montane vegetation (e.g., alpine aster, broadleaf lupine, Cascade aster, diffuse phlox, Hitchcock's smooth woodrush, mountain arnica, mountain mariposa lily, Mt. Hood pussypaws, partridge foot, Newberry's fleeceflower, Pacific lupine [dwarf lupine], scarlet paintbrush) that have managed to sparsely populate these harsh environments. (See appendix for a complete list of botanical species in the proposed project area.) Lone individuals or small groups of plants grow isolated in many places in a matrix of open, bare, exposed, volcanic soil with sparse to no overstory. It takes a long time for such pioneering high-elevation plant species to colonize timberline environments characterized by a short growing season (July-September), long winters with persistent snowpacks (November-June), and extremely nutrient-poor soils. Plants in upper mountain zones are well adapted to short growing seasons, low summer air and soil temperatures, high interannual variability in climate, and intense ultraviolet radiation (Rochefort et al. 2006). Perennial plants of short stature often dominate these plant communities. The few annuals that do grow in this zone must be able to germinate, flower, and set seed within just a few weeks. Perennial plants often have high root/shoot ratios and have the ability to spread vegetatively. They establish in exposed areas with virtually no soil organic matter and bind soil particles, preventing soil erosion, particularly during snowmelt in June and July.

Such plants really do survive on the ecological edge. Future efforts to restore sparsely vegetated timberline habitat, once disturbed by trail construction and mountain bike traffic, will be challenging. Lower in elevation, high montane meadows, by contrast, support a lush cover of Cascade aster, broadleaf lupine, dwarf bramble, Hitchcock's smooth woodrush, mountain arnica, diffuse phlox, green false hellebore, sedges, rushes, grasses, and other species. These meadows remain undisturbed throughout the year, receiving few human visitors in the summer and lying under deep snow during the ski season. Mountain bike trails will clear vegetation, fragmenting and disturbing these meadows. There is a high likelihood that trampling of vegetation along the sides of trails or through the creation of informal (unauthorized) trails made by "rogue riders" will occur despite the best intentions of the trail designers and RLK & Company.

Removal of snags considered hazardous because they could potentially fall on riders along proposed trails would negatively alter forest structure in the proposed project area if quite a number of them are removed. There are many snags along the proposed trail system in the proposed project area. Snags are an important forest component, a source of coarse woody debris that provides a diversity of ecological functions (e.g., organic matter, nutrient cycling, water storage, and habitat for soil biota and wildlife). Construction of ski runs in the special-use permit area has already fragmented formerly contiguous forest into remnant patches. Removal of a large number of snags would further fragment these forest stands.

Even with careful armoring of trails to buffer impacts to root systems, mountain bike traffic will damage tree roots (through compaction or abrasion), making trees more susceptible to disease.

The routing of some mountain bike trails through "stringers" (narrow bands of residual forest), particularly in the upper third of the proposed project area containing subalpine and high montane forest, which now function as important refugia for plants and wildlife and reduce soil erosion from wind, would compact the root zone (*rhizosphere*) of residual trees, damaging their roots and thereby making trees more susceptible to disease, leading to increased tree mortality in these remnant patches of forest.

Rocks of various sizes would be pried out and moved from locations nearby to armor the surface of trails, resulting in soil disturbance additional to that caused by trail construction, creating growing space opportunities for invasive non-native plants where rocks are pried out.

Risk of Introducing Invasive Non-Native Plants or Plant Pathogens

Mountain bikers can transport invasive non-native plants and seed on their bikes, shoes, or clothes, greatly increasing the risk of introducing invasive plants in the special-use permit area. Presently, there are only a few invasive non-native plant species (bird's-foot trefoil, oxeye daisy, and prostrate knotweed) in the proposed project area, all in areas that have been disturbed (ski runs, roadsides, trailsides, building perimeters). Populations of bird's-foot trefoil (*Lotus corniculatus*) and oxeye daisy (*Leucanthemum vulgare*) can be found along the perimeter of Wy'East Lodge. Populations of prostrate knotweed (*Polygonum aviculare*) and white clover (*Trifolium repens*) are scattered among wood stand (wood fiber mulch) in the Timberline Express ski runs, evidently introduced in the wood strand or the seed mix that was applied to these areas in 2007. Mountain biking will likely introduce more invasive non-native plant species into the proposed project area.

Disturbance of vegetation and soils from mountain biking, as with hiking and horse riding, is likely to introduce invasive non-native plants (weeds) although there appear to be no research studies yet documenting invasive plants on trails used for mountain biking (Pickering et al. 2010). Similarly, no studies examining mountain bikes as weed seed vectors have been found in searches of the scientific literature simply because few studies have been done yet (Pickering & Mount 2009). However, mountain bikes clearly have the potential to act as vectors for the transport of weed seed (Pickering et al. 2010). Studies on vehicles as weed vectors indicate that seed from over 505 invasive non-native plant species can be transported over long distances by vehicles (Pickering & Mount 2009). Ferguson (2008) expresses her distress over the spread of the invasive plant garlic mustard (*Alliaria petiolata*) in forests in Ontario by free-riding (off-trail riding) mountain bikers. Garlic mustard, regarded as an ecosystem-altering invasive non-native plant species because of its ability to completely overrun forest understories, has spread from the town of Corbett to hiking trails in the Columbia River Gorge by recreationists (e.g., hikers, golf frisbee players) and animals (e.g., deer and elk). A population was recently found on the south side of the town of Welches by biologists with The Nature Conservancy—the first and only sighting of the plant so far in the upper Sandy River Basin. Meadows and glades in the Timberline special-use permit area are vulnerable to invasion by orange and meadow hawkweed (*Hieracium aurantiacum* and *H. pratense*). Populations of these invasive plant species already occur along Lolo Pass Road (west of Mt. Hood), along the Pacific Crest trail near Lolo Pass, and in the Mt. Hood Wilderness Area. Increased human activity will increase the risk of transporting such invasive species from source populations to uninfested areas like the proposed mountain bike park.

Similarly, plant pathogens can be transported from infected areas to uninfected areas by hikers, vehicles, animals, and mountain bikers. For example, mountain bike tires have been found to carry the spores of *Phytophthora ramorum,* a root pathogen causing sudden oak death syndrome in oaks and other plant species in California and the Pacific Northwest (Cushman et al. 2007). Wildlife, cattle, hikers, and workers in the woods can transport the root pathogen *Phytophthora lateralis,* which attacks and kills Port Orford cedar in southwestern Oregon and northern California, by moving spore-infested mud on feet and boots (Jules et al. 2002). *P. ramorum* is restricted mostly to oaks and *P. lateralis* to Port Orford cedar, so neither of these two pathogens would affect plant species in the special-use permit area. But mountain bikers could transport similar plant pathogens into forest stands in the special-use permit area that are not present there now.

Mountain biking increases the risk of introducing invasive non-native plants and disease pathogens not present in the special-use permit area, especially given that mountain biking visitors to the special-use permit area will have likely been in other mountain bike parks or riding areas elsewhere in the United States, Canada, or abroad that may contain invasive plants or disease pathogens not found in the special-use permit area.

Increase in Human Detritus

Pickering et al. (2010) observe that if mountain bike riders go on overnight rides in natural areas, human waste may introduce a range of biophysical impacts into the environment. Although there will be no overnight rides in the proposed Timberline mountain bike park, the potential for introducing human waste into meadows and forest may increase substantially given that restroom facilities are only located at the Wy'East Lodge. Mountain bike riders may find it easier to stop along trails and relieve themselves outdoors rather than waiting until the chairlift ride back to the Wy'East Lodge. Lost or discarded human detritus (e.g., trash/litter, plastic water bottles, soft drink cans, clothing) along the trails would certainly increase. There are already beverage cans, plastic water bottles, clothing, and other human detritus that have been either lost or discarded by skiers scattered throughout the proposed project area. Trash is not only unsightly but degrades the subalpine and forest environment.

Effects on Soils & Vegetation

Soils and vegetation are vulnerable to mountain biking. Damage to soils and vegetation can occur very quickly (Ferguson 2008). When soil is disturbed, the valuable upper layers of the soil become susceptible to erosion (soil loss). In contrast to the rapid loss of topsoil from mountain biking, hiking, or horse riding, it takes a long time (decades or much longer depending on the ecoregion) to create just a centimeter of topsoil (Ferguson 2008, Marion & Wimpey 2007). Loss of soil from erosion also means a loss of soil nutrients that are important to nutrient cycling in forests and meadows. Soil compaction, erosion, trail widening, and vegetation disturbance are commonly cited impacts associated with mountain biking that vary in severity with location, soil type, rainfall, and use (Sun & Walsh 1998).

Soil structure, slope, and environmental factors are as influential as type and amount of use in determining impacts such as soil loss. If managed properly, impacts such as compaction and vegetation loss can be confined to the trail, with minimal damage to trail peripheries (White et al.

2006). The creation and maintenance of trail corridors remove shrubs and trees, allowing greater sunlight exposure that favors a different set of groundcover plants within trail corridors (Marion & Wimpey 2007). Trampling (the action of crushing or treading upon vegetation, either by foot, hoof, or tire) causes a wide range of vegetation impacts, including damage to plant leaves, stems, and roots, reduction in vegetation height, change in the composition of species, and loss of plants and vegetative cover (Marion & Wimpey 2007, Leung & Marion 1996, Thurston & Reader 2001). Trailside trampling within trail corridors favors the replacement of fragile plants (e.g., broadleaved herbs) with those more resistant to trampling traffic (e.g., grasses, sedges) or those able to exploit disturbed ground (e.g., invasive non-native plants). Trail construction, use, and maintenance can be harmful when trails divide sensitive or rare plant communities. Trampling associated with avoidable off-trail traffic can quickly break down vegetation cover and create a visible route that attracts additional use (Marion & Wimpey 2007). Informal (unauthorized) trails can be created rapidly with a substantial amount of vegetation and soil impact occurring in a relatively short period of time (Webber 2007). Complete loss of vegetation cover occurs quickly in shady forested areas and less quickly in open areas with resistant grassy vegetation (Marion & Wimpey 2007). Studies have consistently revealed that most impact occurs with initial or low use, with a diminishing increase in impact associated with increasing levels of traffic (Hammit & Cole, 1998; Leung & Marion, 1996). Once trampling occurs, however, vegetative recovery is a very slow process (Marion and Wimpey 2007, Ferguson 2008).

Compositional changes in vegetation along trails can have beneficial or adverse effects. Trampling-resistant plants (e.g., certain grasses and sedges) provide a durable groundcover that reduces soil loss by wind and water runoff and have root systems that stabilize soils against displacement by heavy traffic (Marion & Wimpey 2007). Invasive non-native vegetation can be introduced to and spread along trail corridors (Ferguson 2008). Many of these species are associated with disturbance and are naturally limited to areas where vegetation is routinely trampled or cut back. However, many non-native species, once introduced, are able to out-compete native plants and spread from the trail corridor into undisturbed habitats. Some of these species form dense cover that crowds out or displaces native plants. Removal or control of invasive plants is difficult and expensive. Restoration of the sides of trails where riders have physically damaged plants and trees is difficult (Ferguson 2008). Young trees (saplings and seedlings), shrubs, and forbs—all are vulnerable to trampling from a mountain bike pass. Native understory species, once knocked over or ridden over, may be damaged to the point of non-recovery within a growing season (Ferguson 2008). Additionally, plants that have been placed in the ground for restoration efforts are already faced with the challenge of survival due to their sensitivity to environmental stresses; coupled with damage from mountain bikes the risk of a transplant not surviving increases (Ferguson 2008).

Mountain Biking and the Spread of Invasive Plants

Little scientific research exists investigating the potential of mountain biking to introduce and spread invasive non-native (exotic) plants. Consequently, researchers have been cautious in making any generalizations or drawing any conclusions. For example, mountain bike trails as vectors for the spread of invasive non-native (exotic) plant species have been identified as a concern, but little empirical work is available to draw any conclusions beyond the knowledge that exists for other similar hiking and horse trails (Quinn & Chernoff 2010). Despite the considerable literature documenting the presence of weeds along roads and trails, there is a lack of experimental studies assessing the direct and indirect role of hikers, horse riders, and mountain bikers, respectively, in the introduction and spread of weeds; further research is required into the potential of mountain bikes, horses, and people to act as vectors for weed seeds and to cause environmental disturbance that favors weeds (Pickering et al. 2010). That said, however, there is an ample body of scientific literature in the field of weed ecology documenting that invasive plants are able exploiters of disturbed ground and increase at sites that have been disturbed (e.g., see Pickering & Mount 2010). It is also well established that people and animals are weed vectors. People introduce weeds into natural areas, transporting their seeds on motorized or non-motorized vehicles (e.g., tires, wheels, radiator grilles, undercarriages, bike chains, pedals), clothing, and shoes. Roads and trails are primary conduits for their spread. Soil disturbance allows for the invasion of undesirable non-native species by creating an unfavorable soil environment for native plants to reproduce and grow but one exploitable by opportunistic non-native plants (Ferguson 2008). Incursion by an invasive plant species can last a lifetime (the span of a human life) if there is no effort to prevent it from colonizing or to control it once present. Control of a species, once it has invaded, is much more costly than preventing it from establishing in the first place. Many invasive non-native plant species are associated with disturbance and are naturally limited to areas where vegetation is routinely trampled or cut back (Marion & Wimpey 2007); however, some non-native species, once introduced to trail corridors, are able to out-compete native plants and spread away from the trail corridor into undisturbed habitats (Ferguson 2008). Some of these species form dense cover that crowd out or displace native plants. Unfortunately, removal of invasive species is difficult and expensive. Control rather than eradication is the usually the most realistic outcome.

Botany Table 2 presents Project Design Criteria that have been included in the proposed action to address the concerns discussed above.

Botany Table 2
Project Design Criteria

Veg-1	All mountain bike trails would be designed to avoid the cutting of trees with a diameter at breast height (dbh) greater than 6" to reduce impacts to upland forest and riparian reserves. No whitebark pine would be cut. Bike park trails would be routed around large trees and, where possible, around the roots of larger trees to prevent damage to tree roots. (See also Soil-3).	Construction
Veg-2	Clearing limits for bike park trail, including any trees greater than 6"dbh that cannot be avoided, would be reviewed in the field and approved by the Forest Service Permit Administrator.	Construction
Veg-3	If any new populations of special-status plant species are encountered during the construction process, work would be suspended in that area until the Forest Service Permit Administrator is consulted.	Construction
Veg-4	Clean heavy equipment either: A) prior to arrival on MHNF, to prevent the introduction of invasive plant seed or other vegetative propagules (e.g., stem and root fragments). The contract administrator or project activity coordinator would inspect all project equipment before it is allowed to operate at the project site. The equipment should be free of soil clumps and vegetative matter or other debris that could contain or hold seeds or other vegetative	Construction

	propagules. Cleaning of the equipment would include pressure washing and should be done outside of the National Forest boundary; or B) a self-contained heavy equipment cleaning station may be set up at the project site, for cleaning the equipment thoroughly in order to remove soil clumps and vegetative matter or other debris that could contain or hold weed seeds.	
Veg-5	If gravel, soil, or wood is imported from outside the project area, it should be determined to be from a source approved by the Forest Service Permit Administrator, who will consult with the MHNF botanist to determine if the soil, gravel, or wood is free of invasive species.	Construction
Veg-6	Survey project areas with any ground disturbance or vehicular traffic annually, during the time of year when invasive non-native plants, including noxious weeds, are identifiable. Long-term control must include periodic removal of any invasive non-native plant species and reporting of their presence and exact location (UTM coordinates in NAD-83 datum), when found, to the Forest Service Permit Administrator, who will consult with the MHNF Forest botanist within one month of finding.	Both
Veg-7	Avoid daylighting the trail by protecting overstory vegetation and defining the limits of the bike trails with vegetation, wood, rocks, or other native materials.	Both
Veg-8	Aggressively treat invasive plants by manual control or with herbicides. The Forest Service Permit Administrator will consult with the MHNF botanist on which method works best for which species.	Operations
Veg-9	Bike park staff (RLK) would monitor trail conditions throughout the hours of operation on a daily basis to ensure that unauthorized trails or terrain features are not created by riders.	Operations
Veg-10	RLK would prepare a Plant Salvage Plan in conjunction with the Forest Service. The plan will be approved by the Forest Service prior to construction. The plan will identify methods (outlined in the botany specialist report) and locations for the salvage of whole plants from proposed trails in advance of trail construction. The plan will also identify transplant locations for re-planting once construction is completed (e.g., areas along trails where excavated material has been sidecast, in restoration projects, or in sparsely vegetated areas in adjacent ski runs). The objective is to make use of (i.e., salvage) plants in the area that would needlessly be destroyed during trail construction.	Construction
Veg-11	Vegetation transplanting would be carried out as described in the section "Plant Propagation & Restoration" in the botany specialist report.	Construction
Veg-12	Collect seed from native plants in the special-use permit area and propagate seedlings from this seed in a nursery for restoration of disturbed areas in subsequent years. Directly sow collected seed in disturbed areas for those species for which this method is effective. Consult with Mt. Hood National Forest botanist for details.	Construction
Veg-13	Use only native plant materials (seed, transplants, seedlings, divisions, cuttings) collected locally on the Mt. Hood National Forest. If supplies of locally collected native seed (e.g., mountain brome, blue wildrye grass) are low and erosion control or restoration of disturbed areas is urgent, use annual ryegrass (*Lolium perenne* ssp. *multiflorum*), which is a nonpersistent nonnative grass species, or a mix of native species mixed with annual ryegrass.	Construction

Veg-14	Use GIS and GPS mapping technology and photopoints to provide an accurate and informative assessment of the impact of mountain bike riders on trails in the mountain bike park. Repeating the assessment at regular intervals (e.g., annually) can identify problems (e.g., trail widening, excessive soil disturbance, vegetation trampling, informal trails), document informal trails, and determine where re-vegetation or other remedies are needed. Include this information in the Annual Monitoring Report (see Mon-2).	Both
Veg-15	Through signage, educate riders about the environmental consequences of unauthorized trail development, about the benefits of low-impact riding practices (e.g., avoiding skidding on the trail, riding within established trail corridors, avoiding impacts to vegetation) and about invasive non-native plants and the potential for the transport of invasive plant seed or vegetative propagules on mountain bikers (e.g., tires, wheels, spokes, frame, pedals, shoes, clothing). Educate riders that dirt and mud on their clothes and shoes from riding elsewhere before coming to the Timberline downhill mountain bike park could harbor and spread invasive plant seed or propagules.	Operations
Veg-16	RLK would provide a cleaning station for mountain bikes near the proposed skills park in the Wy'East parking lot area and require that all riders coming to the bike park for the first time from riding elsewhere (outside the park) ~~to~~ clean their bikes of mud, dirt, and other debris, which could harbor invasive plant seeds or propagules.	Operations
Veg-17	Open the mountain bike park each summer only after trails are snow-free and soils are not saturated. Snow drifts may be removed from the trails when the surrounding ground is snow-free, provided no earth or vegetation disturbance takes place.	Operations
Veg-18	Regulate access to trails and the skills park by use of physical barriers (e.g., boulders, fences, logs, vegetation).	Operations
Veg-19	Patrol for trash and clean up trash along trails and elsewhere in the mountain bike park.	Operations
Veg-20	Salvage plants currently occupying the proposed skills park and proposed bike park trails and transplant them in and around the historic Timberline Lodge. (See also Veg-11).	Construction
Veg-21	Confine soil disturbance around the skills park using entrances and barriers. Prevent soil disturbance and trampling/denudation of vegetation around and outside the skills park.	Operations

Cumulative Effects to Vegetation: Layers of Disturbance

Viewed in the larger context of both past and future disturbances, a Timberline mountain bike park would add another layer of disturbance to subalpine and high-montane forests and meadows in the special-use permit area (1,415 acres in size). Past disturbance (construction of ski runs, chairlifts, and service roads, including those recently constructed for the Timberline Express project in 2006-2007, and four existing mountain bike trails) has removed vegetation and disturbed soils in the special-use permit area. A 1952 aerial photo shows roughly 593 acres of forest in the special-use permit area at that time. Since then, roughly 103 acres of forest have been removed for ski runs, a 17 percent reduction in forest habitat, leaving roughly 490 acres of forest remaining.

Ecologically, the cumulative disturbance to forest and meadows in the special-use permit area reduces their resiliency to future environmental stresses (e.g., climate change, summer drought, disease, insect attack, invasion by non-native plants). Structural fragmentation of residual forest and trail incursion in meadows lower the environmental quality and health of these habitats and devalue their aesthetic quality for the general visitor. Subalpine and high-montane forest and meadows (i.e., particularly in the upper half of the proposed project area) grow on shallow, volcanically derived soils low in organic matter and nutrients, which slow tree establishment and growth.

Survey Results

Federally Listed Threatened or Endangered Species

Howellia aquatilis (vascular plant), the only plant species federally listed as threatened by the U.S. Fish and Wildlife Service, is generally confined to palustrine wetlands. This species is suspected to occur on the Mt. Hood National Forest but there are no documented sites for it. Wetlands are excluded from the proposed project; therefore, the proposed action will have **NO EFFECT** on this threatened species. There are no plants in Region 6 that are federally listed as endangered.

Special-Status Species

Populations of the moss *Rhizomnium nudum* (both a Region 6 Sensitive and Survey & Manage species) were found in the proposed project area in the riparian/wetland complex associated with Still Creek and it tributaries adjacent to and above the Jeff Flood ski chairlift terminal. These populations were found during survey work for the Timberline Express EIS (2005). Attempts to refind these populations during surveys for the proposed mountain bike park were not made because the proposed bike trails lie outside the riparian/wetland complex where the populations are located. A population of *R. nudum* was found along the toe of the streambank for Still Creek about 50 ft. north of a proposed mountain bike trail; however, this proposed trail was later dropped for reasons other than the presence of *R. nudum*.

Fungi

No special-status fungi were found.

Bridgeoporus nobilissimus (fungus) is known from several sites on the Zigzag Ranger District (Larch Mountain, Wildcat Mountain, the Bull Run watershed), the far west side of the Clackamas River Ranger District (Goat Mountain, South Fork Mountain, and in the vicinity of Memaloose Lake and Williams Lake), and on nearby Salem District BLM-administered lands. There are 12 known sites on the Mt. Hood National Forest (NRIS 2010). It is certain that the perennial conk of *B. nobilissimus* is present elsewhere on the Clackamas River and Zigzag Ranger Districts in forests and within road prisms wherever large-diameter noble fir or Pacific silver fir stumps, snags, and live trees are present. This conk is present year-round, growing at the base of large-diameter noble fir or Pacific silver fir stumps, snags, and, occasionally, live trees—and sometimes out of the ground. It is known from road prisms (FS road 2609 on Wildcat Mountain) and young plantations, where it is always associated with large-diameter true (noble or Pacific silver) fir stumps or snags.

Because B. nobilissimus conks are detectable year-round, surveys for this species are practical and required in areas with suitable habitat for this species. No *B. nobilissimus* conks were found in the proposed project area containing noble fir or Pacific silver fir during surveys. Therefore, there will be **no impact** to this special-status fungal species.

Fungi Assumed Present Within or Adjacent to the Project Area

The following thirty-one special-status fungi have a reasonable likelihood of occurring in the proposed project area. Surveys for these species are not considered practical so they are simply assumed to be present in the proposed project area. A brief discussion is included below for each species. The proposed action may have an impact on individuals or their microhabitat, but neither the construction of mountain bike trails nor mountain bike traffic along trails, if they are constructed, are expected to lead to a trend toward federal listing of any of these species of fungi.

1. ***Alpova alexsmithii***, in the false truffle group, forms fruiting bodies beneath the soil surface and is associated with conifer trees in the Pinaceae family, particularly western hemlock and mountain hemlock, from 1,200 to 3,200 meters in elevation. There are only four known sites on the Mt. Hood National Forest (NRIS 2010).

2. Choiromyces venosus, in the true truffle group, forms fruiting bodies beneath the soil surface under Douglas-fir and western hemlock at low elevations. Only two known sites were reported for this species in the Northwest Forest Plan area in 1999 (Castellano et al.). No known sites are documented on the Mt. Hood National Forest (NRIS 2010), but the species is suspected to occur on the Forest.

3. ***Chroogomphus loculatus*** is endemic to Oregon and forms fruiting bodies beneath the soil surface. This species is associated with various conifers in the Pinaceae family, particularly mountain hemlock, at mid-elevations. No known sites are documented on the Mt. Hood National Forest (NRIS 2010), but the species is suspected to occur on the Forest.

4. ***Cortinarius barlowensis*** is widely distributed, known from 16 sites in the western Cascade Range (Oregon and Washington), Coast Range, and Olympic Mountains. There are two known sites from the Mt. Hood National Forest (Zigzag Ranger District). Habitat is soil in coniferous forest.

5. ***Cudonia monticola*** is endemic to the Pacific Northwest and grows under conifers in the spring and summer. This earth tongue fungus is scattered to gregarious, growing on spruce needles, coniferous debris, humus, soil, or rotting wood. There are two known sites on the Mt. Hood National Forest (NRIS 2010).

6. ***Cystangium idahoensis*** (formerly *Martellia idahoensis*) forms fruiting bodies beneath the soil surface and is associated with the roots of Pacific silver fir, subalpine fir, noble fir, Engelmann spruce, and mountain hemlock from 1,200 to 1,650 meters in elevation. No known sites are documented on the Mt. Hood National Forest (NRIS 2010), but the species is suspected to occur on the Forest.

7. ***Gastroboletus imbellus*** is endemic to Oregon and only one site was reported for this species (on the Willamette National Forest) in 1999 (Castellano et al.). No known sites are documented on the Mt. Hood National Forest (NRIS 2010), but the species is suspected to occur on the Forest. This species forms fruiting bodies beneath the soil surface and is associated with the roots of grand fir, subalpine fir, and mountain hemlock at higher (5,000 ft. or more) elevations.

8. ***Gomphus kauffmanii*** is endemic to western North America and found in California, Oregon, and Washington along the Pacific coast or in the Cascade Range. There are six known sites for this mushroom on the Mt. Hood National Forest. Host trees for *G. kauffmanii* include true firs and pines. *G. kauffmanii* forms symbiotic associations with the fine-root systems of plants.

9. ***Helvella crassitunicata*** is endemic to Oregon and Washington and grows scattered to gregarious on soil, especially along trails, in montane regions with Pacific silver fir, noble fir, grand fir, and subalpine fir. There are only two known sites documented on the Mt. Hood National Forest (NRIS 2010).

10. ***Hygrophorus caeruleus*** is endemic to Oregon and Washington and occurs in soil with roots of conifer trees near melting snowbanks. The species epithet *caeruleus* refers to the blue-tinged color of the mushroom and its blue-green waxy gills. No known sites are documented on the Mt. Hood National Forest (NRIS 2010), but the species is suspected to occur on the Forest.

11. ***Leucogaster citrinus***, a false truffle**,** is endemic to the Pacific Northwest with 45 sites known from western Washington, western Oregon, and northern California. There are four known sites on the Mt. Hood National Forest (Zigzag Ranger District). This belowground-fruiting species is associated with the roots of white fir, subalpine fir, lodgepole pine, western white pine, Douglas-fir, and western hemlock from 280 to 2,000 meters in elevation.

12. ***Macowanites mollis*** is endemic to Oregon and Washington. There is only one known site on the Mt. Hood National Forest (Larch Mountain). This mushroom looks like a disfigured specimen of *Russula* or *Lactarius* and is found in association with the roots of grand fir, Douglas-fir, and western hemlock above 1,000 meters elevation.

13. ***Mythicomyces corneipes*** is widespread across western North America and northern Europe and was reported on the Mt. Hood National Forest (Castellano et al. 2003); however, no known sites are documented on the Mt. Hood National Forest in the NRIS database (2010). This species is in the Cortinariaceae family, is solitary to gregarious in habit, and grows along margins of bogs among mosses or on wet soil under conifers and alder species.

14. ***Octaviania macrospora***, a false truffle, is endemic to Oregon and found in association with the roots of western hemlock. One known site for the entire Northwest Forest Plan area is reported for the Mt. Hood National Forest (Twin Bridges Campground) by Castellano et al. (1999); however, no known sites are documented on the Mt. Hood National Forest in NRIS (2010).

15. ***Otidea smithii*** is endemic to the Pacific Northwest, known from 10 scattered sites in western Washington, western Oregon, and northern California. It is also known from Idaho. One location is known on the Mt. Hood National Forest (Clackamas River Ranger District). *O. smithii* grows in soil, duff, or moss under Douglas-fir, western hemlock, and cottonwood.

16. ***Phaeocollybia attenuata*** is endemic to western North America from British Columbia south to Marin County (northern California) with 131 sites known from western Washington and Oregon to northern California. One known site is reported by Castellano et al. (1999) for the Mt. Hood National Forest (Larch Mountain); however, no known sites are documented in NRIS (2010). *P. attenuata* grows scattered to closely gregarious in humus and with mosses in moist coniferous forest (Sitka spruce, western hemlock, true firs, and Douglas-fir). It is recorded most frequently from Oregon coastal forests (Norvell & Exeter 2009).

17. ***Phaeocollybia californica*** is endemic to the Pacific Northwest with 34 sites known from western Washington, western Oregon, and northern California. There is one known site on the Mt. Hood National Forest (Larch Mountain) recorded in NRIS (2010). *P. californica* is terrestrial (mycorrhizal), fasciculate (growing in close bundles) to gregarious (growing in arcs) in habit, and occurs in humic soils of moist coniferous (true fir, hemlock, Douglas-fir) forest and mixed (true fir, Pacific madrone, oak, Douglas-fir, and hemlock) coastal and coastal montane forests.

18. ***Phaeocollybia olivacea*** is endemic to the Pacific Northwest with 106 sites known from western Washington, western Oregon, and northern California. There is only one documented site on the Mt. Hood National Forest (near Estacada) (NRIS 2010). This mushroom species is terrestrial (mycorrhizal), grows in clusters or is gregarious (growing in arcs), and associated with the roots of Douglas-fir, western hemlock, and Pacific silver fir.

19. ***Phaeocollybia oregonensis*** is endemic to the Pacific Northwest with 10 sites known from the Oregon Coast Range and the western Cascade Range. There are five known sites documented on the Mt. Hood National Forest (NRIS 2010). This mushroom species is terrestrial (mycorrhizal), occurring solitary to gregarious, and associated with the roots of true fir, western hemlock, and Douglas-fir.

20. ***Phaeocollybia piceae*** is endemic to the Pacific Northwest, known from 49 sites in western Washington, western Oregon, and northern California. One known site is reported by Castellano et al. (1999) for the Mt. Hood National Forest (Wildcat Mountain); however, no known sites are documented in NRIS (2010). This mushroom species is terrestrial (mycorrhizal), occurring solitary to scattered in small groups, and associated with coniferous (spruce, hemlock, Douglas-fir, true fir) forests.

21. ***Phaeocollybia pseudofestiva*** is endemic to the Pacific Northwest, known from British Columbia south through western Washington and western Oregon to California. There are 38 known sites in Washington, Oregon, and California. Only two sites are documented on the Mt. Hood National Forest (NRIS 2010). The species is terrestrial (mycorrhizal) and occurs solitary to densely gregarious in coniferous (spruce, fir, hemlock, and Douglas-fir) forest.

22. ***Phaeocollybia scatesiae*** is endemic to the Pacific Northwest with 17 sites documented in the Northwest Forest Plan area, three of those on the Mt. Hood National Forest (Zigzag Ranger District). This species is terrestrial (mycorrhizal), grows densely caespitose (clumped) in erumpent mounds in woody humus in coastal and montane (<4,000 ft.) coniferous forests.

23. ***Pseudorhizina (=Gyromitra) californica*** is found from British Columbia south to northern California and east to Colorado, Montana, and Nevada. It is known in Washington, Oregon, and northern California from 35 sites, one of which is on the Mt. Hood National Forest (Hood River Ranger District). *G. californica* grows on well-rotted stumps and logs of conifers or in soil with rotted wood.

24. ***Ramaria amyloidea*** is endemic to the Pacific Northwest with 16 sites known from western Washington to northern California. There is one known site on the Mt. Hood National Forest (NRIS 2010). Habitat for the species is soil in coniferous forest.

25. ***Ramaria aurantiisiccescens*** is endemic to the Pacific Northwest with sites known from western Washington to northern California. There are two known sites documented on the Mt. Hood National Forest (NRIS 2010). Habitat for the species is humus or soil in coniferous (true fir, Douglas-fir, and western hemlock) forest.

26. ***Ramaria gelatiniaurantia*** is endemic to the Pacific Northwest with 24 sites known from western Washington to northern California. Three sites are reported by Castellano et al. (1999) for the Mt. Hood National Forest (Eagle Creek, junction of FSroads 4610 and 150, and Fish Creek Road); however, no known sites are documented in NRIS (2010). Habitat for the species is humus or soil in coniferous (true fir, Douglas-fir, and western hemlock) forest.

27. ***Ramaria spinulosa* var. *diminutiva*** has not been reported for the Mt. Hood National Forest, but it is suspected to occur here. Castellano et al. (1999) reported a site in Mendocino County (northern California) and a site on the Mt. Baker-Snoqualmie National Forest (Glacier Peak Wilderness). Habitat for the species is humus or soil in coniferous (true fir, Douglas-fir, and western hemlock) forest.

28. ***Rhizopogon exiguus***, a false truffle, is endemic to Oregon with known sites from the Mt. Baker-Snoqualmie, Siuslaw, and Siskiyou National Forests. There are no known sites on the Mt. Hood National Forest although the species is suspected to occur here. This species is associated with the roots of Douglas-fir and western hemlock.

29. ***Rhizopogon inquinatus***, a false truffle, is found in association with the roots of Douglas-fir and western hemlock from 500 to 1,400 meters elevation. There are no known sites on the Mt. Hood National Forest although the species is suspected to occur on the Forest. Castellano et al. (1999) report two sites on the Willamette National Forest.

30. ***Sowerbyella rhenana*** occurs in Europe, Japan, and northwest North America. In the Pacific Northwest, it is known from 63 sites in western Washington, western Oregon, and northern California, including two sites from the Mt. Hood National Forest (Eagle Creek, Rhododendron) according to Castellano et al. (1999); however, only one known site is listed in NRIS (2010) for the Forest. This species grows scattered to gregarious to caespitose (clumped) in duff of moist, relatively undisturbed, older coniferous forests (Castellano et al. 1999).

31. *Stagnicola perplexa*, in the Cortinariaceae family, grows in groups on rotten wood, occasionally buried deeply enough to appear "rooting" in wet (or recently) dried-up depressions in coniferous forest. One known site is reported for the Mt. Hood National Forest (middle fork of the Salmon River) by Castellano et al. (2003); however no known sites are listed in NRIS (2010) for the Forest.

Botany Table 3 summarizes the effect of the proposed project on special-status species present or with potential habitat in the proposed project area. Individuals or the habitat of some special-status species may be impacted (MIIH rating). A no effect/impact (NI) rating is given for species whose habitat is not present in the proposed project area. It is assumed there will be no effect on species whose habitats are not present in the proposed project area.

Botany Table 3
Biological Evaluation Process Summary by Species

SPECIES	Step #1	Step #2	Step #3	Step #4	Step #5
	Prefield Review	Field Reconn.	Conflict Determination	Analysis of Effects	Biological Investigation
	Habitat present in the proposed project area?	Species present?	Conflict?	Important?	Needed?
Vascular Plants					
Agoseris elata	No	No	No Impact	N/A	N/A
Arabis sparsiflora var. *atrorubens*	No	No	No Impact	N/A	N/A
Astragalus tyghensis	No	No	No Impact	N/A	N/A
Botrychium lunaria	**Yes**	No	No Impact	N/A	N/A
Botrychium minganense	No	No	No Impact	N/A	N/A
Botrychium montanum	No	No	No Impact	N/A	N/A
Calamagrostis breweri	**Yes**	No	MIIH	N/A	N/A
Carex abrupta	**Yes**	No	MIIH	N/A	N/A
Carex capitata	No	No	No Impact	N/A	N/A
Carex diandra	No	No	No Impact	N/A	N/A
Carex lasiocarpa var. *americana*	No	No	No Impact	N/A	N/A
Carex livida	No	No	No Impact	N/A	N/A
Carex retorsa	No	No	No Impact	N/A	N/A
Carex vernacula	**Yes**	No	MIIH	N/A	N/A
Castilleja thompsonii	No	No	No Impact	N/A	N/A
Cimicifuga elata var. *elata*	**Yes**	No	MIIH	N/A	N/A
Coptis trifolia	No	No	No Impact	N/A	N/A
Corydalis aquae-gelidae	No	No	No Impact	N/A	N/A
Delphinium nuttallii	No	No	No Impact	N/A	N/A
Diphasiastrum complanatum	**Yes**	No	MIIH	N/A	N/A
Elatine brachysperma	No	No	No Impact	N/A	N/A
Erigeron howellii	No	No	No Impact	N/A	N/A

Eucephalus (=Aster) gormanii	**Yes**	No	No Impact	N/A	N/A
Fritillaria camschatcensis	No	No	No Impact	N/A	N/A
Lewisia columbiana var. *columbiana*	No	No	No Impact	N/A	N/A
Lomatium watsonii	No	No	No Impact	N/A	N/A
Lycopodiella inundata	No	No	No Impact	N/A	N/A
Ophioglossum pusillum	No	No	No Impact	N/A	N/A
Phlox hendersonii	**Yes**	No	No Impact	N/A	N/A
Potentilla villosa	**Yes**	No	No Impact	N/A	N/A
Ranunculus triternatus (=R. reconditus)	No	No	No Impact	N/A	N/A
Romanzoffia thompsonii	No	No	No Impact	N/A	N/A
Rorippa columbiae	No	No	No Impact	N/A	N/A
Rotala ramosior	No	No	No Impact	N/A	N/A
Scheuchzeria palustris var.*americana*	No	No	No Impact	N/A	N/A
Sisyrinchium sarmentosum	**Yes**	No	No Impact	N/A	N/A
Streptopus streptopoides	**Yes**	No	No Impact	N/A	N/A
Sullivantia oregana	No	No	No Impact	N/A	N/A
Suksdorfia violacea	No	No	No Impact	N/A	N/A
Taushia stricklandii	**Yes**	No	No Impact	N/A	N/A
Utricularia minor	No	No	No Impact	N/A	N/A
Utricularia ochroleuca	No	No	No Impact	N/A	N/A
Wolfia boralis	No	No	No Impact	N/A	N/A
Wolfia columbiana	No	No	No Impact	N/A	N/A
Bryophytes					
Barbilophozia lycopodioides	No	No	No Impact	N/A	N/A
Brachydontium olympicum	**Yes**	No	MIIH	N/A	N/A
Bryum calobryoides	**Yes**	No	MIIH	N/A	N/A
Calypogeia sphagnicola	No	No	No Impact	N/A	N/A
Chiloscyphus gemmiparus	**Yes**	No	No Impact	N/A	N/A
Conostomum tetragonum	**Yes**	No	MIIH	N/A	N/A
Encalypta brevicollis	No	No	No Impact	N/A	N/A
Encalypta brevipes	No	No	No Impact	N/A	N/A
Gymnomitrion concinnatum	**Yes**	No	MIIH	N/A	N/A
Helodium blandowii	No	No	No Impact	N/A	N/A
Herbertus aduncus	**Yes**	No	MIIH	N/A	N/A
Lophozia laxa	No	No	No Impact	N/A	N/A
Polytrichum sphaerothecium	**Yes**	No	MIIH	N/A	N/A
Rhizomnium nudum	**Yes**	**Yes**	MIIH	N/A	N/A
Rhytidium rugosum	**Yes**	No	MIIH	N/A	N/A
Schistostega pennata	**Yes**	No	MIIH	N/A	N/A
Scouleria marginata	**Yes**	No	No Impact	N/A	N/A
Splachnum ampullaceum	No	No	No Impact	N/A	N/A
Tayloria serrata	**Yes**	No	MIIH	N/A	N/A
Tetraphis geniculata	No	No	No Impact	N/A	N/A
Tetraplodon mnioides	**Yes**	No	MIIH	N/A	N/A
Tomenthypnum nitens	No	No	No Impact	N/A	N/A
Trematodon boasii (= T. asanoi)	**Yes**	No	MIIH	N/A	N/A
Tritomaria exsectiformis	No	No	No Impact	N/A	N/A
Lichens					

Chaenotheca subroscida	**Yes**	No	MIIH	N/A	N/A
Dermatocarpon meiophyllizum	No	No	No Impact	N/A	N/A
Hypogymnia duplicata	**Yes**	No	No Impact	N/A	N/A
Leptogium burnetiae	**Yes**	No	MIIH	N/A	N/A
Leptogium cyanescens	**Yes**	No	MIIH	N/A	N/A
Lobaria linita	**Yes**	No	MIIH	N/A	N/A
Nephroma occultum	**Yes**	No	MIIH	N/A	N/A
Pannaria rubiginosa	**Yes**	No	MIIH	N/A	N/A
Peltigera pacifica	**Yes**	No	MIIH	N/A	N/A
Pilophorus nigricaulis	No	No	No Impact	N/A	N/A
Pseudocyphellaria rainierensis	**Yes**	No	No Impact	N/A	N/A
Ramalina pollinaria	No	No	No Impact	N/A	N/A
Stereocaulon spathuliferum	**Yes**	No	MIIH	N/A	N/A
Tholurna dissimilis	**Yes**	No	No Impact	N/A	N/A
Usnea longissima	No	No	No Impact	N/A	N/A
Fungi					
Alpova alexsmithii	**Yes**	Assumed Presence	MIIH	N/A	N/A
Bridgeoporus nobilissmus	**Yes**	No	No Impact	N/A	N/A
Choiromyces venosus	**Yes**	Assumed Presence	MIIH	N/A	N/A
Chroogomphus loculatus	**Yes**	Assumed Presence	MIIH	N/A	N/A
Cortinarius barlowensis	**Yes**	Assumed Presence	MIIH	N/A	N/A
Cudonia monticola	**Yes**	Assumed Presence	MIIH	N/A	N/A
Cystangium idahoensis	**Yes**	Assumed Presence	MIIH	N/A	N/A
Gastroboletus imbellus	**Yes**	Assumed Presence	MIIH	N/A	N/A
Gomphus kauffmanii	**Yes**	Assumed Presence	MIIH	N/A	N/A
Helvella crassitunicata	**Yes**	Assumed Presence	MIIH	N/A	N/A
Hygrophorus caeruleus	**Yes**	Assumed Presence	MIIH	N/A	N/A
Leucogaster citrinus	**Yes**	Assumed Presence	MIIH	N/A	N/A
Macowanites mollis	**Yes**	Assumed Presence	MIIH	N/A	N/A
Mythicomyces corneipes	**Yes**	Assumed Presence	MIIH	N/A	N/A
Octaviania macrospora	**Yes**	Assumed Presence	MIIH	N/A	N/A
Otidea smithii	**Yes**	Assumed Presence	MIIH	N/A	N/A
Phaeocollybia attenuata	**Yes**	Assumed Presence	MIIH	N/A	N/A
Phaeocollybia californica	**Yes**	Assumed Presence	MIIH	N/A	N/A
Phaeocollybia olivacea	**Yes**	Assumed	MIIH	N/A	N/A

		Presence			
Phaeocollybia oregonensis	**Yes**	Assumed Presence	MIIH	N/A	N/A
Phaeocollybia piceae	**Yes**	Assumed Presence	MIIH	N/A	N/A
Phaeocollybia pseudofestiva	**Yes**	Assumed Presence	MIIH	N/A	N/A
Phaeocollybia scatesiae	**Yes**	Assumed Presence	MIIH	N/A	N/A
Pseudorhizina (=Gyromitra) californica)	**Yes**	Assumed Presence	MIIH	N/A	N/A
Ramaria amyloidea	**Yes**	Assumed Presence	MIIH	N/A	N/A
Ramaria aurantisiccescens	**Yes**	Assumed Presence	MIIH	N/A	N/A
Ramaria gelatiniaurantia	**Yes**	Assumed Presence	MIIH	N/A	N/A
Ramaria spinulosa var. *diminutiva*	**Yes**	Assumed Presence	MIIH	N/A	N/A
Rhizopogon exiguus	**Yes**	Assumed Presence	MIIH	N/A	N/A
Rhizopogon inquinatus	**Yes**	Assumed Presence	MIIH	N/A	N/A
Sowerbyella rhenana	**Yes**	Assumed Presence	MIIH	N/A	N/A
Stagnicola perplexa	**Yes**	Assumed Presence	MIIH	N/A	N/A

No Impact = A project or activity will have *no* environmental impacts on habitat, individuals, a population, or a species because the habitats where these species occur are closed to special forest products use/harvest.
MIIH = May impact individuals or habitat, but will ***not*** likely contribute to a trend towards federal listing or loss of viability to the population or species.

Conclusion

The proposed action to construct a downhill mountain bike park in the vicinity of Timberline Lodge **may impact** some special-status vascular plant, bryophyte, lichen, or fungal species **or** their habitat, but will ***not*** likely contribute to a trend towards Federal listing or loss of viability to the population or species.

_____ No Impact

__X__ May Impact Individuals or Habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species.

_____ Will Impact Individuals or Habitat with a consequence that the action may *contribute to a trend towards Federal listing or cause a loss of viability to the population or species.*

The construction of 17.2 miles of proposed downhill mountain bike trails is not expected to threaten *Rhizomnium nudum* populations in the riparian/wetland complex near and above the Jeff

Flood ski chairlift terminal so long as trails are kept out of the riparian/wetland complex where *R. nudum* populations occur, mountain bike riders stay on designated trails and do not create informal (unauthorized) trails through the riparian/wetland complex where *R. nudum* occurs, mountain bike trails are patrolled frequently by park staff to keep all riders on designated trails, and sediment or other disturbance resulting from mountain bike traffic along trails does not impact *R. nudum* populations. Some populations of this moss occur along the toeslope of incised streambanks, streams that funnel water and sediment from above on the mountain, where downhill mountain bike trails are proposed for construction, downstream.

Two years of fall and spring surveys, at a minimum, are needed for a reasonable likelihood of detecting special-status fungi within proposed trails because fruiting body production can vary widely from year to year with some fungi not fruiting annually or for several years at a time (Vogt et al. 1992).

The construction of mountain bike trails may impact individuals or the habitat of special-status fungi that were detected during the 2010 fall field surveys (particularly hypogeous fungi which produce belowground fruiting bodies). Construction of trails would cut through belowground mycelia networks, destroying mycelia and their fruiting bodies, including those of undetected special-status fungi. However, trail widths are narrow and therefore small in terms of the areal extent of their impact on soils and mycelia. Mycological research indicates that the mycelia of mycorrhizal fungi can form an extensive underground web (a "wood-wide web") linking them to the fine roots of trees (Beiler et al. 2009, Zhou et al. 2001, Simard & Durall 2004). The mycelia of fungi that would be destroyed by trail construction, including those of undetected special-status species, would more than likely extend beyond the narrow width of trails. Undisturbed mycelia outside trails would in all likelihood survive the disturbance of trail construction and continue to persist, produce fruiting bodies, and regenerate sexually or asexually.

Excessive trail widening or the formation of informal (unauthorized) trails or shortcuts between designated trails would increase the risk of harm to mycelia of any undetected special-status fungi or, worse, the extirpation of the species at the site because a greater proportion of the mycelium or all of it might be destroyed. For this and other ecological reasons, it is important that designated trails be confined in width during their lifetime of use and that trail widening and formation of informal trails and shortcuts be prevented from occurring when mountain bikers use the trail system. If trail widening does occur, widened areas should be revegetated and monitored.

Survey and Manage

In addition to effects on TES species, all Forest Service projects, programs, and activities are reviewed for possible effects on Survey and Manage (S&M) species. The agencies' current direction is to apply the January 2001 *Record of Decision (ROD) and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures, Standards and Guidelines* (2001 ROD) for the Northwest Forest Plan without modifications made through the 2001, 2002, and 2003 Annual Species Review process.

The 2001 ROD includes direction to conduct "equivalent-effort" fungi surveys in old- growth forest for all habitat-disturbing projects with decisions in 2011 and beyond. Old-growth forest is defined as "at least 180-220 years old with moderate-to-high canopy closure; a multi-layered, multi-species canopy dominated by large overstory trees; high incidence of large trees; some with broken tops and other indications of old and decaying wood (decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground" (pp. 29-30, Standards and Guidelines, 2001 ROD). Based on surveys conducted in 2010 it was determined that much of the proposed project area (roughly ¾ of it) qualifies as old-growth mountain hemlock (*Tsuga mertensiana*) forest using a definition for old-growth hemlock developed by research ecologist David Peter of the Pacific Northwest Research Station in Olympia, WA.

Habitat disturbing activities are defined as "those disturbances likely to have a significant negative impact on the species' habitat, its life cycle, microclimate, or life support requirements." The 2001 ROD also states, "'Habitat disturbing' is not necessarily the same as 'ground disturbing'; helicopter logging or logging over snow-pack, for example, may not disturb the ground but might clearly affect microclimate or life cycle habitat factors. Conversely, an activity having soil-disturbing effects might not have a large enough scope to trigger a need to survey." (p. 22, Standards and Guidelines, 2001 ROD).

In determining a need for survey the 2001 ROD directs line officers to "consider the probablility of the species being present on the project site, as well as the probability that the project would cause a significant negative effect on the species habitat or the persistence of the species at the site." (p. 22, Standards and Guidelines, 2001 ROD).

Discussion

Although no Survey and Manage species were found during field surveys for special status fungi in 2010 there is a possibility that some do exist within the project area. This is due to habitat being present and the difficulty of locating the species during surveys. The project however would not have a significant adverse effect on the species because the mycelia of fungi that could be destroyed by trail construction, including those of undetected survey and manage species, would more than likely extend beyond the narrow width of trails. Trail widths are narrow and therefore small in terms of the areal extent of their impact on soils and mycelia. Mycological research indicates that the mycelia of mycorrhizal fungi can form an extensive underground web (a "wood-wide web") linking them to the fine roots of trees (Beiler et al. 2009, Zhou et al. 2001, Simard & Durall 2004). Undisturbed mycelia outside trails would in all likelihood survive the disturbance of trail construction and continue to persist, produce fruiting bodies, and regenerate sexually or asexually. The project would also not have a significant adverse effect since the host for these fungi species (old growth trees) are not being cut or removed with this project.

3.5 Heritage

Existing Condition

The project is located on the south slopes of Mt. Hood. Elevation for the projects ranges from 6035 feet at the highest trail, to 4860 feet at the lowest trail route area. The project will affect approximately 12.1 acres of MHNF land, all of which are currently within Timberline's Special Use Permit (SUP) area. The area of potential effect for the heritage resources study includes all proposed bike trails, skills park, and West Leg Road (Forest Road 2645) between the uppermost and lowermost crossings of the road.

The terrain varies from rolling slopes and benches, open meadows and slopes of 5- 30%, to steep, barren canyons up to 60% slope. Volcanic activity on Mt. Hood has occurred as recent as 180-300 years ago. Steam venting and minor ash eruptions were reported in 1859 and 1865. Fumeroles are currently active, and may occasionally be detected from areas very near the mountain peak. Earthquakes and tremors on the mountain occur frequently. Seismic activity was first recorded in 1896.

The project lies within the Pacific Silver Fir Vegetation Zone, of the Mt. Hood Forest. Western hemlock, mountain hemlock, Douglas-fir, western redcedar and noble fir constitute the primary overstory species. Underground species include huckleberry and Pacific rhododendron, with a ground cover of beargrass, lupine, lichens and various mosses. Culturally significant plants include western red cedar, beargrass and huckleberry. The project area encompasses known traditional huckleberry and cedar bark gathering areas.

In the subalpine highlands, soils vary from cobbly sandy loams to cobbly loams. These higher elevation soils are primarily influenced by volcanic ash deposits, with outcrops of tuffaceous breccia. The local soil consistes of a dark brown loams, with a subsoil of poorly developed, dark gray to dark brown sand and silt loam, mixed with course, unconsolidated glacial till. Boulders and cobbles of andesite and basalt are present. Soil deposition is primarily colluvial. Ground visibility is limited by detritus and ground cover, and ranges from 0-10% in vegetated areas to 55% in open areas. Precipitation ranges from 100 to 120 inches per year, primarily occurring as snow. Winters are severe, with high winds and snow from October to June.

Prehistory

Relatively little is known about the prehistory of Mt. Hood specifically, although studies of prehistoric use of the Cascades have received increasing emphasis over the past two decades (e.g., Burtchard, 1998; Burtchard and Keeler, 1994; Lewarch and Benson, 1991; Mack, 1989; Schalk, 1988; Zweifel and Reid, 1991). Occasional use of the southern Washington Cascades may date to 12,000-11,000 years B.P., as suggested by a Clovis-like fluted point found 10 miles east of Snoqualmie Pass (Hollenbeck and Carter, 1986). This early period is generally interpreted as representing a relatively uniform cultural adaptation characterized by small, mobile populations with an economy focused on hunting large game. Fishing, shellfish collecting, and plant gathering were probably at least minor elements of the subsistence, however, the archaeological record from this period is very limited and remains of plants and smaller animals have not yet been recovered.

Assemblages dating between ca. 10,000/8,000 and 5,000 B.P., and known variously as Cascade, Old Cordilleran, or Lithic, are characterized by large stemmed and lanceolate projectile points, core and large flake tools, lanceolate knives, scrapers, and edge-ground cobbles. Artifacts are made of crystalline volcanic rock and other locally available cobbles using a distinctive lithic reduction technology. The economy appears to have been more broadly based than in the previous period, with increased differentiation of cultures east and west of the Cascades and exploitation of more localized resources, including plants, fish, shellfish, and smaller mammals. Few occupations from this period are known from the Cascades, although "Cascade"-like projectile points have been found around several mountain lakes east of Snoqualmie Pass (Hollenbeck and Carter, 1986).

After about 5,000 B.P., cultures west of the Cascades exploited a broad range of marine resources, including shellfish, marine mammals, and freshwater and marine fish. A wide variety of ground and chipped stone and bone artifacts made of both local and imported materials are found in sites dating to the last 2,500 years, indicating complex and diversified technologies for fishing, hunting, food processing, and storage. Semi-subterranean pithouses east of the Cascades and cedar plank houses west of the Cascades are well represented after 3,500 to 3,000 B.P., evidence of a large, semi-sedentary regional population (Ames and Maschner, 1999; Blukis Onat, 1987; Fladmark, 1982; Galm et al., 1985). Increasingly specialized economies focused on a narrower range of resources and efficient storage technology are evident within the past 3,000-2,500 years. East of the Cascades, the primary resources exploited are salmon, river mussels, deer or mountain sheep, and roots (Chatters, 1989; Schalk and Cleveland, 1983). West of the Cascades, salmon become increasingly dominant, although other fish, shellfish, mammals, and plants continued to be used.

Increased occupation of upland and montane areas dates to ca. 4,500/4,000 B.P. and may be associated with higher regional population size and establishment of a logistical land use system emphasizing intensive exploitation of certain highly productive or predictable resources (e.g., Burtchard, 1998; Schalk, 1988). Sites attributed to this period have a greater proportion of groundstone tools than earlier sites, and cryptocrystalline silica (CCS) increasingly replaces crystalline volcanic rock for chipped stone tools.

Sites from the past 2,500 to 3,000 years in the Cascades are found in a wide variety of upland settings. Sites from both east and west slopes of the Cascades show a general continuity in distribution and contents, which may reflect, in part, closer inter-group connections via trade, travel, and kinship ties. Obsidian from sources in eastern Oregon is found in sites on both sides of the Cascade crest, in both Oregon and Washington.

Indian tribes on the Columbia Plateau began to acquire horses in the early to mid-eighteenth century, facilitating long-distance travel and carrying of heavier loads. Some groups began to make annual trips east to the Great Plains to hunt bison. Trips into and across the Cascades to collect huckleberries, hunt, and visit and trade with people from the other side of the mountains apparently also increased.

Socio-Cultural Description

Numerous archaeological investigations have been conducted in the foothills and uplands of the Western cascades Mountains and on lands of the Mt. Hood National forest. Syntheses of these studies, conducted on MHNF and other federally-administered lands have resulted in an overview of upland prehistory and models of prehistoric and historic land-use (Bryant et al 1978; Burtchard 1990 and 1993). Similarly, the general prehistoric context of the Portland Basin lowlands has been explored and interpreted through a variety of investigations (Minor et al 1993, 1994). Together, these studies can provide a general framework for examining the prehistoric nature of the MHNF and the Pacific Northwest.

Following direct and indirect contact with non-native people, Native Americans along the Columbia and in the Willamette Valley were heavily impacted by a series of epidemics. For the Portland Basin and lower Willamette, the greatest devastation came in the early 1830s during an outbreak of malaria, with estimates of population loss as high as 90% (Boyd, 1985:67). Considerable shifting about of people resulted, even before significant numbers of Euroamericans began moving into the valley. Native Americans in this area were and are the; Clackamas, Mollala, Warm Springs, Wasco, and Tenino, and the Paiute.

Wy'East is the name given to what we call Mt. Hood by the Native American Indians. They utilized the area and exploited the natural resources. Hunting deer and elk, as well as fishing, harvesting camas, tarweed seeds, hazelnuts, and gathering huckleberries were activities carried out in the area. They depended on roots, nuts, and seeds. Camas was especially important, being traded in the form of large dried cakes. Camas, along with salmon was one of the most highly traded and prized staples.

Whitebark pine nuts were collected in the timberline area of Mt. Hood, and several other kinds ofberries and medicinal plants were also gathered. Cedar bark, beargrass, willow, and other plants were used to make baskets and other items. Cambium, pitch, roots, bark and wood of other species were also used for food, medicines, construction materials, and fuel.

The U.S. Government, in the 1850s signed treaties with a number of Indian tribes in Oregon. Most tribal lands were ceded to the U.S. government and several reservations were established for the tribes to be relocated. The Confederated Tribes of the Warm Springs Reservation of Oregon was established by the Treaty of June 25, 1855 (12 Stat. 963, ratified March 8, 1859) under Oregon Superintendent of Indian Affairs Joel Palmer. The signatories included representatives of the Tenino (Tenino proper, Tyigh, Wyam and Dockspuse) and Wasco (Kigaltwalla, Dog River, and Dalles bands). The treaty of 1855 retained the Warm Springs Tribes' traditional fishing and hunting rights; however, a second, highly disputed treaty ratified in 1865 ceded most of their off-reservation subsistence rights (Beckham, 1998:152). In 1973, the Warm Springs Tribes were awarded monetary compensation for loss of their lands resulting from the 1855 treaty. The Northern Molala's lands in the northeastern Willamette Valley, where most of their villages were located, were ceded in another 1855 treaty. That treaty also provided for a

reservation, although no permanent reservation was ever established. Some Molala moved to the Grand Ronde and Klamath reservations and were absorbed into those tribes, while others remained off reservation without federal recognition.
Today, the Mt. Hood National Forest is one of the most visited land use areas in the Nation with millions of recreationists or visitors annually. There are over 180 developed campgrounds. These are campgrounds that have restroom facilities and picnicking areas. There are over 150 lakes that are utilized for recreational fishing and boating. Hikers, bicyclist, motorcycles, horse riders, and Off-Highway-Vehicles (OHV) can travel on hundreds of miles of trails on Mt. Hood Forest Service lands. There are recreation activities year round on the Mt. Hood including hunting and climbing. Winter sports are popular activities on the forest.

There are several winter parks that cater to skiing, snowmobile, snow shoeing, snowboarding, and tubing on the mountain. Mt. Hood is one of a handful of recreation areas were winter sports are available year round.

R.L.K. and Company meets the winter skiing and snowboarding demands by operating seven chairlifts; include five high speed detachable quads, a triple, one bunny slope double, a rope tow, and one magic carpet for ski school use. Timberline winter sports has been a long and varied one. In 1938-39 a portable tow rope was constructed for use at Timberline. Construction of the original Magic Mile began in mid-1938 and finished late 1939. The Magic Mile chairlift began operation on November 17, 1939 laying claim as the longest chairlift in the world at the time. There have been three productions of the Magic Mile chairlift at Timberline. The first existed from 1938 until 1962, with the second lift operating from 1962 through 1992. The existing chairlift has operated since 1992.

The next lift to be developed at Timberline was the Pucci lift built in 1955, followed in 1978 by the Palmer Express. 1979 was the birth of the Blossom Lift which was renamed the Stormin Norman Express in 2000. Bruno’s Lift was built in 1987 adjacent to the Wy’East Day Lodge. The last lifts to be constructed were Molly’s Express in 2000, and the Jeff Flood – Still Creek Express in 2007.

Pre-field Background Research

In 2003, the West Leg Road (Forest Road 2645) was surveyed by Margaret Nelson of the SE Group for the Forest Service in conjunction with proposed Timberline Express Chairlift in the Timberline ski area (Report #2004-060609-043). The West Leg Road was deemed eligible for inclusion on the National Register of Historic Places, with which SHPO concurred on September 17, 2004. The historic road and associated features were the only archaeological properties located within the project area.

West Leg Road was surveyed again in 2004 by Heritage Program Manager, Rick McClure as a supplemental report (Report #2004-060609-043A) for the proposed Timberline Express Chairlift. The project was determined to have “No Adverse Effect” to the historic property pending implementation of the proposed design criteria. A detailed analysis to existing impacts and historic integrity are documented in this report which found the greatest retention of historic character for the West Leg Road are encompassed on the lower sections, south of the existing developments of the Timberline Ski Area.

The historic West Leg Road (site # 669-084) is a National Register eligible resource in the project area. The one lane road originally known as the Timber Line Auto Trail was built by the C.C.C. between 1930 -1931 to provide vehicle access to the recreation areas on the south slope of Mt. Hood. The road has also been referred to as the Timberline Road and the Mt. Hood Hotel Road before the name West Leg Timberline Road was adopted in 1937. The road was first constructed for the use of hikers and mountain climbers, with a public camp near the upper end (McNeil 1990:149). Due to increased visitor use, between 1936 and 1938, the road was widened and extended to the site of Timberline Lodge. In 1934, construction of an east leg road commenced to provide a continuous one-way loop route to and from Timberline. Nelson (2003) provides a summary of the history and significance of the West Leg Road in the Oregon Inventory of Historic Properties Section 106 Documentation Form, filed with the Oregon SHPO in July 2004.

The West Leg Road (Forest Service Road 2645) is a 15+ ft. wide asphalt road approximately 5.2 miles in length, extending from US Route 26 north to its junction with the Timberline Highway (FR 50) approximately 0.4 mile south of Timberline Lodge. It winds upslope to the northeast, switchbacking a number of times between Still Creek and the West Fork Salmon River. The road has been in use since it opened in 1931, and was completed along its current alignment in 1938. Numerous masonry culverts and catch basins were constructed with local volcanic stone; 46 were recorded between the upper end of the road and about 4,600 ft. elevation in 2003 (Nelson, 2004).

Survey

The majority of the project area has been surveyed for archaeological properties previous to the current project. The survey design intends to survey the entire area of the potential location of the trail system and skills park. Previous surveys within one mile of the project area were negative for archaeological properties, indicating that the likelihood for archaeological sites was low. Field surveys were conducted from August 4th thru October 5th 2010. The survey conducted for the Timberline Mountain Bike Trail and Skills Park did not reveal any new archaeological properties. A review of ethnographic material revealed cultural use areas within the proposed project area.

Potential Effects to Eligible or Potentially Eligible Properties

Timberline Lodge

The proposed project will not have an adverse effect on the qualities that made Timberline Lodge eligible to the National Register of Historic Places or its Historic Landmark status. Potential effects are primarily visual and are consistent with the existing developed character of the Lodge environs. The Skills Park will not be visible from Timberline Lodge.

West Leg Road

The proposed project will not have an adverse effect to the qualities that make the Historic West Leg Road eligible to the NRHP. The project will not alter the physical characteristics of the road or its alignment. Historic culverts will be avoided; no trails will be placed adjacent to culvert locations. Culverts and other historic features of the road will not be damaged by project construction.

There will be a total of six West Leg Road crossings. There will be no new man made created clearings or openings along the road. The six trail crossings will be placed along naturally occurring openings or those previously created for ski area activities.

Traditional Cultural Heritage Resources

The proposed project may have some impacts to vegetation in the project area and may affect existing plant-gathering uses. Trails will be routed to avoid these resources when possible. If removal is necessary, the establishment of new huckleberry (*Vaccinium* sp) shrubs would occur outside the bike trails.

To ensure adequate protection of historic values and to reduce visual effects of Timberline Ski Area developments during the proposed project, a series of design criteria have been included in the proposed action. These include:

- The Skills Park would be designed as to not be visible from Timberline Lodge.
- Trails and trail terrain features would be sited to be the least visible from West Leg Road, allowing for consideration of riparian protection.
- No new man made openings would be created for this project. Trail crossings will utilize naturally occurring or previously created clearings/openings.
- No large tree cutting would occur along West Leg Road.
- Historic culverts would be avoided; no trails would be placed adjacent to culvert locations.
- No treated lumber would be used for terrain features.
- Vegetative screening, to the extent possible, would be utilized to lessen any visual impacts associated with the proposed development.
- If native shrub species need to be removed, they would replant or transplant to nearby areas.

- Bike Trail signs or any types of barriers would need to be compatible with the character and design of the historic roadway. Wood posts or stone barriers are compatible options.
- The use of wood or stone barriers would be used to delineate the Skills Park.

In compliance with Section 106 of the National Historic Preservation Act, the agency has conducted an assessment of adverse effects (36CFR 800.5) and determined that the proposed project will have “No Adverse Effect” to the historic property pending implementation of the proposed design criteria.

3.6 Recreation

Affected Environment

This portion of the analysis explains the effects of the project on recreation, defines the project area, examines pertinent assumptions, and discusses potential changes in recreation use patterns and the quality of the recreational experience as a result of the Action and No Action Alternatives. First the Affected Environment is discussed, followed by Forest Plan Direction for the analysis area. Then the effects of the No Action and Action Alternative are discussed, including cumulative effects. The recreation effects analysis includes both direct and indirect effects.

The recreation effects analysis area defined for the Recreation Analysis covers the area 2 miles north and south on the PCNST from Timberline, south to Government Camp and east to Rhododendron. Primarily the effects area follows an interconnected web of trails from Timberline Lodge to Government Camp and then Rhododendron (Recreation Figure 1).
Direct effects are ways in which the alternatives would create, modify, or remove current recreation opportunities, including user displacement and noise impacts. The direct effects of the mountain bike park would occur predominantly within the proposed project area where existing trails intersect with proposed bike trails or are visible from project area. Trails directly impacted include the Pacific Crest National Scenic Trail (PCNST), the Timberline to Town Trail, the Mountaineer Trail, the Glade Trail, and the Alpine Trail. The area directly affected includes the immediate vicinity of the Timberline Special Use Permit (SUP) area and the adjacent Mt. Hood Wilderness (Figure 2, Chapter 1).

The indirect effects of the mountain bike park would be secondary effects, including an increase or displacement of recreation opportunities, a potential change in recreation use patterns, or changes in the quality of experiences as a result of the project. Areas indirectly affected include the Mt. Hood Wilderness, the Government Camp trail system, the community of Government Camp, and Timberline Lodge. Uses indirectly affected include summer skiing, hiking, mountain biking, huckleberry picking, tourism, and mountain climbing.

Mountain Biking

Timberline currently provides no lift service for mountain bikers and there are no trails within the SUP area that are designated specifically for mountain biking. Currently, the Mt. Hood National Forest manages approximately 200 miles of designated mountain bike trails. These trails consist of everything from native-surface logging roads and two-track roads to primitive-style single-track trails and are primarily cross-country trails, where mountain bikers access the trail by biking to them.

Today's mountain bikes differ from the bikes of ten years ago in several key ways - most notably in terms of their more sophisticated braking and suspension systems. Most modern mountain bikes are equipped with dual hydraulic disc brakes and front and rear suspension with up to 6-8” of travel. This makes them much more suitable for higher speeds and negotiating loose or rough terrain and obstacles. Consequently, today's users are demanding more and more challenging terrain. Much of which would have been considered impassible by the mountain bikes of the 1990s. Consequently, the existing mountain bike trails on the Forest are susceptible to damage and increased maintenance. Many of these trails were originally designed for hikers and horse travel, over fifty years ago.

Developed Recreation

Timberline

Timberline Lodge and Ski Area is a four-season resort and is the only ski area in North America that is open 12 months of the year. In the wintertime, thousands of people come to enjoy the mountain for alpine skiing, snowboarding, Nordic skiing and snowshoeing[1]. Timberline Lodge has a wide variety of facilities including two lodges, four restaurants, gift shops and seven chairlifts. During the summer Timberline has two chairlifts running to provide skiing on the Palmer Snowfield. The Palmer Express and the Magic Mile Express provide for 670 and 640 skiers-at-one-time, or a total capacity of 1,310 skiers. Racers, ski camps, and locals use this opportunity to ski year round. Timberline offers ski lessons with lodging and fine dining available year round in the historic resort.

Tourists come from all over the world to visit historic Timberline Lodge. In the summer Timberline Lodge offers rides on the Magic Mile chairlift transporting people to 7,000’ on Mt. Hood. The summer visitors use the chairlift ride to picnic, hike and photograph the Mt. Hood area. Timberline currently operates under an approved CCC limit of 4,665 (USDA, 1975, 2004). Although the ski operation is capable of reaching this capacity, the greatest factor limiting Timberline from reaching their actual CCC is limited parking capacity. The existing parking lots accommodate both skiers and non-skiers, thereby limiting the number of skiers and other guests that can park at Timberline. Due to this unique parking situation and available parking for ski guests, Timberline’s actual ski area operating capacity CCC is approximately 2,900.
The parking situation in the summer is similar to the winter operation in that the parking provides for both skiers and non-skiing guests.

During the summer, the non-skiing guests represent a greater proportion of the visitors. Non-skiing guests tend to stay in the area for a shorter duration than skiers, and thus, the parking

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[1] Timberline has averaged approximately 320,000 skier visits per year since the opening of the Jeff Flood Express lift and trails.

spaces taken by these guests realize a greater rate of turnover than those spots taken by skiers. In addition, more parking space is available due to the absence of snow in the summer time. The net effect of this parking situation is that the parking lots may actually accommodate a greater total total number of people per day in the summer. Currently, the parking lots provide sufficient space for all of the recreating guests and visitors on most summer days (Kruse, 2011).

Mountaineering

Thousands of people from all over world climb 11,237-foot Mt. Hood each year. The South Side route, which begins at the Timberline Lodge parking lot (elev. 6,000’), is the shortest and most popular route to the summit of Mt. Hood. As climbers ascend the mountain they will enter the heart of the Mt. Hood Wilderness. It is estimated that 6,500 people a year climb Mt. Hood from the south side route. Climbers come for challenges, scenery and to fulfill a lifelong dream.

Ski Bowl

SkiBowl is approximately 6 miles from Timberline and offers lift-served mountain biking. The trails offered at SkiBowl are comprised of steep, downhill trails and easier road systems. Many of the mountain bike trails at SkiBowl are multi-use and allow hiker and horseback rider traffic, as well. There are a number of trails that allow for uphill and downhill mountain biking. SkiBowl host several downhill mountain bike events such as the Fluid Ride Downhill Series. Riders at SkiBowl ride up the Lower and Upper Bowls lifts, which are Riblet, fixed-grip double chairlifts. During the summer SkiBowl doesn’t just offer Mountain biking but has a full adventure park, which includes an alpine slide, a bungee tower, a climbing wall, horseback rides, disc golf and much more.

Summit Ski Area

Summit Ski Area is a small, family-friendly ski hill located next to the downtown area of Government Camp. During the winter families can find affordable beginner skiing and a tubing hill at Summit Ski Area. Many skiers shuttle or hitch-hike up to Timberline Lodge and ski down through the Summit Permit Area during the winter months. Summit Ski Area does not operate during the summer, although mountain bikers occasionally ride off-trail and into the ski area, presumably from the Timberline SUP area. The Forest Service has been working with Summit Ski Hill to prevent this unauthorized use and rehab areas that have been affected.

Trails

PCNST

The PCNST spans 2,650 miles from Mexico to Canada. Over 100 of these miles pass through the Mt. Hood National Forest. PCNST users utilize the Timberline parking lot as a trailhead for the PCNST. There are a variety of connecting trails that transect the PCNST within the Timberline SUP area boundary.

Implementation of the proposed mountain bike park has the potential to increase the number of summer users at Timberline, and therefore on the PCNST. The proposed mountain bike park may also affect the PCNST user's experience due to increased noise during construction and subsequently, during operation of the park. Currently, Timberline has both winter and summer operations. As a result, PCNST hikers already experience some noise from the current operation of the ski area facilities, as well as the operation and maintenance of the Lodge itself. Mountain bikes are not allowed on the PCNST. Currently, bike restriction compliance on the PCNST in the vicinity of Timberline Ski Area is good. Implementation of the mountain bike park has the potential to increase the number of bikes in the area, resulting in increased pressure for mountain bike use on the PCNST.

Estimated visitor use numbers for the PCNST at Timberline Lodge are based on samples taken by the Forest Service (Reference). Records indicate 5,100 northbound hikers used the PCNST Timberline trailhead in 2010. It is estimated that these counts are under-reported because they are collected from voluntary registration boxes at the wilderness entry points. There is no visitor count of people hiking south on PCNST from Timberline Lodge, as no registration exists.

Mountaineer Trail

The Mountaineer Trail is a popular, 2.6 mile long trail, and is the highest elevation trail on the south side of Mt. Hood. It leaves from Timberline Lodge next to the Magic Mile Express chairlift and also serves as a connecter to the PCNST. Typical use on the Mountaineer Trail is family day hiking, sightseeing and viewing wildflowers.

Timberline to Town Trail

The Timberline to Town Trail was designed as part of the Government Camp Trails Project in 2005 (MHNF, 2005). The trail is intended to be a low-gradient trail for mountain bikers and hikers to travel between Government Camp and Timberline. Construction began in 2009 and will be completed in 2011. The Timberline to Town Trail is approximately 5 miles long.

Glade Trail

The Glade Trail has traditionally been used as a ski trail from Timberline to Government Camp. The trail has also been used by hikers, mountain bikers, and huckleberry pickers. According to the Government Camp Trails Project Environmental Assessment (MHNF, 2006), the Glade Trail will be closed to mountain biking in order to reduce erosion and to increase safety when the Timberline to Town Trail is finished.

Alpine Trail

The Alpine Trail has also traditionally been used as a ski trail from Timberline to Government Camp. The trail has also been used by hikers, mountain bikers and huckleberry pickers. Similar to the Glade Trail, the Alpine Trail is slated for closure to mountain bikes after the Timberline to Town trail is complete (MHNF, 2006).

Pioneer Bridle Trail

The Pioneer Bridle Trail follows the historic Barlow Road connecting the villages of Government Camp and Rhododendron. The trail was not originally planned or designed as a mountain bike trail. The Pioneer Bridle Trail's designated uses include mountain biking, equestrian, and hikers. The first four (western-most?) miles of trail have a 10% grade or less and the upper, (eastern-most) section of trail averages 20% or more. Through a network of trails the Pioneer Bridle Trail is interconnected with trails that access Timberline.

Other Trails

The Government trail system is approximately 2 miles from Timberline. There are connecting trails from Timberline that intersect several trails near Government Camp. The Government Camp Trail system connects the east side of Government Camp to the west side. It includes many short loops and connecter trails into Government Camp. The Government Camp Trail system is managed for hikers, mountain bikers and Nordic skiers. The trails included in the Government Camp Trail System are Maggie's, Lucy's, Wally's Tie, Camp Creek Loop, Skiway and Crosstown Trail. There are approximately 6 miles of trails around Government Camp. The trails were designed to allow snow grooming in the winter, so they are not out-sloped and contoured as a mountain bike-specific trail would be.

Wilderness

The Mt. Hood Wilderness encompasses 67,320 acres; the heart of the wilderness is Mt Hood, the highest volcano in Oregon. The Timberline SUP area is surrounded by the Mt. Hood Wilderness to the west, east and north (Figure 2, Chapter 1). The fundamental goal of the Mt. Hood Wilderness is "lands designated for preservation and protection in their natural condition" and to provide "outstanding opportunities for solitude". The Mt. Hood Wilderness boundary is within 0.6 mile of the top terminal of the existing Stormin' Norman Express chairlift, and less than one-forth mile from the closest proposed mountain bike trail in the Proposed Action (Figure 3, Chapter 1).

Timberline is one of many ski areas on National Forest Service (NFS) lands that are in close proximity to established wilderness areas. Congress recognized the continued existence of uses and activities adjacent to wilderness areas that are similar to those of a ski area in the U.S. Senate's statements in the Congressional Record of October 2, 1984:

> "The Congress does not intend that the designation of a wilderness area under this act lead to the creation of protective perimeters or buffer zones around such wilderness areas. The fact that non-wilderness activities or uses can be seen or heard from areas within a wilderness shall not preclude such activities or uses up to the boundary of the wilderness area." (Congressional Record of October 2, 1984, S126622, Section 9 Buffer Zones)

Therefore, activities and operations along the SUP area boundary at Timberline are not expected to serve as a buffer to the wilderness. Instead "buffer zones" exist just inside the wilderness boundary, and a wilderness experience should not be expected at the edge of the wilderness boundary.

At Timberline Lodge, recreationalists access the Mt. Hood Wilderness from the PCNST when traveling both north and south along the PCNST. Climbers also access the Mt. Hood Wilderness by following the popular south-side climbing route from Timberline Lodge. The number of wilderness users accessing the Mt. Hood Wilderness from Timberline Lodge is estimated at approximately 11,000 users per year; this number includes hikers, backpackers and climbers. The implementation of the mountain bike park at Timberline has the potential to change the number of summer users in the vicinity of the Mt. Hood Wilderness, as well as the quality of their recreation experience (e.g., presence or absence of noise above current levels) during and after construction.

Wild and Scenic Rivers

The Salmon River is located to the South and East of the Timberline Lodge Ski Area Special Use Permit Area (SUP) (see Figure 2). The River at its closest point is approximately 0.5 mile from the mountain bike project area. The Salmon River was designated by Congress as a Wild and Scenic River in 1988. The River was designated in its entirety from its headwaters on the south slope of Mt. Hood to its confluence with the Sandy River 33.5 miles downstream.

The Salmon River Management Plan completed in 1992 provides for the protection and enhancement of the resource values of the River Corridor as well as identification of public uses consistent with the River's designation. The River segment closest to the mountain bike project area (Segment 1) is designated as a Recreational Segment. Recreational River areas are defined by the Wild and Scenic Rivers Act to include:

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

Management of recreational river segments should give primary emphasis to protecting the values, which make it outstandingly remarkable while providing river-related outdoor recreational opportunities in a recreational setting.

Recreation is on one of the Outstandingly Remarkable Values (ORV) for the Salmon River. The Salmon River Management Plan recognized the wide variety of recreational opportunities along the Salmon River including alpine skiing and highly developed resort facilities contributed to recreation being considered as an ORV. The other ORV's for the Salmon River include scenery, fisheries, wildlife, hydrology and Botany/Ecology.

The Forest Service is responsible to evaluate projects that are above or below a designated river corridor. The agency must ensure that a project will not impact the free flow of the river, degrade water quality, or degrade the ORV's of the River.

Forest Plan Direction

The Forest Plan outlines direction for recreation management of the project area. Guiding principles from the Forest Plan for managing Forest recreation related to this project are to:

> Foster coordination among partners who provide outdoor recreation activities and settings.
> Be primary advocates and providers of outdoor recreation opportunities that are appropriate to a large natural forest setting.
> Enable people to learn and grow in their outdoor experience.
> The trail system shall be developed and designed to disperse recreational use and provide a range of difficulty levels ….” (A11-010)

All of the project area is within the A11 Winter Recreation Area. The specific objectives for this area are to “provide areas for high quality winter recreation (and associated summer) opportunities including downhill skiing, Nordic skiing, snowmobiling, and snow play within a natural appearing forest environment.” In addition, the desired conditions for this allocation are that “opportunities exist for summer recreation activities such as hiking, mountain bicycling, and horseback riding.” A key element of this analysis is that the desired conditions for A-11 include the statement that “Winter recreation improvements may be designed for year round use.” The current Timberline operation includes skiing opportunities throughout the year (i.e., both summer and winter), as well as a wide range of summer opportunities, as described above. Timberline’s recreation offering is consistent with the direction for A11 – Winter Recreation.

Environmental Consequences

No Action

<u>Mountain Biking</u>
Under the No Action Alternative, mountain biking at Timberline would remain as described for the existing condition and the demand for lift-served, designated mountain bike trails would not be met. With the modern style of riding, the newer bikes and their higher speeds, the Mt. Hood National Forest would continue to see increased maintenance needs on the existing cross-country mountain biking trail network. The existing trail network would continue to serve cross-country mountain biking, while the mountain bike market would continue to grow toward downhill, managed bike parks. Under the No Action alternative, no new recreation opportunities would be created in the project area. No recreation effects associated with construction or operation of a mountain bike park would occur.

<u>Developed Recreation</u>

Timberline:
Under the No Action alternative, skiers, climbers, sightseers, and tourists would visit the Timberline Lodge area as described for the existing condition. Ski operations would continue as normal and the lodging and dining would remain open for the public. The summer recreation offering at Timberline would not change. The capacity at Timberline would continue to be

limited by parking.

Mountaineering:
Under the No Action alternative, mountaineering would be as described for the existing condition, with approximately 6,500 people a year climbing Mt. Hood from the south side route.

Ski Bowl:
SkiBowl would continue summer operation with lift assisted mountain biking and Adventure Park would as described for the existing condition. Increases in visitation to SkiBowl during the summer would be attributable to population growth.

Summit Ski Area:
Summit ski area would continue to operate in the winter months with skiing and tubing. Skiers would continue to ski from Timberline Lodge through Summit permit boundary. No operations would take place during the summer and off-trail mountain biking would be as described for the existing condition.

Trails

PCNST:
Under the No Action Alternative, the current summer use on the PCNST would continue and there would be a slight increase of use as the population around the area continues to grow. Implementation of the No Action alternative one would not add any new sights or sounds that may disturb the Mt. Hood Wilderness user.

Mountaineer Trail:
Effects to the Mountaineer Trail under the No Action Alternative would be as described for the PCNST. No new trail crossings would be constructed.

Timberline to Town Trail:
The No Action Alternative would result in no new recreation offering at Timberline. Summer visitation would likely remain constant with a nominal increase reflecting population growth. Consequently, the No Action Alternative would not increase pressure for use of the Timberline to Town Trail.

Glade Trail:
Under the No Action Alternative, the Glade Trail would be closed to mountain biking upon the completion of the Timberline to Town Trail. With no new development at Timberline, there would be no new pressure for mountain biking or other uses on the trail.

Alpine Trail:
The effects of the No Action Alternative in the Alpine Trail would be as described for the Glade Trail.

Pioneer Bridle Trail:
The effects of the No Action Alternative in the Pioneer Trail would be as described for the Glade Trail.

Other Trails:
The No Action Alternative would result in no new trail crossings and no increased pressure for mountain bikers or other users on these trails.

Wilderness

The users going into the Mt. Hood Wilderness would not experience any changes in human caused sounds or sights resulting from new construction or operations. Visitors would continue to visit the Mt. Hood Wilderness, as in the existing condition. There may be a minimal rise in visitor use over time due to population growth.

Wild and Scenic Rivers

Under the No Action Alternative, no additional development would take place in the study area. As such, there would be no new effects on the free flow character or degradation of the ORVs of the Salmon River.

Forest Plan Direction

Under the No Action Alternative, the Timberline operation would continue to offer recreation opportunities throughout the year. Timberline's recreation offering would remain consistent with the direction for A11 – Winter Recreation.

Proposed Action

Mountain Biking
The proposed action would result in the construction and operation of the mountain bike park (Figure 3, Chapter 1). The intention of the Proposed Action is to add a new summer recreation opportunity at Timberline (See Chapter 1, Purpose and Need). By diversifying and introducing a new type of recreation (lift-served, downhill mountain biking) at Timberline, the area would appeal to a larger customer base during the summer season and it would meet the demand for a different type of mountain biking that is not readily available on the Forest (i.e., a lift-served mountain bike park). (Refer to the Socio-Economics Section of this analysis).

Visitation at the proposed Timberline Bike Park is projected in the Socio-Economics section of this analysis (See Social Table 2). Given an estimated Year 6 with 21,656 visits and 10 weeks of operating season, approximately 2,156 visits would occur each week during the summer, on average. Higher visitation would be on weekends. Assuming that the bike park would operate at or near capacity on weekends (i.e., 338 PAOT) for 20 weekend days, a total of 6,760 visits would occur on weekends. That leaves 14,805 visits for the remaining 50 days, which is 296 visits per day (or about 87% capacity). If Timberline would rely on a local market, it would not be possible to maintain 87% capacity throughout weekdays. However, as described in the Socio-Economics section, it is anticipated that a large number of visitors to the area will be regional visitors who are enjoying multiple-day visits to the bike park. In addition, mountain bike events would likely sponsor substantial visits on Fridays, particularly in the afternoon as event participants and guests arrive for the weekend.

Mountain biking has been increasing in popularity, it is estimated that 40 million people in the U.S. annually partake in mountain biking. Mountain bike parks are also gaining recognition and mountain bike technology is improving every year. The Mt. Hood National Forest lost approximately one hundred miles of mountain-biking trails due to the recent wilderness expansion. However, the demand for mountain biking has continued to grow in the Mt. Hood area (Thornton, 2010). The increase of mountain bike users and need for more challenging terrain could be supplemented by the Timberline Mountain Bike Park. In addition to adding a wider variety of terrain to users it could also reduce the current practice of creating illegal mountain bike trails on federal lands. By having a patrolled and well designed mountain bike park, bikers would not need to create their own trails because the demand for this type of trail would be partially met at Timberline (Thornton, 2010).

Increased use resulting from additional visitors around the area of Timberline Lodge could lead to increased crowding and interactions between users. Even though there would be an increase in bike use around Timberline, the mountain bike park users would be located primarily in an area that is distant from the Lodge and the summer ski terrain. Consequently, only that portion of the mountain biking market (i.e., the park capacity would be 318 bikers- at-one-time) that would use other recreational facilities at Timberline, such as ski facilities or trails, would impact the existing users of these facilities. Ultimately, an increase in visitation by 6,000 (Year 1) to 21,656 (Year 5) would account for a small percentage of the two million people that visit Timberline annually.

Under the Proposed Action, the current parking limitation at Timberline would continue to be a problem. The addition of 169 cars on a capacity day would further tax the parking lots. The existing parking lots would continue to limit the number of visitors in the SUP area and this issue would be somewhat exacerbated on a capacity day at the bike park. During mountain bike events and busy days, RLK would manage parking by segregating user groups into different parking areas. RLK would also implement parking and spectator management provisions in the Spectator Management Plan (Rec-5). RLK has indicated that they would use shuttles to transport spectators from Government Camp as a primary means of reducing the demand for parking during events, thereby protecting available parking for other Timberline users and guests.

Developed Recreation:

Timberline Ski Area:
The Proposed Action would slightly reduce the quality of the recreation experience for those recreationalists that use the Jeff Flood Express pod in the summer in that the lift would be

operating and several hundred mountain bikers would be present in the area on busy days. The mountain bike park would displace some recreationalists in, and around the Timberline area. Implementation of the mountain bike park would contribute to additional human caused sights and sounds that are currently not present in the area. During the first two years, project construction would create human caused noise above the users' current level of experience. Currently the project area is one of the quiet places on the mountain where people can get away from the sights and sounds of the ski area. It is also a popular spot for day hikers and huckleberry pickers. Having mountain bikers in this area would not preclude the existing recreation opportunities, but it may disperse it to other, less developed areas in the Timberline vicinity.

Hikers, climbers, horseback riders, skiers, huckleberry pickers, tourists and bikers are already going to a place that is highly developed, so their expectations under the Proposed Action would not measurably affect existing use levels under the Proposed Action, particularly given that the mountain bike use would be focused on an area that is currently under-utilized compared to the Lodge and upper mountain during the summer. Recreationists coming to Timberline Lodge would now have an opportunity to participate in lift-served, downhill mountain biking, which would enhance the recreation opportunity for a portion of the existing summer visitors.

Capacity:

The summer ski operation at Timberline would continue to function on the upper mountain under the Proposed Action. With the addition of mountain bikers in the vicinity of the Wy'East Day Lodge, all users in the area would realize increased densities. However, it is expected that these densities would remain less than is typical on a busy winter ski day.

Under the Proposed Action, the Timberline Bike Park would be designed to provide a balance between the uphill lift capacity and the downhill capacity. The winter operating capacity of the *Jeff Flood Express* lift is 1,800 people per hour (pph) and the lift has a total of 102, four-passenger carriers. During the summer, every other chair would be used as a bike carrier with no passengers, leaving 51 carriers for passengers. RLK also proposes to run the lift at 75% speed, resulting in a summer operating capacity of 720 pph (75% of 900 pph). With 6 trails in the bike park, if a mountain biker started down each trail every 30 seconds, 720 pph would descend the trails. Consequently, the lift and trail capacities have been designed to balance at 720 pph.

In the winter time, the *Jeff Flood Express* CCC is 900. Again, operating half of the chairs as bike carriers and running the lift at 75% speed, the PAOT would be 338 (75% of 450 pph). The CCC typically refers to the people that would be divided into three categories: 1/3 on the lift, 1/3 riding the trails, and 1/3 milling about or practicing in the Skills Park. Based on this calculation, approximately 110 – 115 people would be comfortably riding on the trails at any given time during a capacity day. Given that each rider would average approximately four to six laps per hour, the 720 pph calculation balances with the CCC (110-115 riders riding 6 times totals 660 – 675 riders per hour).

Mountaineering:

Under the Proposed Action, the existing summer offering at Timberline would continue remain, including skiing on the upper mountain. The addition of approximately 318 people in vicinity of the Wy'East Day Lodge and the *Jeff Flood Express* pod would add to the already-congested conditions on busy days. As a result, mountaineers would also be subject to the increased densities. Given that climbing Mt. Hood from Timberline is generally the stated objective of climbers leaving from Timberline, the increased density of other recreationists in the area would not affect mountaineering visitation at Timberline.

Ski Bowl:
Ski Bowl would be affected by the addition of a Mountain Bike Park at Timberline. Currently SkiBowl offers mountain biking in the summer. During the initial few years of operation at Timberline, it is expected that current, local SkiBowl riders would visit Timberline instead of SkiBowl. However, as more and more regional/destination riders visit Timberline Mountain Bike Park, the presence of these new visitors to the Government Camp area would sponsor new riders at SkiBowl. Ski Bowl has steeper grade runs than the Timberline Mountain Bike Park proposal, so it would cater to the more advanced mountain bikers.

Summit Ski Area:
Summit Ski Area does not operate during the summer. RLK would manage bike park riders to ensure that lift-riding mountain bikers stay within the park and no bike park trails have been designed to connect directly to existing trails. Nonetheless, with increased mountain bike activity, an increase in pressure for mountain bikers to ride through the Summit to access Government Camp from Timberline would be expected. Summit already experiences mountain bikers creating unauthorized user trails through the ski area, so the the Forest Service would continue to work with Summit Ski Area to prevent unauthorized use and rehab areas that have been affected. In addition, the Proposed Action at Timberline includes PDCs that are intended to minimize off-trail riding practices in general (see Rec-3 and 5, Veg-9 and 14)

Trails

PCNST:
An effect of Proposed action on existing users of the PCNST would be an increase in human caused sights and sounds above the current level, affecting the PCNST user experience. Existing trail users that currently see or hear the operations at the ski area and lodge area existing trails would also see or hear the construction and operation of the bike park. The effect this has on the user is largely based on the timing, duration, and intensity of the disturbance as well as the individual’s perception and expectation.

The short-term effects of this project would occur during the construction stage when PCNST hikers would see and hear equipment near the PCNST. This construction would take place during the summer months and for two construction seasons. In addition the majority of the trail construction would take place below the tree line, and away from the PCNST. The long-term effects would include an increase in noise due to the operation of the bike park. A number of the bike trails would be visible from the PCNST, so trail users would be able to see the running chairlift and mountain bikers entering the bike park. Given that these users already experience operating chairlifts associated with the summer ski season, the bike park operation would not affect their recreational experience any more than the current operation. Although nothing in the project is intended specifically to increase use of the PCNST, it is likely that some of the bike park users and other non-biking users would partake in some hiking, which could lead to an increase in PCNST visitation. The visitation use going north on the PCNST from Timberline Lodge in 2010 was estimated at 5,100 and a busy Saturday would include approximately 150 hikers. The contribution of additional PCNST hikers (bike park capacity is 318 PAOT) associated with the bike park would be small relative to the existing level of use. Consequently, no measurable increase in PCNST use would result from the bike park.

The PCNST is designated for use by hikers and equestrians only. It is illegal to mountain bike on the trail. While adding more mountain bikers to the area could result in more pressure for unauthorized bike use, this pressure would be eliminated by implementing and maintaining effective signage and policing by RLK. MTB use would remain illegal on the PCNST and, if effectively policed and signed, the Proposed Action would not contribute to bike use on the PCNST.

Mountaineer Trail:
The proposed MTB Park trail system would cross the Mountaineer Trail twice on the southwest section of trail. The effect of the crossing would be eased by the use of chicanes and uphill grades to reduce biker's speed as they cross the Mountaineer Trail. Trail signs would be posted on both Forest Service Trails and bike park trails to indicate a trail crossing. There would also be trail signs installed and maintained by RLK stating that mountain bikers should stay on designated bike park trails (see Rec2, 3 and 4). As a result, there would be no measurable increase in mountain bike use on the Mountaineer Trail. Both user groups would be well-informed to expect an encounter at these two crossings.

Timberline to Town Trail:
The proposed bike park trails would cross the Timberline to Town Trail 3 three times on its northern end. The effect and management of these trail crossings would be as described for the Mountaineer Trail. The management objective for the Timberline to Town Trail is for use by hikers and bikers. The trail is uphill and downhill trail, meaning you can hike and bike in both directions. The bike park would increase pressure on the Timberline to Town Trail. It is expected some mountain bikers would shuttle the Timberline to Town trail from Government Camp to Timberline Lodge in a similar way that the Glade and Alpine trails are shuttled in the winter for skiing. While this would not be a direct result of the bike park trails, it would be an indirect effect of the increase number of mountain bikers in the area. Customers of the Timberline bike park would likely use the Timberline to Town Trail as their last bike run of the day, on a rest day, or when the park is closed. The Timberline Bike Park would increase use on the Timberline to Town Trail compared to the No Action alternative. Consequently, hikers and uphill mountain bikers would be affected by this increased pressure. The intended use and design of the Timberline to Town Trail as a two-way trail would be diminished as result of the mountain bike park.

Glade Trail:
The management direction for the Glade Trail is to close it to mountain bikers once the Timberline to Town Trail is completed. Since the Glade Trail would be crossed four times by the bike park trails, there would be increased pressure for mountain bikers on the trail. The effect and management of these trail crossings under the Proposed Action would be as described for

the Mountaineer Trail. Under the Proposed Action, the Glade Trail would continue to be managed for hikers, huckleberry pickers, skiers, and snowshoers. In the summer months, huckleberry pickers would not be directly displaced on the top third of the trail that passes through the bike park. However, the increase in mountain biker traffic and the overall increase in recreation in the area would detract from their experience compared to the No Action alternative. Similarly, the increase in mountain bike use on the trail may increase the need for routine maintenance of the trail.

Alpine Trail:
The Alpine Trail would also be closed to mountain bikes once the Timberline to Town Trail is finished but it will remain open to hikers, huckleberry pickers, skiers and snowshoers. The effects on the Alpine Trail under the Proposed Action would be similar to the Glade Trail.

Pioneer Bridle Trail:
The management direction for the Pioneer Bridle Trail is hikers, equestrians and mountain bikers. The effects on the Pioneer Trail under the Proposed Action would be similar to the Glade Trail, with the addition that equestrians would be affected as well as hikers.

Other Trails:
The Government Camp Trail system is located outside of the bike park, but trails from Timberline connect with this trail system. It is likely that these trails would see more use that could lead to increased user densities on the trail network. The Government Camp Trail system connects to the bottom portion of the Timberline to Town Trail, so it is possible that additional users will access this trail network via the Timberline to Town Trail.

The management objective and design for the Government Camp Trails System is for use by hikers, skiers, snowshoers and mountain bikers. The needs of each of these user groups must be equalized so a larger recreational group can enjoy the area. The Government Camp EA (MHNF, 2006) discussed the need for these trails to reduce some of the pressure from hikers in the wilderness. With increased destination visitors to Government Camp, it would be expected that increased mountain bike use, as well as other uses by these new visitors, would be realized on these trails, which could detract from the recreation experience of some other users. The overall increase in use on the trails would increase the need for routine maintenance of the trails.

Wilderness

It is estimated the over 10, 000 people enter the Mt. Hood Wilderness from Timberline Lodge every year. This number would increase under the Proposed Action as the number mountain bikers and other visitors to Timberline Lodge increases. The contribution of new visitors by the bike park (i.e. hundreds of people) would be small relative to the existing level of use at Timberline overall (i.e., thousands of people).

Implementation of the Proposed Action would add construction noise during the first two summers, as well as increased noise from summer operations for the lifetime of the bike park operation. These increased levels of activity and noise would detract from the wilderness experience of those users that would be near the Timberline SUP area. However, these uses would be compatible with the wilderness boundary in that it abuts a developed recreation area.

Wild and Scenic Rivers

The bike park would be located outside the river corridor and approximately 0.5 miles away from the corridor at its' nearest Point. As such the mountain bike proposal would have no effect on the free flow character of the Salmon River. Also due to the distance to the River and the project design criteria there would be no measurable impact to the water quality of the Salmon River, and there would be no degradation of the ORV's of Scenery, Recreation, Wildlife, Fisheries, Hydrology, and Botany/Ecology.

Forest Plan Direction

Under the Proposed Action, the Timberline operation would continue to offer recreation opportunities throughout the year. The mountain biking program would dramatically increase the recreation opportunities at Timberline, as well as increase summertime utilization of the current SUP area. Consequently, under the Proposed Action, Timberline's recreation offering would remain consistent with the direction for A11 – Winter Recreation.

Cumulative Effects

The effect on Recreation from the Proposed Action result from increased activity (construction and operations) and increased visitation at Timberline. During construction of the bike park, the routine maintenance of the ski area and Timberline Lodge would add to construction activity in the area, detracting from the natural environment and the recreation experience of those wishing for a wilderness-like experience at Timberline. Similarly, the operation of the lodge and ski area in the summer would reduce the natural character of the area. Both of these effects would incrementally increase the effect of the bike park, but would be consistent with the Forest Plan Direction for the Timberline SUP area. Population growth and an increase in recreational activity (see Socio-Economics Section) under the No Action would likely result in growing visitation at Timberline without the addition of a bike park. Under the Proposed Action, the addition of over 20,000 annual visits would be incrementally larger due to this growth in visitation.

3.7 Visuals

Introduction

The Timberline Mountain Bike Park proposal involves the development of a downhill, lift-assisted mountain bike trails system and a separate mountain bike skills park. These developments have the potential to affect the scenic resources of the area. Therefore this analysis will analyze the scenic quality of the area in the context of the management direction, goals, and objectives of the Forest Plan, as Amended, the Timberline Lodge Special Emphasis Area and The Comprehensive Plan for the Pacific Crest National Scenic Trail.

The US Forest Service Visual Resources Management System helps establish Visual Quality Objectives (VQOs) for various landscapes and helps define how the landscape would be managed, the level of acceptable modification in the area, and under what circumstances modifications are allowed.

Mt. Hood Forest Plan VQOs

For purposes of this analysis, the following definitions are provided as general characteristics or areas that meet the VQO described.[1].

- **Foreground Retention** - This visual management intensity applies to lands visible up to a distance of 0.5 mile from selected travelways, water bodies or public use areas. The ground is generally free of unnatural forms and patterns of debris and litter.
- **Foreground Partial Retention** - This visual management intensity applies to lands visible up to a distance of 0.5 mile from selected travelways, water bodies, or public use areas. The ground is generally free of unnatural forms and patterns of debris and litter.
- **Middleground Retention -** This visual management intensity applies to lands visible from 0.5 mile to 5.0 miles from selected travelways, water bodies, or public use areas. Natural appearing forest landscape and management activities are not visually evident.
- **Middleground and Background Partial Retention -** This visual management intensity applies to lands visible for distances from 0.5 mile to 5.0 miles from selected travelways, water bodies, or public use areas. Natural appearing forest landscape, with little evidence of human alteration. Management activities repeat form, line, color, and texture common to the characteristic landscape.
- **Middleground and Background Modification -** This visual management intensity applies to lands visible for distances farther than 0.5 mile from selected travelways, water bodies, or public use areas. Management activities are blended with natural landforms and existing vegetation with natural shapes, edges, patterns, and sizes. Offers a wide variety of land uses and recreation opportunities.

[1] For more detailed information, see Forest Plan, B2 Scenic Viewsheds, pages Four - 218 through Four-228 for detailed definitions. For further information on the Visual Resources Management System and its use, refer to *USDA Handbook 462 - National Forest Landscape Management, Vol.2.* (USFS, 1974).

Tiering To The Timberline Express Environmental Impact Statement Visuals Analysis

The Timberline Express Final Environmental Impact Statement (EIS) was an analysis of a proposal to improve winter recreational opportunities at Timberline Ski Area. The Record of Decision (November, 2005) for that analysis selected Alternative 3, which allowed for the addition of the Timberline Express ski lift (now known as the Jeff Flood ski lift) ski trails, and associated infrastructure.

Chapter 3 of the Timberline Express EIS includes a comprehensive visual resource analysis for the Timberline Express project (page 3-289, section 3.15). The visual resource analysis for the Timberline Mountain Bike Park tiers to the Timberline Express EIS Visual Resource analysis and to The Record of Decision (ROD) for the Timberline Express Final Environmental Impact Statement, which included Forest Plan Amendment No. 15.

The visual analysis for the Timberline Mountain Bike Park proposal is based on those effects identified for Alternative 3 of the Timberline Express project, as modified by the Timberline Express ROD and Forest Plan Amendment No. 15.

Forest Plan Amendment No. 15

The Record of Decision for the Timberline Express project included Forest Plan Amendment No. 15, which modified the VQO Standards and Guidelines within the Timberline SUP area. The ROD states:

> "I am amending the *1990 Mount Hood National Forest Land and Resource Management Plan* (Forest Plan) to change the Visual Quality Objective (VQO) standard and guidelines (A11-017 and A11-020) from *Partial Retention* to *Modification* in the foreground as viewed from Timberline Trail, Timberline Hwy (Hwy 173), West Leg Road (Rd 2645), Timberline Road, and riparian areas within the Timberline SUP area." (Timberline Express ROD)

The rationale for amending standard A11-017 and A11-020 in the ROD is given as the following:

> Forest Plan VQO's were developed with a focus on the degree of vegetative alteration of natural landscapes on National Forests. A VQO of partial retention means activities must be visually subordinate to the natural characteristic of the landscape. Ski area developments introduce urban scale facilities into an otherwise natural setting. The nature of ski facilities, particularly the high-tech materials and modern lift towers and terminals are unlikely to appear subordinate to the natural landscape when viewed in the foreground no matter how they are designed or what mitigation measures are employed. Our present Forest Plan standards do not focus on these more urban elements or provide a basis for resolution of design issues for ski facilities.

> Forest Plan standards and guidelines are intended to help guide the achievement of management goals and desired future conditions in the Forest Plan. The management goals for this area include downhill skiing and the desired future condition includes ski lodges and chairlifts (Forest Plan, Four-190,191). A VQO of partial retention in the foreground does not help achieve these management goals and theoretically could even preclude facilities such as ski lodges and chairlifts. Therefore Forest Plan Standards A11-017 and A11-020 need to be amended to more accurately reflect the visual characteristics of developed ski areas. In recognition of the unrealistic standard of achieving a VQO of partial retention in the foreground I am amending this standard to a VQO of modification in the foreground as viewed from Timberline Trail, Hwy 173, West Leg Road, Timberline Road, and riparian areas within the timberline SUP areas. A VQO of modification means that man's activity may dominate the character of the landscape but at the same time, utilize the natural established form, line, color and texture. The Timberline Ski Area presently meets a VQO of modification in the foreground and will continue to meet a VQO of modification with the implementation of Alternative 3. (Timberline Express ROD).

As a result of Forest Plan Amendment No. 15, the VQO of Modification applies to the entire Timberline SUP area. Consequently, the Visual Analysis for the Timberline Bike Park is based on a comparison of the proposed bike park facilities to the prescribed VQO of Modification in the SUP area. The Timberline Express EIS identified eight critical viewpoints that cover the Timberline Ski Area and surrounding area. Visual impacts to Timberline Lodge itself were analyzed from Critical Viewpoint # 5 (Timberline Lodge Front Entrance) and Critical Viewpoint # 6 (Timberline Lodge Rear Patio).

Environmental Consequences

<u>No Action Alternative</u>

Under the No Action alternative, no additional development would occur at the Timberline Ski Area. Visual conditions would remain unchanged.

<u>Proposed Action</u>

VQOs

The visual impacts that would result from the implementation of the proposed Timberline Mountain Bike Park, as seen from the eight critical viewpoints, would be as follows:

- **<u>View Point #1</u>** <u>- Highway 26 at Map Curve</u> **-** VQO would remain as **Partial Retention**. Mountain bike trails or activities would not be visible from this viewpoint.
- **<u>View Point #2</u>** <u>- Highway 35 at the White River bridge</u> - VQO would remain as **Partial Retention**. Mountain bike trails or activities would not be visible from this viewpoint.

- **<u>Viewpoint #3</u>** <u>- Timberline Road at the Entrance to the Lodge and Ski Area</u> - Foreground: VQO would remain as **Modification.** Mountain bike trails, terrain features and activities would be visible from this viewpoint but would be consistent with the prescribed VOQ of **Modification.**
- **<u>Viewpoint # 4</u>** <u>- Timberline Trail #600 (aka Pacific Crest National Scenic Trail</u>) - VQO would remain as **Modification.** Mountain bike trails and activities would be visible from this viewpoint, but would be consistent with the prescribed VQO of **Modification.**
- **<u>Viewpoint # 5</u>** <u>- Timberline Lodge Front Entrance</u> - VQO would remain as **Modification,** however mountain bike trails would not be visible from this viewpoint due to topography in the front of the lodge. The fill slope associated with the Lodge parking lot would block the view to the bike trails..
  <u>Viewpoint #6</u> <u>- Timberline Lodge Rear Patio</u> - VQO would remain as **Modification,** however mountain bike trails or activities would not be visible from this viewpoint.
- **<u>Viewpoint #7</u>** <u>- West Leg Road Adjacent to the Jeff Flood Express Lower Terminal Location</u> - VQO would remain as **Modification.** Mountain bike trails and activities would be most visible from this viewpoint, as the bottom terminal of the lift would receive the most use of any area in the Bike Park. However, the presence of the mountain bike trails and mountain bike activities would be consistent with the prescribed VQO of **Modification**.
- **<u>Viewpoint #8</u>** <u>- Trillium Lake Day Use Area</u> - VQO would remain as **Partial Retention,** however mountain bike trails or activities would not be visible from this viewpoint.

Skills Park as Seen From Timberline Lodge

The skills park would not be visible from Timberline Lodge because it would be completely blocked by the The Wy'East Day Lodge. (see Appendix F).

Visibility of Mountain Biking Trials, Skills Park, and Associated Activities Limited by Season

The proposed mountain bike trails, skills park, and associated activities would be visible primarily in the early summer to mid fall. Mountain bike activities would not be visible outside of the mountain bike park operating season because the terrain features in the Skills Park would be removed prior to the ski season and all of the Bike Park trails and features would be covered with snow during the winter.

Cumulative Effects

Given that the Proposed Action would not have any visual effects that would be inconsistent with the VQOs, the Proposed Action would not cumulatively effect the visual quality of the surrounding area when added to other past, present or reasonably foreseeable projects.

3.8 Social and Economics

Social and Economics Affected Environment

The Social and Economics analysis evaluates the market and economic factors that would affect, and would be affected by the proposed action. The social and economic analysis area includes those communities that would experience economic effects as a result of the proposed mountain bike park at Timberline. Government Camp, located at the base of Mt. Hood would likely observe changes in economic activity should the mountain bike park be implemented. It can also be expected that larger population centers with overnight lodging, restaurants, and retail facilities, would also realize additional economic activity if the Timberline Mountain Bike Park would be implemented. Consequently, the Highway 35 and 26 corridors from Hood River to Sandy are considered the analysis area for social and economic effects.

This analysis includes direct, indirect, and cumulative effects. Direct social and economic effects are those that would result directly from changes in visitation or economic activity at Timberline, such as changes in spending, traffic or cultural activities at Timberline and the Government Camp vicinity. Indirect effects are those that result from implementation of the proposed action, but are not directly attributable to or located in the vicinity of Timberline. These would include changes in economic activity in Hood River or Sandy or altered traffic patterns in these cities. Finally, cumulative effects are those impacts from other actions, that when coupled with the effects of this proposed action, could accumulate in the analysis area. These could include changes in the mountain biking market at Timberline or other nearby resorts or other summer-related activities that could affect cultural activities in the area at the same time and place as the proposed mountain bike park.

The following sections discuss the affected environment for four subject areas: Market and Economics, Emergency Services, Traffic and Parking, and Environmental Justice.

Market and Economics

Numerous studies and analyses are available that document the economic impacts of mountain biking in Whistler, BC and other ski areas. Whistler is not only one of the premier skiing destinations in North America, but it is also becoming a major summer destination as well, in part for mountain biking (MBTA, 2006). The analysis of the Timberline Bike Park relies on data generated from the Whistler example and from multiple studies, as described below.

Sea to Sky Mountain Biking Economic Impact Study

The Sea to Sky Mountain biking Economic Impact Study (MTBA, 2006) analyzed the economic impact of mountain biking in the Sea to Sky Corridor including both Whistler Bike Park and the Whistler Valley Trails, which are similar in nature to the existing mountain bike trails on the MHNF. Surprisingly, this analysis showed that in the Sea to Sky Corridor, there was less than 10% crossover between Bike Park Riders and those using the Whistler Valley trails, suggesting that the Bike Park riders are a different user group than traditional trail riders. In fact, 90% of the Bike Park riders surveyed went to Whistler solely to ride at the park.

Overall, 68% of those surveyed were non-residents, and that of Bike Park riders, 80% of the respondents were non-residents. Based on the survey methodology, MBTA, 2006 estimated

1,713 riders per week on the Whistler Valley Trails and 5,111 riders per week at the Bike Park. Of the non-residents, 37% of the total and 40% of the Bike Park riders were from the United States, with Washington accounting for almost half of the US visitors.[2] Non-residents spent an average of $133.13 per person, per day on food, lodging and retail.

For the summer 2006 study period analyzed in MBTA, 2006, the study estimates that the Bike Park itself generated over $39 Million in economic activity (i.e., initial expenditure, indirect spending, and wages), excluding the Crankworx event, which generated another $28.5 Million. In addition, the Bike Park sponsored 384 total jobs within the Bike Park and the local economy.

2010 GravityLogic Forum

The GravityLogic Forum (GravityLogic, 2010) is a conference that has been organized since 2005, where mountain biking experts speak on all a wide range of topics relating the bike park industry. Attendees typically include resort operators, land managers, and regulators interested in starting, expanding, or improving bike parks around the world. About half of the attendees for the 2010 event were from outside of North America.

The following excerpts are taken from a presentation at the 2010 event about the growing market for mountain bike parks.

Whistler Mountain Bike Park has grown in visitation at least 10% for the previous ten years, with 115,000 biker visits in 2008 and 125,000 biker visits in 2009 (Illustration 1). Similarly, the much newer Winter Park in Colorado grew 60% in biker visits between 2008 and 2009, and retail sales at Winter Park increased 600% from 2009 to 2010. Winter Park Instruction and Programs had more total students and more revenue in June 2010 than in the entire 2009 season. This is attributed directly to the conversion of cross-country riders to mountain bike park riding.

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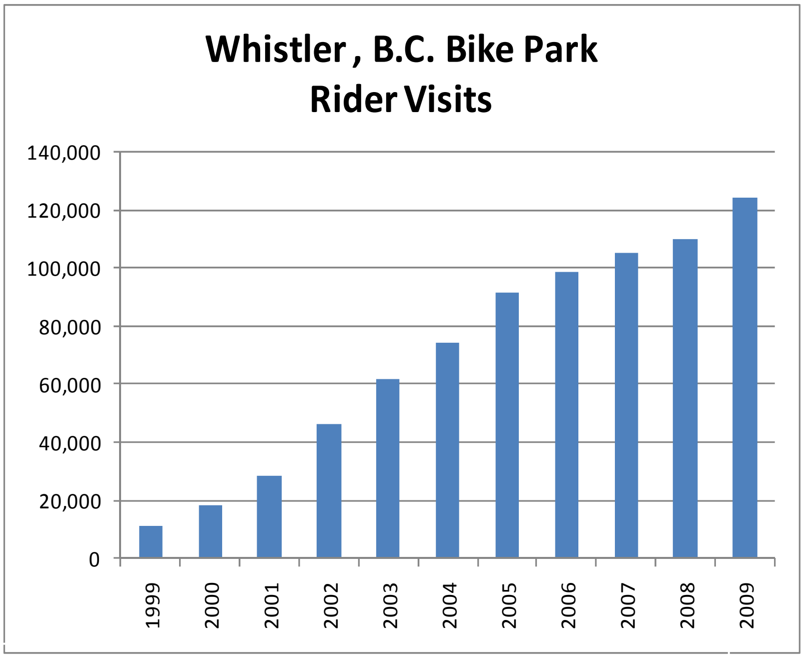
[2] MBTA, 2006 did not quantify riders from Oregon. Only Washington was separated from other US riders.

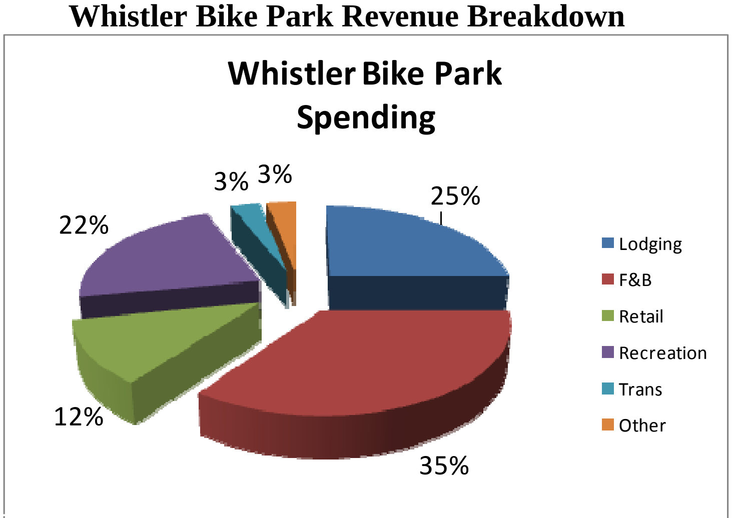
Illustration 1
Whistler Mountain Bike Park Biker Visits 1999 - 2009



Source: Re-Align Environmental, adapted from GravityLogic (2010)

The economic impact of the Whistler Mountain Bike Park is evident in that the busiest weekend and week) for the mountain-owned bar and restaurant at the base of Whistler Mountain is now during the summer. Prior to the bike park opening, the same restaurant used to close its doors in the summer. As shown in Illustration 2, the largest percentage of bike park spending is on food and beverage, which totals 35% of the revenue at Whistler Bike Park. Second, lodging represents 25% of the revenue generated from bike park riders and third, recreation (including park tickets) accounts for 22% of the spending. An estimated 12% of revenue is generated from retail sales.

Illustration 2
Whistler Bike Park Revenue Breakdown



Source: Re-Align Environmental, adapted from GravityLogic (2010)

GravityLogic (2010) reports that during 2009, 25% of mountain bike park riders came from United States. The majority of bike park guests (65-80%) had overnight stays with an average length of 6 nights, which was longer than the average stay for a winter guest at Whistler. Including locals and out-of-towners, the typical bike park rider averaged 14 days in the bike park. Mountain Bike Park riders during 2009 were 76% male and 24% female and almost 25% of the visitors were 35 – 44 years old. During 2009, the average person spent approximately $230 per day at Whistler Bike Park and offsite facilities (e.g. lodging, food and beverage, retail).

Outdoor Industry Foundation

The Outdoor Industry Foundation (OIF) is a non-profit organization whose mission is to inspire and grow future generations of outdoor enthusiasts. OIF funded this economic analysis(OIF, 2006), which was conducted by Southwick Associates, Inc. , a firm that specializes in quantifying the economics of fish, wildlife, and outdoor-related activities for government agencies and industry.

According to this study, the Oregon active recreation economy contributes more than $5.8 billion annually to Oregon's economy, supporting 73,000 jobs across the state. The active recreation economy generates $310 million in annual state tax revenue and it produces $4.6 billion annually in retail sales and services across Oregon – accounting for 3.4% of gross state product. OIF, 2006 estimates that Oregon has 773,028 bikers or 28% of the State's population.
Oregon offers spectacular recreation, including the Columbia River Gorge, and Crater Lake, and other treasured destinations that bring in tourist dollars from out-of-state active outdoor recreation participants. Oregonians also recreate close-to-home in local parks and venues.

The Value of the Bicycle-Related Industry in Portland

This report (Alta, 2008) provides an update of the 2006 study: Bicycle-Related Industry Growth in Portland (sponsored by the Portland Office of Transportation). This report estimates direct bicycle-related business activity in Portland.

The estimated total bike-related economic activity in Portland is approximately $90 million. The largest segment of this economic activity is in the retail sector, totaling approximately 60% of the market. The $90 million in activity represents a 38% increase in the value of the bicycle-related industry since 2006. The total number of companies in the bicycle-related sector rose from 95 in 2006 to 143 in 2008, a growth rate of 50%. New businesses are primarily small and locally owned.

The bicycle-related economy provides between 850 and 1,150 jobs in Portland. Hand-built bicycle manufacturers increased from 5 to 17 between 2006 and 2008, representing 340% growth. Portland is currently home to nearly 4,000 annual races, rides, events and tours (an average of one ride every 27 minutes). This has nearly doubled since 2006, when the number of rides was 2,100.
While this report addresses the overall bicycle industry, including both road and mountain biking, it is indicative of the level of economic activity that the industry sponsors in the Portland

Region. This report also provides evidence that the bicycle industry is rapidly growing in the Portland area.

Outdoor Recreation Participation Report

According to Outdoor Foundation (2010), an outside force is needed to convince Americans to leave their home and recreate in the outdoors. Outdoor activities such as fishing, running, camping, bicycling or hiking can serve as a "gateway" to outdoor activities, often leading people to participate in other outdoor activities. Participation in these gateway activities generally increased in 2009.   Biking has grown in popularity since 2006, as displayed in Table 1. Overall, this study suggests that the largest growth in recreation activities between 2006 and 2009 has been in active, sports that require roads or trails. For example, the largest growth rate, 16%, is in the area of Running/Jogging and Trail Running. Likewise, both Hiking and Road/Mountain Biking and BMX have increased by 9% during the same time.

Table 1
U. S. Participation in "Gateway" Activities Between 2006 - 09

	2006	2007	2008	2009	% Growth
Fresh/Saltwater and Fly Fishing	49,696,000	51,836,000	48,206,000	48,046,000	-3
Running/Jogging and Trail Running	38,719,000	41,957,000	42,103,000	44,732,000	16
Car, Backyard and RV Camping	43,123,000	39,836,000	42,396,000	44,034,000	2
Road/Mountain Biking and BMX	39,688,000	42,126,000	41,548,000	43,264,000	9
Hiking	29,863,000	29,965,000	32,511,000	32,572,000	9

Source: Re-Align Environmental, adapted from Outdoor Foundation (2010)

People who participate in those gateway activities are more likely to participate in another outdoor activity than they are likely to participate in one activity alone. Outdoor Foundation (2010) found that 88 percent of hikers participate in more than one outdoor activity. Their participation in these activities often leads to higher activity levels and a greater connection with the outdoors.

In summary, these reports and presentations paint the picture of a recreation industry that is growing each year and that includes considerable participation in the Pacific Northwest. The active outdoor recreation market in the Hood River/Portland area appears to be thriving, as are bicycle- related markets.   These studies also suggest that visitation at bike parks represents the opportunity to sponsor economic activity outside of the bike park itself, including food and beverage, lodging and retail.

Emergency Services

Public services for Timberline, including fire and emergency medical, are provided via the Hoodland Fire Department, which has a station in Government Camp. The Hoodland Fire Department is a combination volunteer/career organization funded primarily through taxes levied on property within the District. Additional revenue is generated from fees assessed on non-resident drivers involved in vehicle crashes on Highway 26. The nearest Clackamas County sheriff station is located in Oregon City, approximately 50 miles from Timberline. The nearest hospital is in Gresham, approximately 38 miles from Timberline. AMR, the Clackamas County ambulance service, dispatches 2 rigs each day out of Government Camp. Their response time to Timberline is approximately 15 minutes.

Traffic and Parking

Timberline currently operates under an approved Comfortable Carrying Capacity (CCC) limit of 4,665 (USDA, 1975, 2005). At full winter-time operation, Timberline operates seven chairlifts with a CCC of the 3,990 guests per day. Although the ski facilities are capable of reaching this capacity, the greatest factor limiting Timberline from reaching their actual CCC is limited parking capacity – 920 spaces. The existing parking lots accommodate both skiers and non-skiers, thereby limiting the number of skiers that can park at Timberline. Due to this unique parking situation and available parking for ski guests, Timberline's actual winter-time operating CCC is approximately 2,900.

The summer parking capacity has not been specifically measured for many reasons. Primarily, the summer visitor at Timberline stays for less time than the winter visitor, making parking counts difficult to quantify. In addition, the absence of snow and the ski season arrival window (i.e., a rush of cars in the morning) create a situation that is much less constrained and much less in need of management compared to the winter time. The majority of visitors at Timberline in the summer are tourists visiting the historic lodge, but other visitors that are in need of parking include skiers, mountain climbers, hikers and other similar visitors. Consequently, parking that is occupied by these visitors may turn over several times during the day. RLK reports that on all but the busiest of days currently, the parking lot is usually capable of accommodating several hundred additional cars, particularly when parking is managed in the lots (Kruse, 2011).

Environmental Justice

Environmental justice is an important component of Federal regulatory programs, initiated by President Bill Clinton's Executive Order No. 12898 *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations* (Federal Register, 1994). As stated in the Executive Order:

> "…each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high adverse human health of environmental effects of its programs, policies and activities on minority populations and low-income populations…" (Federal Register, 1994)

The minority and low-income groups living in the area surrounding Mt. Hood work in diverse occupations. Some minorities, low-income residents, and Native Americans may rely on forest products or related forest activities for their livelihood and/or culture.

There are no known areas of religious significance in the area. There are no known special places of minority or low-income communities within the project area. Individuals may work, recreate, gather forest products, or have other interests in the area.

Social and Economics Effects– Alternative 1

Market and Economics

Under Alternative 1, RLK would not construct or operate a mountain bike park within the SUP area. As a result, there would be no additional capital expenses or operating expenses. Similarly, there would be no new revenues. RLK's current operating model would remain in place and any changes to Timberline's economic conditions in the analysis area would be the result of population growth and/or other larger-scale economic conditions.

Emergency Services

Any increased visitation due to population growth or other economic factors would result in a corresponding increased use of emergency services. As the Hoodland Fire Department is funded by property taxes and fees assessed on nonresident drivers, any increase in services would be balanced by increased revenue. Similarly, any increase in ambulance service would be balanced by the corresponding increase in recreationists in the Government Camp area and associated spending and tax revenues.

Traffic and Parking

Under Alternative 1, the current 920 parking spaces at Timberline would continue to accommodate a theoretical 2,900 people. The presence of skiers and non-skiers in the parking lots during the summer would continue to result in the availability of parking spaces during all but the busiest of summer days.

Environmental Justice

There would be no change in access to the Timberline SUP area with implementation of the No Action Alternative or the Proposed Action. Consequently, no disproportionate effects to minority or low-income populations relating to access would take place under the No Action Alternative.

The No Action Alternative would retain the existing patterns of recreational use at Timberline, and therefore would not disproportionately affect low-income or minority populations wishing to recreate in the area.

Social and Economics Effects – Alternative 2

RLK and their bike park design firm, GravityLogic prepared a preliminary evaluation of the potential biker visitation to the proposed Timberline Bike Park, as well as economic pro forma, which modeled the capital and operating costs with the potential revenues[3]. Subsequent to finalizing the Proposed Action in this EA, RLK re-evaluated the pro forma (Re-Align Environmental, 2011) and included a shorter phasing of construction, reducing the construction time from 5 years to 2 years. The revised calculations were used to project visitation, revenues and expenses for the mountain bike park. In order to estimate the economic effect of the bike park on the analysis area, the revenue sectors provided in the Whistler Bike Park (Illustration 2) were used to estimate offsite economic activity that would be sponsored by the Timberline Bike Park.

Market and Economics

Visitation and Spending

The economic performance of the Timberline Bike Park under Alternative 2 was modeled using Excel for a period of 6 years, starting with Year 1 as the initial year of construction and Year 2 as the first operating season. The following assumptions were used in the analysis:

- The capacity of the bike park at full build-out and a utilization of over 80% would result in approximately 20,000 season visits as the ultimate comfortable carrying capacity of the bike park (see Recreation Section – Capacity).
- Each bike park visitor would account for $200 in total spending – MBTA (2006) reported $133 plus bike park spending per day and GravityLogic (2010) reported $230 per day.
- Timberline Bike Park Revenue is based on RLK's revised pro forma (Re-Align Environmental, 2011).
- Food and beverage spending is 35% of total spending, based on GravityLogic (2010).
- Offsite Lodging spending is 25% of total spending, based on GravityLogic (2010).
- Offsite retail spending is 12% of total spending, based on GravityLogic (2010) and RLK Retail Revenue is based on RLK's revised pro forma (Re-Align Environmental, 2011).
- Offsite Retail Revenue is based on total revenue less RLK Retail Revenue.
- Bike park construction would be funded with cash – no loans or debt service is considered in the analysis.
- All values are in 2011, US dollars.

[3] The original Feasibility Study is in the project record and is not included in this analysis due to the revisions that were made during the final development of the Proposed Action.

Table 2
Timberline Bike Park – Alternative 2
Economic Impact Analysis

Year	Projected Visits	Total Revenue ($)	Timberline Bike Park Revenue ($)	RLK Revenue as % Total Revenue	Food and Beverage Revenue ($)	Offsite Lodging Revenue ($)	Total Retail Revenue ($)	RLK Retail Revenue ($)	Offsite Retail Revenue ($)
1	0	0	0	0	0	0	0	20,000	NA
2	6,000	1,200,000	393,000	33	483,000	345,000	165,600	30,000	135,600
3	7,500	1,500,000	496,500	33	603,750	431,250	207,000	31,500	175,500
4	11,250	2,250,000	770,625	34	905,625	646,875	310,500	50,625	259,875
5	19,688	3,937,500	1,413,750	36	1,584,843	1,132,031	543,375	98,437	444,937
6	21,656	4,331,250	1,547,625	36	1,743,328	1,245,234	597,71	108,281	489,431

Source: Re-Align Environmental

As shown in Table 2, it is expected that RLK will initiate retail sales to promote the Timberline Bike Park during the first year of construction. Aside from this retail revenue, no other bike park-related revenues would be generated in Year 1.

In Year 2, all of the Phase 1 trails and skills park would be built (see Chapter 2 and Appendix A) and the bike park operation would open. With an operating season of approximately 90 days, it is projected that the Timberline Bike Park would realize 6,000 bike park visits.

During Year 3, the entire bike park would be constructed. This would be the first year for RLK to market the bike park in its entirety, so it is not projected that visitation would increase by more than 25%, projected at 7,500 biker visits.

Year 4 is projected to see a 50% increase in visitation due to increased marketing and the potential for several events to take place in the bike park, resulting in a projected 11,250 bike park visits.

By Year 5, it is expected that RLK marketing would be fully implemented and word-of-mouth among U.S. Mountain bikers would sponsor a 75% increase in bike park visits, growing to 19,688 visits.

As of Year 6, the bike park would have reached its operating capacity, increasing visits by 10% and resulting in 21,656 visits for the season.

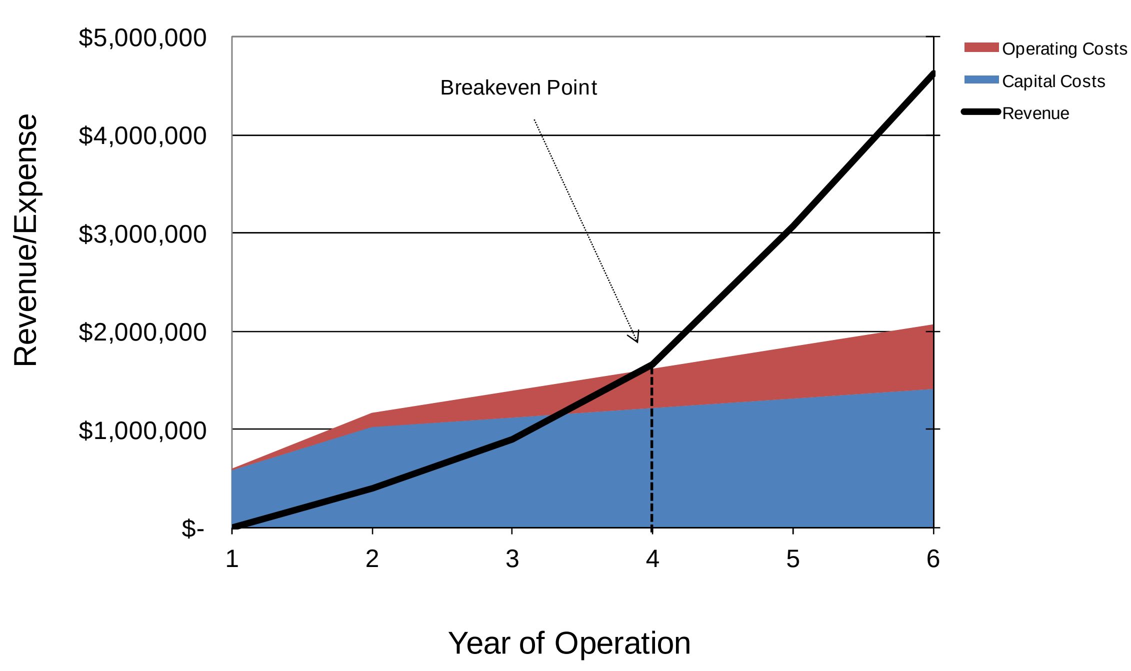
Table 2 shows that RLK's projected revenue reaches 36% of the total by Year 6, suggesting that 64% of the total revenue would be realized at offsite facilities such as hotels, restaurants and stores in Government Camp and along the analysis corridor from Hood River to Sandy.

Breakeven Analysis

A Breakeven Analysis was conducted to evaluate the economic viability of the proposed Timberline Mountain Bike Park. The breakeven analysis evaluated the revenues and expenses associated with a 6-year timeframe. Operational break-even represents the number of bike park riders needed in any given year to cover all costs that the bike park incurs in that year. The determination of a break-even point is an important measure used to assess the financial feasibility of the bike park. This helps the Forest Service determine the financial and operational security of a newly approved facility on NFS lands.

The break-even analysis was completed for a six year period following the implementation of the Proposed Action by evaluating the capital and operating costs compared to the revenue received from the visitation projections described in Table 2. The costs tied to capital and operating expenses were subtracted from the revenues to determine the net revenue. An operational break-even point was then computed as the point in which the net revenue equals the operating and capital costs. As shown in Illustration 3, the Timberline Bike Park is projected to reach operational breakeven during Year 4.

Illustration 3
Timberline Bike Park Breakeven Analysis – Alternative 2



Source: Re-Align Environmental

Emergency Services

Under Alternative 2, any increased visitation would result in a corresponding increased use of emergency services. As the Hoodland Fire Department is funded by property taxes and fees assessed on nonresidents, any increase in services would be balanced by increased revenue.

With over 20,000 additional summer visits at the Timberline Bike Park under Alternative 2 (Year 6), it is expected that injuries would increase to some degree. However, it is not expected that additional ambulance staging would be required in Government Camp or at Timberline and the numbers of injuries would be substantially less than during the ski season.

Traffic and Parking

Under Alternative 2, the current 920 parking spaces at Timberline would continue to accommodate a theoretical 2,900 people. The presence of both skiers and non-skiers in the parking lots during the summer would continue to result in the availability of parking spaces during all but the busiest of summer days. As described in Section 3.6 – Recreation, the Timberline Bike Park would accommodate a PAOT of 338, resulting in an additional 169 cars on a capacity day[4]. The existing parking lots would continue to limit the number of visitors in the SUP area and this issue would be somewhat exacerbated on a capacity day at the bike park. During mountain bike events and busy days, RLK would manage parking by segregating user groups into different parking areas. RLK would also implement parking and spectator management provisions in the Spectator Management Plan (Rec-5), which would include the use of shuttles from Government Camp to reduce the parking demand resulting from the bike park.

Environmental Justice

Under the Proposed Action, installing a fee-based mountain bike park at Timberline would serve a specific, “high end” market, as described earlier in this section. As a result, the intended user group – mountain bikers – would benefit the most from the Proposed Action. However, the bike park would be developed in an area that is typically not heavily used by recreationists during the non-skiing season, and therefore would not displace any other user groups such as non-paying mountain bikers using West Leg Road or other mountain bike trails in the area. As a result, the Proposed Action would not cause any disproportionate recreation effects to low-income or minority populations.

The Confederated Tribes of the Warm Springs have expressed interest in gathering huckleberries within the Timberline SUP area (USDA, 2004). The No Action Alternative would retain the existing patterns of use in the area, and would not affect huckleberry gathering. The Proposed Action may result in the removal of individual huckleberry plants along the ground disturbance corridor due to the creation of the bike trails. However, given that the majority of the bike trails are in heavily forested areas, where huckleberry growth is typically more sparse, as opposed to the ski trails where huckleberry growth is more dense, the availability of huckleberry in the SUP area would not be measurably reduced. Consequently, under the No Action or the Proposed Action, there would be no disproportionate effects to tribal huckleberry gathering.

[4] Assuming 2 people per car, which is less than the average for ski days in the winter.

Cumulative Effects

Because none of the alternatives would be expected to disproportionately affect low-income populations or minority populations, there would be no contribution by the No Action Alternative or Proposed Action to cumulative effects associated with environmental justice.

Recent upgrades to the mountain bike trail system at SkiBowl would add to the supply of developed mountain bike trails in the Government Camp area. SkiBowl has voiced support for the Timberline Bike Park, indicating that they believe the new bike park would draw more people to the Government Camp area, including both Timberline and SkiBowl. The economic impact of this synergy would likely increase offsite spending beyond the projections in this analysis.

3.9 Aquatic Resources

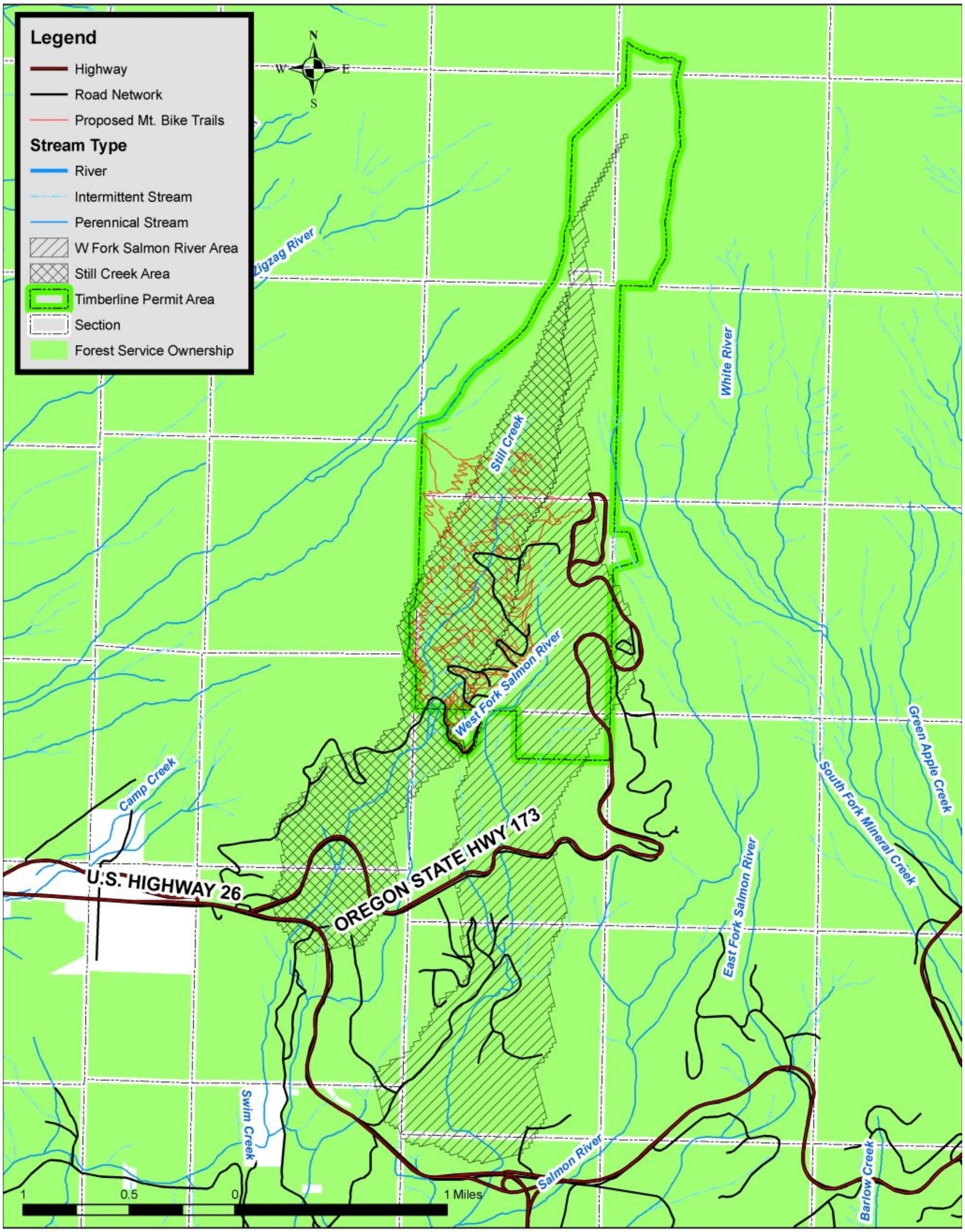
3.9.1 Introduction

The analysis area for aquatic resource indirect and cumulative effects analysis includes the proposed downhill bike trails and skills park as well as existing road and trail network associated with ski area operations at Timberline. The Action Area includes portions of Hwy 26 where Still Creek and the West Fork Salmon intersect Highway 26 and riparian reserves along all streams (both perennial and ephemeral) (Figure 1). For a discussion of the hydrologic planning areas and watershed resources identified for this project, refer to the Hydrology Specialist Report (Appendix C).

Several aquatic habitat elements could be impacted by downhill mountain bike trail construction and use. The primary elements are related to erosion that could lead to increased sedimentation into surface waters downstream of the proposed project, the extension of the stream drainage network, and long and short term impacts to riparian buffers.

Fine sediment routing and turbid conditions would extend downstream varying distances from the project depending on stream flow, stream size, gradient, and habitat complexity (the more complex the habitat the more likely sediment would be trapped behind logjams or other structures). For purposes of this analysis, it was assumed that in Still Creek fine sediment generated from the bike park would be transported through the steep gradient below the project area and likely settle out in the first low-gradient section below Highway 26 (adjacent to Still Creek Campground), which is located approximately 1.2 miles below the project area. In the West Fork Salmon, this analysis assumes that sediment will likely be transported to the first low gradient area that exists above the Highway 26 and Highway 35 interchange (see Map Fish 1). Sediment generated in the Glade and Sand Canyon sub-watershed is not expected to extend beyond the ski area permit boundary.

Figure 1. Map of the area that is likely to be directly or indirectly affected by the project as it relates to aquatic resources ("Action Area"). Cross-hatches delineate the Action Area in Still Creek and stripes delineate the Action Area in the West Fork Salmon River.



3.9.2 Status of Listed Fish Species/Critical Habitat and Presence of Region 6 Special Status Species

The Mt. Hood National Forest uses salmonids (salmon, trout and char) as management indicator species for aquatic habitats. Due to their value as game fish and their sensitivity to habitat changes and water quality degradation, salmonids are used to monitor trends within Forest streams and lakes. Although other fish species may be present (e.g., lamprey, sculpins and dace), their population status and trends are unknown. Since more information exists on salmonids, this group serves as a more optimal choice for monitoring aquatic environments.

The Sandy River supports several species of anadromous salmonids, including spring and fall Chinook, coho, and winter steelhead. These salmon and steelhead populations, which historically numbered in the tens of thousands (Taylor 1998), have experienced significant declines during the last century (SRBP, 2005). Within the last decade, the federal government and State of Oregon have listed all of these populations for protection under either the state or federal Endangered Species Act (ESA) (Aquatic Table -1).

Salmonids listed under the ESA are grouped by distinct population segment (DPS) or evolutionary significant unit (ESU) - large geographic areas that are reproductively isolated from each other (i.e. different run and spawning timing). The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service have agreed the grouping name for Pacific salmon will be ESU and for steelhead DPS. More information may be found in Federal Register ESA listings.

Aquatic macroinvertebrates are important residents of streams, lakes, and ponds in the Forest. Presence, abundance, and status of invertebrate species that reside in area water bodies are not well understood. Most streams within the Forest have good water quality within their natural constraints (e.g., glacial streams are naturally turbid at times and carry a high sediment load) and habitat conditions are generally favorable. Macroinvertebrate populations appear robust and a range of species representing a wide variety of feeding groups (predators, grazers, leaf shredders) are usually present, but definitive studies to characterize diversity, richness, and biomass are lacking. Therefore, the following discussion, as well as the effects analysis, focus on the four snails and one caddisfly listed in Table Aquatic-1.

Lower Columbia River Steelhead

Winter-run steelhead trout (*O. mykiss*) are indigenous to the Sandy River Basin, and historic returns may have once numbered 20,000 adults (ODFW, 2002, as found in SRBP, 2005). Today the average native run return is size is around 1,500 (Mobrand, 2004). In regards to habitat utilization, they occupy a greater range of habitat than any other salmon or trout species and their range in the Sandy River extends from the Timberline Ski Area Boundary to the Sandy River Delta. Steelhead are more of an opportunist anadromous species compared to salmon. As such, they are often more widespread and can utilize smaller streams more readily than many salmon species which is why steelhead are the only anadromous species known to reside in the action area.

Aquatic Table -1
ESA Listed, Special status and Other Important Aquatic Species Found in the Sandy River Basin

Species	DPS/ESU	Status[a]	Fifth Field Watersheds
Bull trout (*Salvelinus confluentus*)	Columbia River DPS	Threatened 6/98	Lower Sandy
Steelhead trout (*Oncorhynchus mykiss*)	Lower Columbia River DPS	Threatened 1/06	Middle Sandy, Upper Sandy, Zigzag, Salmon
Steelhead trout	Lower Columbia River DPS	Threatened 1/06	Middle Sandy, Upper Sandy, Zigzag, Salmon
Chinook salmon (*O. tshawytscha*)	Lower Columbia River ESU	Threatened 6/05	Middle Sandy Upper Sandy, Zigzag River, Salmon
Coho salmon (*O. kisutch*)	Lower Columbia River ESU	Threatened 6/05	Middle Sandy, Upper Sandy, Zigzag Salmon
Smelt (Th. Pacificus)	Southern DPS	Threatened 3/10	Lower Sandy
US Forest Service, Region 6 Regional Forester's Special Status Species (R6 SS)			
Redband/ Inland Rainbow Trout (*O. mykiss*)	Not Applicable (N/A)	R6 SS – 1/08	Middle Sandy, Bull Run, Upper Sandy, Zigzag
Columbia duskysnail (*Colligyrus sp. nov. 1*)	N/A	R6 SS – 1/08, Rare & Uncommon	Most 5th field watersheds within the MHNF
Barren Juga (*Juga hemphilli hemphilli*)	N/A	R6 SS – 1/08	Unknown[b]
Purple-lipped Juga (*Juga hemphilli maupinensis*)	N/A	R6 SS – 1/08	Unknown[b]
Scott's Apatanian Caddisfly (*Allomyia scotti*)	N/A	R6 SS – 1/08	Salmon and White; may be present elsewhere[b].
Basalt Juga (*Juga* (*Oreobasis*) n. sp. 2)	N/A	Rare & Uncommon – 1/01	Middle Columbia/Mill Creek[c]
Other Species Addressed in this Analysis			
Pacific lamprey (*Lampetra tridentata*)	N/A	Culturally and locally important	Middle Sandy , Upper Sandy , Zigzag, Salmon
Cutthroat Trout (*O. clarki*)	N/A	Forest MIS Species	Middle Sandy Upper Sandy, Zigzag, Salmon

[a]The date in the status column is the date of listing or most recent status review and subsequent Federal Register notice for ESA listed species and the date of the most recent sensitive species list and/or Northwest Forest Plan Record of Decision for special status species.

[b]These three species were recently added to the Region 6 Regional Forester's Special Status Species list. Extensive surveys for these species have not been conducted. Recent surveys (Wissman, 2010) indicate they are present within the action area and are assumed to be requirements (see below) indicate they could be present at least in some areas and where habitat is suitable they are assumed to be present.

[c]The Basalt Juga was found for the first time during the 2008 field season in North Fork Mill Creek. It has not been found in any other streams surveyed in the Forest. Given that all other known locations are within the Columbia Gorge near The Dalles it is presumed this snail is localized in distribution and not present in most watersheds on the Forest.

Typically, winter-run steelhead enter the basin in significant numbers from February through May, with peak spawning occurring in mid-May. The majority of suitable spawning habitat is located upstream of the former Marmot Dam site in the Salmon River and its tributaries, and in Still Creek (PGE, 2002, SRBP, 2005). Spawning habitat is also present in Clear Creek, Clear Fork, Lost Creek, Horseshoe Creek, Zigzag River, Cheeney Creek, Henry Creek, Lady Creek, and Camp Creek (Bishop, pers. comm., 2010). Lower basin tributaries (below the Marmot Dam site) that may support additional winter steelhead production include the Bull Run River and Gordon, Trout, and Buck creeks. Natural production in the Bull Run is limited by a lack of fish passage into the upper reaches of the watershed. Since the Little Sandy Dam removal, adult and juvenile steelhead have been documented above the former dam site and appear to be recolonizing their range in the Little Sandy.

Steelhead are a "stream-type" salmonid with much of their lives spent in their natal stream. Following emergence, steelhead fry will often seek refuge from fast currents by inhabiting stream margins and pool backwater habitats (as found in SRBP, 2005). As they begin to mature and grow larger, juveniles will typically inhabit deeper water habitats of pools, riffles, and runs. Steelhead juveniles may rear 2 – 3 years in their natal stream before migrating as smolts to the ocean. As such, the quality of the habitat they inhabit during this time is critical to their survival. Smolt emigration takes place primarily from March through June during spring freshets (USFS, 2003).

LCR steelhead are present throughout most of the Still Creek sub-watershed and trout/steelhead have been documented in the lower gradient depositional reach below the project area at RM 13-14 (USFS 1980, 1984, 1995b, 1996, 2004). Their current distribution extends up to Still Creek Campground which is within the Action Area (approximately 1.2 miles downstream of the proposed project). It is likely the Highway 26 road culvert currently acts as a fish barrier, although shortly thereafter, there are two potential waterfall barriers at RM 14.4 and RM 15.1 which may have acted as the historic upper limits for the anadromous form of rainbow trout, however, the resident form was historically present within the project area. Designated Critical Habitat for LCR steelhead extends upstream of Highway 26 to the bottom end of the proposed project (RM 15.2) and is therefore present within the Action Area.

In the Salmon River watershed there are several main-stem falls which prevent anadromous fish passage into the upper watershed. One of these occurs on the main-stem of the Salmon River at RM 14.3 (Final Falls) (USDA, 2001). On the West Fork, a natural waterfall barrier at RM 2.0 further prevents fish passage (SE Group 2004, Jones & Stokes 2004). Based on the presence of these barriers and the absence of sightings during 2003 and 2004 surveys the LCR steelhead is not expected to occur within the West Fork Salmon River.

LCR steelhead are also present in the Zigzag River Watershed up to where a natural barrier falls on the Little Zigzag River prevents fish passage into the upper watershed (~5 miles below the Action Area). As such, steelhead are not known to occur within either the Glade or Sand Canyon tributaries of the Zigzag River.

Still Creek, the Lower Salmon River and the Zigzag River are considered primary habitat for native winter steelhead in the basin. The NMFS Willamette/Lower Columbia Technical Recovery Team (NMFS WLC-TRT) classified the winter run as a "core" population in its recovery planning efforts. This designation means the population (1) historically was abundant and productive, and (2) it currently offers one of the most likely paths to recovery in the Lower Columbia Steelhead ESU (McElhany et al., 2003, as found in SRBP, 2005). The Lower Columbia Fish Recovery Board designates the priority for contribution of this stock to recovery goals in the ESU as "Primary." This classification means the Sandy River winter steelhead stock would be targeted for recovery in the Cascade "stratum" to achieve viable population levels with greater than 95 percent probability of persistence (negligible extinction risk) within 100 years (LCFRB, 2004; McElhany et al., 2003; McElhany et al., 2004, as found in SRBP, 2005).

Lower Columbia River Chinook Salmon

Lower Columbia River Chinook salmon are found throughout the Sandy River including several of its 5th field watersheds. This ESU is made up of both spring and fall run components. Both runs have been influenced by historic hatchery operations associated with the Willamette ESU but there is evidence that naturally reproducing spring Chinook in the upper Sandy River have retained at least "a low level of genetic differentiation from upper Willamette River stock propagated in the Clackamas Hatchery (Bentzen, 1998, as found in SRBP 2005)."

The fall Chinook population is comprised of two stocks: an earlier returning non-native "tule" stock and a later returning wild stock known as the "late bright" stock (Murtaugh et al. 1997, as found in SRBP 2007). The late bright fall Chinook population is one of only two remaining wild populations in the Lower Columbia Evolutionarily Significant Unit (ESU) (SRBP 2007).

Spring Run Chinook: Spring run Chinook salmon are indigenous to the Sandy River Basin, and historic returns may have once numbered 15,000 adults (City of Portland 2004). Today, the average native run size is around 2,000 (PGE, 2002). The majority of spring Chinook present in the basin today are of hatchery origin. Sandy River spring Chinook enter the Sandy River delta as early as February, but more commonly in April and May (SRBP 2005). Peak migration into the upper Basin (above the former Marmot Dam site) occurs in June, with a smaller peak occurring in September (SRBP 2005). Spawning occurs primarily in August through October, with peak spawning in September. Fry emergence typically occurs in middle to late winter, followed by a downstream migration to larger mainstem areas for rearing (SRBP 2005). Juvenile spring Chinook rearing distribution is not well documented in the lower Sandy River Basin (ODFW 1997, as found in SRBP 2005)." The majority of smolts migrate to the ocean in the spring of their second year (at age 1+ as stream type fish); however, a significant portion may out-migrate in the fall as sub-yearlings (SRBP 2005).

ODFW and USFS have conducted spring Chinook spawning surveys in the upper Sandy River basin since the early 1990s (Grimes et al. 1996, Lindsay et al. 1997, Schroeder et al. 1998, 1999, 2002, 2003, Schroeder and Kenaston 2004, 2005, 2006-2008, Arendt 2003, Hanna 2009, 2010), excluding run years 2000-01, and designed the surveys to document the geographic distribution, timing, and abundance of naturally spawning spring Chinook (SRBP 2005, Hanna 2009). Principal spawning areas are focused in the Salmon River with the highest redd densities occurring in the four mile reach below Final Falls (RM 10-14) (~ 20 miles below the Action Area) with the next highest densities occurring in Still Creek (from RM 0 to RM 3). The balance are unevenly distributed throughout the Zigzag River, mainstem Sandy River, Camp Creek, and Lost Creek (Schroeder et al 2008, Hanna 2009). Thus, the Salmon River and Still Creek provide the majority of critical spawning and juvenile rearing habitat for LCR spring Chinook, and consequently play a critical role in the recovery of that ESU (SRBP 2005, City of Portland 2004).

As previously described, there are several main-stem falls in the Salmon River which prevent anadromous fish passage into the upper watershed. Based on the presence of these barriers and the absence of sightings during surveys, LCR spring Chinook salmon are not expected to occur within the Action Area that includes the West Fork Salmon River (USDA 2004, Jones & Stokes 2004).

While there are no anadromous fish barriers in Still Creek, spring Chinook have only been observed in the lower 7 miles of the stream (~ 8 miles below the Action Area) (**Error! Reference source not found.**). Above RM 7.0, Still Creek becomes narrow and more entrenched with steep gradients and a series of pool drops which probably act as natural deterrents to spring Chinook migration and juvenile rearing. Potential habitat exists within the Action Area as well as downstream. However, surveys conducted in Still Creek within the study area and downstream did not find any presence of Chinook salmon (Jones & Stokes 2004, USDA 2004). Based on the lack of historic and current distribution of spring Chinook in upper Still Creek, LCR Chinook salmon are not expected to occur within the Action Area that includes Still Creek.

LCR spring Chinook are also present in the Zigzag River Watershed up to Little Zigzag Falls which prevents anadromous fish passage into the upper watershed (~5 miles below the Action Area). As such, LCR spring Chinook are not known to occur within either the Glade or Sand Canyon tributaries of the Zigzag River and therefore are not present within the Action Area that includes those tributaries.

Fall Chinook: The fall Chinook population is comprised of two stocks: "an earlier returning non-native "tule" stock and a later returning wild stock known as the "late bright" stock (Murtaugh et al. 1997, as found in SRBP 2005)." The late bright fall Chinook population is one of only two remaining wild populations in the Lower Columbia ESU.

While historic population estimates of the native "late bright" stock (LRW) are not available, most agree that the stock is depressed (SRBP 2005). "The minimum average annual run estimate for returns to the Sandy River in 1984-1994 was 1,503 (ODFW 2002). Another estimate for 1984 to 2001, as determined by Cooney et al. (2003), was only 504 individuals. Spawning escapement in 2000 reached a record low of only 88 individuals (ODFW 2003a). More recently, Mobrand Biometrics (City of Portland, 2004) summarized Sandy LRW fall Chinook stocks estimates for 1990 to 2000 from several sources. "The winter subcomponent appears to be severely depressed based on declining spawner counts at index sites in Gordon and Trout creeks (ODFW 1997). In most years, only a handful of these fish are observed or caught by anglers in the Sandy River (as found in SRBP 2005)."

"Adult fall Chinook are present in the Sandy River Basin from August through February. Peak spawning occurs from October through December, and spawning distribution appears to be controlled by flow conditions in the basin (ODFW 1997, as found in SRBP 2005)." "Size, age, and run timing of adult fall Chinook vary by stock. The first, the early maturing tule, is also referred to as the Lower River Hatchery (LRH) stock. The second, the late maturing Lower River Wild (LRW) stock, shows run timing and genetic characteristics similar to the late wild stock in the Lewis River in Washington (Cooney et al., 2003, as found in SRBP 2005)." "The early maturing tule fall Chinook are believed to be a mix of: (1) naturally produced fish that originated from hatchery releases made in the Sandy River prior to 1977; (2) the progeny of successful spawning stray hatchery fall Chinook; and to a lesser extent (3) stray hatchery fall Chinook adults originating from hatcheries in both Washington and Oregon (ODFW 1997, as found in SRBP 2005)."

"Tule fall Chinook begin entering the Sandy River in August, and spawning occurs from late September through mid-October. The late maturing LRW stock is indigenous and typically enters the Sandy River in October, with spawning occurring late October through December. Though most spawning of fall Chinook now occurs in the main-stem and tributaries of the lower basin near Oxbow Park, historic spawning distribution occurred both in the Bull Run River and above Marmot Dam in the lower Salmon River and Sixes Creek (a Salmon River tributary stream) (ODFW 2002, as found in SRBP 2005)."

"The NMFS Fisheries Willamette and Lower Columbia Technical Recovery Team (WLC-TRT 2003a) has classified the late run Sandy River brights (LRW stock) as both a "core" and a "genetic integrity" population in their recovery planning efforts (as found in SRBP 2005)." "These designations mean (1) the population historically was abundant and productive, (2) the current population resembles the historic life histories and genetic types in the Sandy River Basin, and (3) it currently offers one of the most likely paths to recovery in the Lower Columbia Chinook ESU (McElhany et al. 2003, as found in SRBP 2005)."

The Lower Columbia Fish Recovery Board (LCFRB) also looked at this stock and designated it as "Primary" in regard to its priority for contribution to recovery goals in the ESU. This classification means the Sandy River late fall Chinook stock would be targeted for recovery to achieve viable population levels with a greater than 95 percent probability of persistence (i.e., negligible extinction risk) within 100 years (LCFRB 2004; McElhany et al. 2003; McElhany et al. 2004). The early fall run tule stock (LRH) did not receive a similar designation as either a "core" or "genetic integrity" population. The Lower Columbia Fish Recovery Board designated the priority for contribution of this stock to recovery goals as "stabilizing," which focuses on maintaining the current population structure of this stock (LCFRB 2004).

ODFW has conducted spawning surveys for fall Chinook in the Sandy River since 1952 (Fulop 2003). Since 1984, ODFW has conducted annual surveys of tule and late-bright wild stocks on a 10-mile index reach on the main-stem Sandy River between the confluence of Gordon Creek and Lewis and Clark State Park. ODFW has also surveyed the late bright fall Chinook stock along two 0.2-mile long index reaches on Trout and Gordon creeks irregularly from 1952 to 1997, and annually in run years 1989-2009.

Principal spawning areas are similar for both tule and late-bright Chinook and are generally located near Oxbow Park. "But due to their run timing, late-brights usually have more available tributary and side channel habitat. Gordon and Trout creeks are important lower basin tributaries used by fall Chinook when flows increase (ODFW, 2002, as found in SRBP 2005)." Based on both historic and current distribution of fall Chinook well below Mt. Hood National Forest boundaries, the LCR Chinook salmon does not occur within the Action Area.

Lower Columbia River Coho Salmon

The Lower Columbia River/Southwest Washington Coast ESU is sustained primarily by hatchery production. "The only two known self-sustaining populations are in the Sandy and Clackamas rivers in Oregon (Iwamoto et al., 2003, as found in SRBP 2005)." "Weitkamp et al. (1995) hypothesized that the only known remaining natural population of coho in the Lower Columbia River/ Southwest Washington Coast ESU is the Clackamas late-run stock. However, since 1999, only natural origin coho have been allowed to pass over Marmot Dam and a naturally spawning population appears to exist (as found in SRBP 2005)." "Currently, the Sandy River Basin supports both an early hatchery run of coho, with peak presence occurring in September and October, and a late wild run generally peaking from September through November (ODFW, 1997, as found in SRBP 2005)."

“Historically, the late wild Sandy coho were thought to have been present in the basin primarily from October through February, with peak spawning occurring in November through February (ODFW 2002, as found in SRBP 2005).” “ODFW (1997) lists two possible factors for the possible shift in run timing of wild coho in the Sandy River Basin: (1) inconsistent flow regimes at Marmot Dam throughout the late summer and early fall from the early 1900s through the early 1970s; and (2) possible genetic introgression with early returning hatchery fish escaping to spawning grounds upstream of Marmot Dam (as found in SRBP 2005).” Peak spawning activity in the Sandy River Basin occurs in late October through November, with very few fish observed on the spawning grounds after December (ODFW 1997).

Fry emergence primarily occurs from February through April and peaks in March (PGE, 2002). Following emergence, juvenile coho typically seek stream margin habitats and backwater pools for initial rearing (ODFW 1997). As they continue to grow in size, juveniles seek low velocity pool and off-channel habitats for summer and winter rearing. Juvenile coho rely heavily on slack water habitats with complex large woody debris for protection from winter freshets. Juvenile coho in the Sandy River typically emigrate to the ocean as 1+ smolts at about 12 to 14 months of age (ODFW 1997). The timing of juvenile coho outmigration is usually late March through June, peaking in April and May (ODFW 1990). Coho salmon in the Lower Columbia River/Southwest Washington Coast ESU typically rear in the ocean for two summers and return as 3-year-olds, the primary exception are “jacks,” which are sexually mature males that return to freshwater after spending one summer in the ocean (Iwamoto et al. 2003).

“Historically, Sandy River Basin coho salmon probably spawned and reared in the majority of the basin and its tributaries accessible to anadromy. Much like today, the major clear water tributaries above Marmot Dam (Salmon River, Boulder Creek, Clear Creek, Camp Creek, Lost Creek, Still Creek, and the Clear Fork of the Sandy River) were probably important coho producers, as were tributaries downstream of Marmot Dam (as found in SRBP 2005).”

Though natural reproduction continues to occur in the lower sub-basin below the former Marmot Dam site, primary spawning and rearing areas are currently located in the clear-water tributaries above Marmot Dam, with principal spawning and rearing habitat occurring in the Salmon River, Still Creek, and Clear Creek (USFS 2005, 2008, 2009).

Surveys conducted within Still Creek in 1978, 1984, and 1992 found presence of coho salmon up to RM 12.15 which is just below the Action Area (USFS 1992, USFS 1996). However, those fish were assumed to be planted hatchery juveniles and no coho have been observed that high in the basin since the late 1990’s. More recent surveys have documented coho presence up to approximately RM 9.0 where steep gradients, and confined channels appear to naturally limit preferred rearing habitat and may also inhibit upstream migration (Mt. Hood National Forest, unpublished data 2004, 2006).However, the first true physical barrier occurs at the Highway 26 road crossing (RM 14) and then shortly thereafter two natural fish barriers occur at RM 14.4 and 15.1. Surveys conducted within the Action Area did not find any presence of LCR coho salmon in Still Creek (SE Group 2004, Jones & Stokes 2004). Suitable habitat exists within the Action Area and downstream in Still Creek.

LCR coho are also present in the Zigzag River Watershed up to Little Zigzag Falls which prevents anadromous fish passage into the upper watershed (~5 miles below the Action Area).

As such, LCR coho are not known to occur within either the Glade or Sand Canyon tributaries of the Zigzag River and therefore are not present within the Action Area.

" Lower Columbia Fish Recovery Board designated the priority for contribution of this stock to meet recovery objectives in the ESU as "Primary." This classification means the Sandy River coho stock would be targeted to achieve viable population levels with greater than 95 percent probability of persistence negligible extinction risk within 100 years (as found in LCFRB, 2004)."

Columbia River Bull Trout

Bull trout are believed to be a glacial relict whose distribution has expanded and contracted with natural climate changes. Bull trout often occur upstream from barriers in many drainages, an indication of early colonization (Meehan et al. 1991). Bull trout live in a variety of habitats including small streams, large rivers, and lakes or reservoirs. In some drainages, the fish spend their lives in cold headwater streams. Basic rearing habitat requirements for juvenile bull trout include cold summer water temperatures (<15°C (59°F)) with sufficient surface and shallow groundwater flows. High sediment levels and embeddedness can result in decreased rearing densities. Adult bull trout would reside in the main-stem and larger tributaries until their spawning period during mid-August through September, at which time they would migrate upstream to smaller tributaries to spawn.

Bull trout spawn in the fall, and require clean gravel and very cold water temperatures for spawning and egg incubation. Bull trout fry utilize side channels, stream margins, and other low velocity areas. Adults require large pools with abundant cover in rivers. Presumably, the various forms of bull trout interbreed, which helps to maintain viable populations throughout their range.

The only known population of bull trout in the Forest is found in the Hood River watershed. Historic presence of bull trout in the Sandy River Basin is uncertain, although there have been at least three occasions since 1999 where adult bull trout were documented in the lower Sandy River. The first was caught (and photo-documented) by an angler in the Lower Sandy in November of 1999. In April 2000, ODFW fish survey crews identified an 18-inch bull trout caught in the trap at Marmot Dam. And finally, in January 2002 a bull trout was caught and released by an angler in the lower Sandy River below Oxbow Park (Muck, J. personal communication).

Potential suitable habitat exists within the Action Area in both the West Fork Salmon River and Still Creek sub-watersheds. However, no bull trout have ever been observed in presence/absence surveys conducted in those sub-watersheds since the early 1990s (USDA 1992; USDA 1996; Jeff Uebal, David Saiget, personal communication). Surveys conducted within the Project Area in Still Creek and the West Fork Salmon River did not find any presence of bull trout (SE Group 2004, Jones & Stokes 2004). The Zigzag Watershed Analysis does not document the existence of bull trout in the 6th field Still Creek sub-watershed (USDA 1995b). The Salmon River Watershed Analysis mentions historic reports of bull trout in the Salmon River drainage as well as suitable habitat and isolation, but its presence within the watershed has not been confirmed (USDA 1995a). Based on the lack of historical evidence of bull trout presence in the Upper Sandy Basin and lack of sightings by survey crews, bull trout are not expected to be present within the Action Area.

Pacific Eulachon (Smelt)

"Eulachon are endemic to the eastern Pacific Ocean, ranging from northern California to southwest Alaska and into the southeastern Bering Sea. In the continental United States, most eulachon originate in the Columbia River Basin. Other areas in the United States where eulachon have been documented include the Sacramento River, Russian River, Humboldt Bay and several nearby smaller coastal rivers (e.g., Mad River), and the Klamath River in California; the Rogue River and Umpqua Rivers in Oregon; and infrequently in coastal rivers and tributaries to Puget Sound, Washington (NMFS,2011)."

"Eulachon abundance exhibits considerable year-to-year variability. However, nearly all spawning runs from California to southeastern Alaska have declined in the past 20 years, especially since the mid 1990s. From 1938 to 1992, the median commercial catch of eulachon in the Columbia River was approximately 2 million pounds (900,000 kg) but from 1993 to 2006, the median catch had declined to approximately 43,000 pounds (19,500 kg), representing a nearly 98 percent reduction in catch from the prior period. Eulachon returns in the Fraser River and other British Columbia rivers similarly suffered severe declines in the mid-1990s and, despite increased returns during 2001 to 2003, presently remain at very low levels. The populations in the Klamath River, Mad River, Redwood Creek, and Sacramento River are likely extirpated or nearly so. (NMFS 2011)."

"Habitat loss and degradation threaten eulachon, particularly in the Columbia River basin. Hydroelectric dams block access to historical eulachon spawning grounds and affect the quality of spawning substrates through flow management, altered delivery of coarse sediments, and siltation. The release of fine sediments from behind a U.S. Army Corps of Engineers sediment retention structure on the Toutle River has been negatively correlated with Cowlitz River eulachon returns 3 to 4 years later and is thus implicated in harming eulachon in this river system, though the exact cause of the effect is undetermined. Dredging activities in the Cowlitz and Columbia rivers during spawning runs may entrain and kill fish or otherwise result in decreased spawning success (NMFS 2011)."

"Eulachon have been shown to carry high levels of chemical pollutants, and although it has not been demonstrated that high contaminant loads in eulachon result in increased mortality or reduced reproductive success, such effects have been shown in other fish species. Eulachon harvest has been curtailed significantly in response to population declines. However, existing regulatory mechanisms may be inadequate to recover eulachon stocks (NMFS 2011)."

There is no known suitable habitat for eulachon in the Action Area nor are they known to occur anywhere in the basin except in the lower Sandy River therefore they are not found in the Action Area.

US Forest Service, Region 6 Regional Forester's Special Status Sensitive Species

As part of the National Environmental Policy Act process the Forest Service reviews programs and activities to determine their potential effect on sensitive species. Species on the Mt. Hood

National Forest included in the January 2008 Regional Forester's Special Status Species List are described below.

Redband Trout: Redband/inland rainbow trout (redband trout) occur in the White River and Fifteenmile Watersheds and are suspected in the Upper Sandy River Watershed but definitive genetic analysis has not been conducted. For this analysis, their presence is assumed within the fifth-field and local watershed scale. Spawning occurs in the spring. Fry emergence from the gravel normally occurs by the middle of July, but depends on water temperature and exact time of spawning. Redband trout prefer water temperatures from 50 to 57 ^{o}F, but have been found actively feeding at temperatures up to 77 ^{o}F in high desert streams of Oregon and have survived in waters up to 82 ^{o}F. Suitable habitat for Redband trout is present within the Project Area and the Action Area.

Scott's Apatanian Caddisfly: (***Allomyia scotti)*** may be a truly rare species (Wissman,2010). So far it has only been collected from the West Fork Salmon River drainage and the White River (Iron Creek) drainage on Mount Hood at elevations ranging from 3800 to about 5000'. The species is present in both the Project Area and Action Area which includes the majority of its known habitat range in Oregon. Habitat for this species occurs in both Still Creek and West Fork Salmon although in the most recent surveys, this caddisfly was only observed in the West Fork Salmon. In the locations it was found, the water was clear and cold, originating from springs supplied by permanent snowfields around the summit of Mt. Hood. Rocks in the stream bear dense growths of a wiry moss. It does not appear there is suitable habitat for this caddisfly in Glade or Sand Canyon.

The larva with its' horned head is so distinctive that it can't be missed (Wissman, 2010). Female Limnephilidae deposit their egg masses above the water in a gelatinous material on various objects (Usinger 1968). Newly hatched larvae drop or migrate into the water nearby. Larvae and pupae inhabit small, cold mountain streams, often at high elevations. The larvae occur at the base of moss fronds and pupal cases are attached to moss (Wigginis 1973). Larvae are shredders, chewing plant material, probably mosses (Merritt and Cummins 1984). Two years are required to complete the life cycle. Prepupae occur as early as June and are still present in September, but have changed to pupae by the following April. Based on gut content analysis of larvae in this genus, the diet is apparently consistent with the interpretation that *Allomyia* larvae scrape the upper surface of rocks and plants.

This species of caddisfly has been documented within the Action Area both historically and during surveys conduction in the summer of 2010 and the results of that survey are attached in Appendix B (Wissman, 2010). "The results of this survey, i.e. presence of the species only in the West Fork Salmon River tributaries, and not in the Still Creek headwater tributaries, suggest that the habitat requirements for this species is very narrow. Perhaps it formerly occurred in the Still Creek tributaries. It seems evident that these Still Creek tributaries have already experienced a much greater level of human impact than seen in the West Fork Salmon River tributaries (Wissman, 2010)."

"Unknown is how widely distributed Scott's apatanian caddisfly is in the Mount Hood area. Collectors have always targeted the easily accessible stream crossings afforded by Highways 26 and 35, the Old and New Timberline Lodge Roads, and access at campgrounds like the Still

Creek Campground. Other than these convenient stream crossings, little, if any, collecting or surveys have occurred to my knowledge in the 4000-5500' elevation band around Mount Hood (Wissman, 2010)."

Columbia Duskysnail: This species of aquatic mollusk has been found across the Forest during surveys conducted over the past several years (Mt. Hood National Forest, unpublished data). Habitat requirements for this species are fairly specific: cold, well oxygenated springs, seeps, and small streams, preferring areas without aquatic macrophytes (Furnish and Monthey 1998). Individuals have not been found in larger streams and rivers, or glacial streams.

Surveys for the Columbia duskysnail have been conducted at sites across the Forest for a wide range of projects. This aquatic mollusk species has been found in many locations across the Forest and it is therefore presumed to be present in seeps, springs, and smaller streams within the Action Area.

Purple-lipped Juga: The Purple-lipped Juga snail is endemic to Oregon. It is found in large streams at low elevations. These snails prefer riffle habitat with stable gravel substrates, in cold well oxygenated water. It is more tolerant of silt and slack water than other Juga subspecies. The known range of the species is the Lower Deschutes River drainage, below Pelton Dam, and the Warm Springs River in Wasco and Sherman counties, Oregon. Sites where the species are known to occur are located on the Warm Springs Reservation and Prineville BLM in the Deschutes Wild and Scenic River Area. There are few locations on the Forest that match the above preferred habitat description. These locations are in larger rivers likely near the Forest boundary. Streams within or near the Action Area do not meet the above habitat description and thus it is assumed that this snail is not present in these locations although surveys have not been conducted.

Barren Juga: This species of aquatic mollusk is found in freshwater habitats in small to medium sized highly oxygenated cold water streams at low elevations. The species prefers streams that have moderate velocity level bottoms with stable gravel substrates. The known range of this species is the Columbia River Gorge in Oregon and Washington. They have been found in the Mt. Hood National Forest and the Columbia River Gorge National Scenic Area. They are also suspected to occur in the Gifford Pinchot National Forest. Since these species prefers low elevation habitat, it is assumed that the species in not present within or near the Action Area although surveys have not been conducted.

Basalt Juga: The Basalt Juga is not a sensitive species but it is on the Region 6 Regional Forester's Special Status Species list. It is a rare and uncommon species as outlined in the Northwest Forest Plan. Their habitat requirements appear similar to the Columbia duskysnail's (Furnish and Monthey 1998). These small snails have only been found in one survey on the Forest in North Fork Mill Creek. They have not been found in any other stream or water body surveyed since Forest personnel began surveying in 1998. They are not believed to reside in watersheds other than those that drain into the Columbia River near The Dalles, Oregon. Since these species appears to be present only on the east side of the mountain, it is assumed that the species in not present within or near the Action Area although surveys have not been conducted.

Other Important Management Indicator Aquatic Species (MIS)

Coastal cutthroat trout: Cutthroat trout residing in waters of the Forest are composed of two native stocks: an anadromous (sea run) form and resident stock. These fish are a Management Indicator Species on the Forest. Coastal cutthroat trout tend to spawn in small (first and second order) tributaries. They spawn from December to May; young emerge from gravel during June and July. Young fry move into channel margin and backwater habitats during the first several weeks. During the winter, juvenile cutthroat trout use low velocity pools and side channels with complex habitat created by large wood or other features. Coastal sea run cutthroat juveniles rear in freshwater for two to three years.

Resident populations of cutthroat are widespread throughout much of the Forest. Historically, sea run cutthroat trout occurred throughout the Sandy River, but anadromous cutthroat populations appear to have greatly declined throughout the watershed. Consistent indicators in abundance trends for most populations of either resident or sea run cutthroat trout do not exist. Resident cutthroat trout have been documented within the Action Area in both Still Creek and the West Fork Salmon River and due to the lack of any physical barriers, sea-run cutthroat are assumed to be present within the Action Area in Still Creek.

Critical Habitat

NMFS designated critical habitat for LCR Chinook and steelhead on September 2, 2005 (70 FR 52630) and critical habitat for LCR coho and southern eulachon is pending. Essential features of designated critical habitat include aspects of substrate, water quality, water quantity, water temperature, food, riparian vegetation, access, water velocity, space, and safe passage that are associated with viability for the ESUs. Detailed maps of specific critical habitat boundaries for each ESU are provided in the Federal Register notice. Much of the discussion concerning critical habitat, including effects analyses, will center on the primary constituent elements (PCE) described below for each species.

Steelhead trout and Chinook salmon Critical Habitat

Critical habitat for steelhead is present in both the Project Area and Action Area, as well as throughout the Salmon and Zigzag 5th field watersheds. Critical habitat for LCR spring Chinook is present within the Salmon and Zigzag 5th field watersheds, but below the Action Area.

Primary constituent elements for steelhead and Chinook are sites and habitat components that support one or more life stages. The first three, listed below, refer to freshwater habitat components, whereas the last three relate to estuarine or marine habitat components. Nothing in the proposed project would have an effect on estuarine or marine habitat components, thus they are not discussed.

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.
2. Freshwater rearing sites with:
    a. Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;
    b. Water quality and forage supporting juvenile development; and
    c. Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

3. Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions, and natural cover, such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

Bull Trout Critical Habitat

There is no designated critical habitat for bull trout in the Sandy River Watershed.

ESA listed fish and Regional Forester's Special Status Species presence/absence, as well as designated critical habitat and essential fish habitat within the Action Area is described in Table . Species and or suitable habitat found within the Action Area are designated with a "Y" in the table. The table is intended to give the reader a basic idea of where various aquatic fauna are located in relation to the proposed project.

Table Aquatic 2
Presence of ESA Listed Fish, Regional Forester's Special Status Species, Designated Critical Habitat, and Essential Fish Habitat within the Action Area

Species/Habitat	Glade Creek (Zigzag)	Sand Canyon (Zigzag)	Still Creek	W. Fork Salmon
Bull Trout	N[1]	N[1]	N[1]	N[1]
Steelhead Trout (LCR)	N	N	**Y**	N
Chinook Salmon (LCR)	N	N	N	N
Coho Salmon (LCR)	N	N	N	N
Redband/ Inland Rainbow Trout	N	N	Unk	**Y**
Columbia duskysnail	**Y**	**Y**	**Y**	**Y**
Barren Juga	Unk	Unk	Unk	Unk
Purple-lipped Juga	Unk2	Unk2	Unk2	Unk2
Scott's Apatanian Caddisfly	Unk2	Unk2	**Y**	**Y**
Basalt Juga (Rare & Uncommon)	N	N	N	**Y**
Coastal Cutthroat Trout (MIS)	N	N	**Y**	**Y**
Bull Trout Critical Habitat	N	N	N	N
Steelhead Critical Habitat	N	N	**Y**	N
Chinook Critical Habitat	N	N	N	N
Coho Critical Habitat	--	--	--	--
Essential Fish Habitat	N	N	N	N

N – species/habitat not present
Y – species/habitat known to be present
Unk – species presence unknown but suspected either due to nearby surveys or presence of suitable habitat.
Unk2 – species presence unknown but not suspected due to habitat preferences (large, low elevation streams).
MIS – Mt. Hood National Forest Management Indicator Species

3.9.3 Environmental Consequences

The Environmental Consequences of the proposed bike park are described in detail in the Aquatics Biological Assessment (Appendix G). This section summarizes the effect of the No Action and the Proposed Action alternatives on the aquatic resources, based on the analysis provided in the Biological Assessment.

No Action

Under the No Action Alternative, RLK would not construct or operate a mountain bike park within the SUP area, nor would watershed restoration take place. Consequently, the sediment regime and current extension of the stream network in the ski area would remain as described for the existing condition (See Section 3.2), and the downstream effects to aquatic resources would remain unchanged from the existing condition.

Proposed Action

The following discussion summarizes effects to ESA listed fish, their critical habitat, Regional Forester's Sensitive aquatic species, and Essential Fish Habitat under the Proposed Action. (Aquatic Table 3) A brief rationale is given for each.

Federally Listed Species & Designated Critical Habitat (NMFS)

Suitable habitat for Lower Columbia River (LCR) steelhead trout exists within and downstream of the Project and Action area in Still Creek. Suitable habitat for (LCR) Chinook and LCR coho salmon does not exist within the Action Area but is present downstream in the Salmon River and Zigzag River Watershed. Sediment, stream drainage network increases, and disturbance of riparian reserves would be the most likely avenue of potential effects. However, For this reason the proposed action **"May Affect, Not Likely to Adversely Affect"** LCR steelhead trout and designated crticial habitat, and will have **"No Effect"** to LCR coho salmon, LCR Chinook salmon and associated designated critical habitat.

Federally Listed Species (USFWS)

Although bull trout have been found in neighboring basins (Willamette River and Hood River) and isolated occurrences of adult bull trout have been reported in the lower Sandy River basin, there is no substantiated historical or present evidence that bull trout populations reside in the Upper Sandy River Watershed. For this reason, the proposed action will have **"No Effect"** on bull trout or its critical habitat.

Aquatic Table 3
Effects Determination Summary for the Proposed Action
ESA Listed Fish and Designated Critical Habitat, Regional Forester's Special Status Species, and Essential Fish Habitat.

	Date of Listing & Critical Habitat	**Critical Habitat Present**	**Species Present**	**Effects of Actions**	
Endangered Species Act Listing by ESU/DPS ***Threatened***				**Construction**	**Operation**
Lower Columbia River steelhead & CH (*Oncorhynchus mykiss*)	1/06 9/05	Y	Y	NLAA	NLAA
Lower Columbia River Chinook & CH (*Oncorhynchus tshawytscha)*	6/05 9/05	N	N	NE	NE
Columbia River Bull Trout (*Salvelinus confluentus*)	6/98	N	N	NE	NE
Lower Columbia River coho *(Oncorhynchus kisutch)*	6/05	N/A	N	NE	NE
Southern DPS Smelt (*Th. Pacificus*)	3/10	N/A	N	NE	NE
Regional Forester's Special Status Species List					
Interior Redband Trout *(Oncorhynchus mykiss spp.)*	7/04	Y*	Y	MIIH	MIIH
Columbia duskysnail *(Colligyrus sp. nov. 1)*	1/08	Y*	Y	MIIH	MIIH
Barren Juga *(Juga hemphilli hemphilli)*	1/08	N	Unk	NI	NI
Purple-lipped Juga *(Juga hemphilli maupinensis)*****	1/08	N	Unk	NI	NI
Scott's Apatanian Caddisfly *(Allomyia scotti)*	1/08	Y*	Y	MIIH	MIIH
Essential Fish Habitat		N/A	N	NAA	NAA

*Suitable habitat exists within the Action Area for this species.

Endangered Species Act Abbreviations/ Acronyms:		**Essential Fish Habitat Abbreviations/ Acronym**	
NE	No Effect	NAA	Not Adversely Affected
NLAA	May Affect, Not Likely to Adversely Affect	AE	Adverse Effects
LAA	May Affect, Likely to Adversely Affect		
Regional Forester's Sensitive Species List Abbreviations/ Acronyms:			
Unk	Species presence unknown but suspected		
NI	No Impact		
MIIH	May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or los viability to the population or species		

Forest Service Region 6 Regional Forester's Special Status Species

Redband Trout

On the Zigzag Ranger District, Redband trout are suspected to be present in the Upper Sandy River Watershed. Habitat may exist for Redband trout at some of the projects sites on small-medium sized streams. Silted water and disturbance would be the most likely avenue of potential effects. Project elements and design criteria are in place that would greatly minimize, if not eliminate, effects to habitat or individuals in each of the four sub-watersheds. Thus, this project "**May Impact Individuals or Habitat"** but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species.

Columbia Dusky Snail

Suitable habitat for the Columbia Dusky Snail is present in the Action area and therefore this snail is assumed to be present. Silted water and disturbance would be the most likely avenue of potential effects. Project elements and design criteria are in place that would greatly minimize, if not eliminate, effects to habitat or individuals in each of the four sub-watersheds. Thus, this project "**May Impact Individuals or Habitat"** but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species.

Barren Juga

Habitat for the Barren Juga is low elevation; cold, pure, well-oxygenated water in springs and small-medium streams and therefore, this snail species is not expected to be present in the Action area. Thus, this project will have "**No Impact"** for individuals or habitat of the Columbia Dusky Snail.

Purple-lipped Juga

Habitat for the Purple-lipped Juga is low elevation; cold, pure, well-oxygenated water in large streams and therefore, this snail species is not expected to be present in the Action area. Thus, this project will have "**No Impact"** for individuals or habitat of the Columbia Dusky Snail.

Scott's Apatanian Caddisfly

Surveys for the rare and uncommon Scotts appatanian caddisfly were conducted as part of this project as their only known location in Oregon is in streams near Timberline Lodge. This species was found in multiple sampling sites within the project area in the West Fork Salmon River but was not observed in adjacent sampling sites in Still Creek. Project elements and design criteria are in place that would greatly minimize, if not eliminate, effects to habitat or individuals in each of the four sub-watersheds. Therefore, the proposed actions "**May Impact Individuals or Habitat"** Scott's appatanian caddisfly.

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance essential fish habitat (EFH) for those salmon species regulated under a Federal fisheries management plan. The Pacific Fisheries Managedment Council (PFMC) has recommended an EFH designation for Pacific salmon fishery that would include those waters and substate necessary to ensure the production needed to support a long-term sustainable fishery.

Salmon fishery EFH includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to the three salmonid species identified under the MSA, coho salmon, Chinook and Puget Sound pink salmon in Washington, Oregon, Idaho, and California, except above impassable barriers identified by PFMC (PFMC 1999). Salmon EFH excludes areas upstream of longstanding naturally impassable barriers (i.e. natural waterfalls in existence for several hundred years).

EFH is commensurate with critical fish habitat where designated. If critical habitat has not been designated then the action agency defines the extent of EFH based on known or suspected fish distribution. There is no EFH in any of the streams within the Action Area as coho and Chinook are not present.

Cumulative Effects

Endangered Species Act cumulative effects are the future effects of state, tribal, local, and private actions that are reasonably certain to occur within the action area associated with the federal action. A full description of cumulative effects for all alternatives is found in Aquatics Aquatics Table 4. Findings relevant to aquatic fauna and habitat are summarized below.

Aquatics Table 4
Summary of Cumulative Effects to Aquatic Fauna and Habitat

Project	Potential Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species and Stream Habitat Effects
Ongoing Road Maintenance (Westleg, Timberline Road, Hwy 26)	Suspended Sediment	Yes	Yes	Not Measurable	An overlap in time and location exists with these road networks and the trails project. There is both short-term introduction of fine sediment that may mix with the fine sediment from the down-hill trail project. Some of the high-risk areas are in Still Creek at the Jeff Flood chair-lift. Project elements and PDC's have been designed to mitigate effects so they are insignificant or discountable.	Potential for cumulative effects to fish is expected to be localized with a potential for some sediment avoidance behavior. Aquatic invertebrate species may have low levels of short-term negative stream conditions. Except for culvert replacements and some road reconstruction, mitigation measures reduce the amount of sediment delivered to streams and affecting aquatic resources to a level that is not measurable and is insignificant, and have a low risk of cumulative effects.
USFS Trail Ongoing Maintenance (Glade Trail, Alpine Trail, Timberline to Town Trail)	Suspended Sediment	Yes	Yes	Not Measurable	There may be an overlap in timing and location of these projects with the bike park project; these projects have a chance of some short-term introduction of fine sediment that may mix with fine sediment from the bike park project. Some of the high risk areas would be in Still Creek and West Fork Salmon River. Other listed projects have a low risk of cumulative effects due to implementation of mitigation and project design criteria that minimize erosion and sediment input.	Potential for cumulative effects to fish is expected to be localized with a potential for some sediment avoidance behavior. Aquatic invertebrate species may have low levels of short-term negative stream conditions. Project elements and PDC' reduce the amount of sediment delivered to streams and affected aquatic resources to a level that is not measurable and is insignificant, and have a low risk of cumulative effects.
	Trail Equipment Related Chemicals	Yes	Yes	No	No cumulative effects are expected due to mitigation measures and design criteria implementation, conformance with existing standards and guidelines on the existing projects.	None
New Trail Construction (Timberline to Town)	Suspended Sediment	Yes	Yes	Not Measurable	Some projects are completed so there are no remaining sediment effects due to natural recovery. Other ongoing projects on adjacent private land such as road maintenance and	Potential for cumulative effects to fish is expected to be localized with a potential for some sediment avoidance behavior. Aquatic invertebrate species may have low levels of short-term negative stream conditions.

Project	Potential Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species and Stream Habitat Effects
					vegetation manipulation have a chance of some short-term introduction of fine sediment that may mix with minor fine sediment from the Bike Park project.	Project elements and PDC' reduce the amount of sediment delivered to streams and affected aquatic resources to a level that is not measurable and is insignificant, and have a low risk of cumulative effects.
	Trail Equipment Related Chemicals	Yes	Yes	No	No cumulative effects are expected due to mitigation measures and design criteria implementation, conformance with existing standards and guidelines on the existing projects.	None
Misc. Tree Salvage (Hazard Trees)	Suspended Sediment	Yes	Yes	Not Measurable	There may be an overlap in timing of this project with the bike park project; any minor suspended sediment would not be measurable due to implementation of mitigation measures and design criteria and conformance with existing standards and guidelines in the projects.	Any cumulative effect would be of minor magnitude due to the localized, minor impact of miscellaneous tree salvage when overlapped with effects of the bike park project. Any effects to aquatics would be minor and not be measurable.
	Riparian Habitat loss	Yes	Yes	No	Project elements and PDC's are in place to ensure that riparian reserves are not impacted by either project	None
Ski Area Operations	Suspended Sediment	Yes	Yes	Not Measurable	The loss of riparian buffers, the development of road networks, and the clearing of vegetation for ski slopes has increased both the short and long-term introduction of fine sediment that may mix with fine sediment from the bike park project. The highest risk of this would be in Still Creek and West Fork Salmon as those sub-watersheds are most heavily impacted by the ski area. Long-term restoration of a more natural sediment regime should occur as mitigation measures and design criteria identified in the EA is implemented.	Potential for cumulative effects to fish is expected to be localized with a potential for some sediment avoidance behavior. Aquatic invertebrate species may have low levels of short-term negative stream conditions. Project elements and PDC' reduce the amount of sediment delivered to streams and affected aquatic resources to a level that is not measurable and is insignificant, and have a low risk of cumulative effects.
Ongoing maintenance	Suspended Sediment	Yes	Yes	Yes	There may be an overlap in timing and location of these projects with the	Potential for cumulative effects to fish is expected to be localized with a potential

Project	Potential Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species and Stream Habitat Effects
and management of Jeff Flood base area					Bike Park project; these projects have a chance of some short-term introduction of fine sediment that may mix with fine sediment from the Bike Park project. Some of the high risk areas would be in Still Creek and West Fork Salmon River due to their close proximity to this project.	for some sediment avoidance behavior. Aquatic invertebrate species may have low levels of short-term negative stream conditions. Project elements and PDC' reduce the amount of sediment delivered to streams and affected aquatic resources to a level that is not measurable and is insignificant, and have a low risk of cumulative effects.
	Equipment Related Chemicals	Yes	Yes	No	No cumulative effects are expected due to mitigation measures and design criteria implementation, conformance with existing standards and guidelines on the existing projects.	None
ODOT Winter Sand & Plowing	Suspended Sediment	Yes	Yes	Not Measurable	There may be an overlap in timing of this project with the Bike Park project; significant, measurable sediment is resulting both in the short term and long term as a result of winter sanding and plowing throughout the Action Area and is negatively impacting both LCR winter steelhead/critical habitat as well as Region 6 Sensitive macro-invertebrates which are assumed or known to inhabit the Action Area.	Potential for cumulative effects to fish is expected to be localized with a potential for some sediment avoidance behavior. Aquatic invertebrate species may have low levels of short-term negative stream conditions. Project elements and PDC' reduce the amount of sediment delivered to streams and affected aquatic resources to a level that is not measurable and is insignificant, and have a low risk of cumulative effects.
	Road Equipment Related Chemicals	Yes	Yes	No	No cumulative effects are expected due to mitigation measures and design criteria implementation, conformance with existing standards and guidelines on the existing projects.	None
Timberline Lodge Waterline Replacement	Suspended Sediment	No	Yes	Not Measurable	There may be an overlap in timing of these project effects with the Bike Park project. Any minor suspended sediment may slightly slow the recovery resulting from restoration project implementation, but this would not be measurable due to implementation of mitigation measures and design criteria and	Potential for cumulative effects to fish is expected to be localized with a potential for some sediment avoidance behavior. Aquatic invertebrate species may have low levels of short-term negative stream conditions. Project elements and PDC' reduce the amount of sediment delivered to streams and affected aquatic resources to a level that is

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species and Stream Habitat Effects
		Time	Space			
					conformance with existing standards and guidelines in the projects.	not measurable and is insignificant, and have a low risk of cumulative effects.
	Equipment Related Chemicals	Yes	Yes	No	No cumulative effects are expected due to mitigation measures and design criteria implementation, conformance with existing standards and guidelines on the existing projects.	None
East Leg Road Decommission	Suspended Sediment	Yes	Yes	Not Measurable	There may be a spatial and temporal overlap of effects of this project with the Bike Park project. Any minor suspended sediment may slightly slow the recovery resulting from restoration project implementation but this would not be measurable due to implementation of mitigation measures and design criteria and conformance with existing standards and guidelines in all projects on National Forest.	Potential for cumulative effects to fish is expected to be localized with a potential for some sediment avoidance behavior. Aquatic invertebrate species may have low levels of short-term negative stream conditions.

APPENDIX B

SOILS REPORT

Draft
Soils Report

For the Timberline Ski Area Lift Assisted Mt Bike and Skills Park Plan EA
February 2011

Organization of This Report:

- Analysis Assumptions
- Analysis Process and Logic
- Existing Environment
- Effects Analyzed
- Cumulative Effects
- References

Analysis Assumptions

Riders would follow the rules for the area to prevent unintended and unpredictable impacts.

The soil map polygons, data, and LIDAR image of the project area are proper for use in the analysis and have been updated where field observations have modified them for accuracy.

Project Design Criteria (PDC's) would be followed and be as effective as predicted in order to ***reduce*** impacts.

Restoration actions as described in the proposed action would be implemented and be effective as planned in order to ***offset*** impacts.

Analysis Process and Logic

This analysis, which is very similar to the recently completed OHV EIS analysis, again provides unique and new challenges regarding how to measure and predict impacts using standards that apply primarily to timber management practices from the era when the Mt. Hood National Forest Land and Resources Management Plan was new. The existing standards still work very well for assessing and predicting impacts to soil productivity in specifically bounded and measurable areas, such as stands undergoing vegetation treatments. However, they are more difficult to use for other recently completed analyses, such as grazing and invasive plant treatments where the analysis area is so large that collection of soil samples is not practical, or a standard does not exist to address a specific concern.

Soil types considered in this report are mapped in the Mount Hood National Forest Soil Resource Inventory (SRI, Howes, 1979), which appears to be accurate and provides a good overview of the planning area. As explained in the Existing Environment below, it is the subtle differences in soils observed by walking the trail locations that provide the details to confidently predict the effects on soils from the placement of the trails and skills park on the land.

For this Environmental Assessment, the primary concern is soil erosion risk, which will be evaluated by considering the bare areas exposed for construction compared to the current bare and eroding areas that will be stabilized as restoration activities. The analysis area regarding soils for this document is the area considered to be directly impacted by the trail system and skills park, as well as locations considered for restoration projects.

Existing Environment – Soils in the Project Area

The top of the project area is at slightly over 6,000 feet in elevation; the bottom is at about 4,800 feet. This is a very important 1,200 feet. Soils nearer the top can barely support a thin groundcover at best, while at the lower elevations soils provide for a much wider array of vegetation.

Despite the differences in vegetation vertically in the area, the physical characteristics of the soils are quite similar, especially texture. In trail locations and skills park, loamy surface soils (very fine sandy loams to loamy sands) are the rule, with varying degrees of gravel and boulders in the subsoil. Soils become slightly coarser on steeper ground, especially near incised drainages, and at the higher elevations where wind and water erosion has removed some of the finer soil particles. This phenomenon is also observed and documented in numerous planning projects from the Mt Hood Meadows Ski Area just to the east.

SRI soil types mapped in the area are 379, 380, and 382, with some included areas of 381. A review of the map units and their accompanying interpretations compared to the field showed a good match, although slightly less gravel content was seen in surface soils in the lower half of the area.

Observed Geomorphic Process

Near the top of the project area, small drainages form where annual snowmelt begins to define channels that downcut through loose sandy material. The ground here is very undulating, with numerous small incised draws and huge supply of erodible material moving around the local landscape via wind and water. Soils in this area are actively eroding at a chronic natural level where they are not otherwise impacted by either user created or sanctioned trails. The naturally coarse material in the upper elevation areas allows for rapid water infiltration compared to lower elevations (not as rapid), which results in lower surface erosion that would otherwise occur.

Observed Road and Trail Erosion

Several roads exist within the analysis area, most of which are native surface. Most access lifts, and have visible signs of erosion occurring. Most notable are the roads at the bottom of the Stormin' Norman lift, which were rilled and are impacting a small drainageway.

Westleg Road is paved, but the ditchline has not been maintained sufficiently to prevent water from moving sediment. In addition, some pipes are blocked/not functioning.

The bottom of Pucci Lift has a large compacted area where water runs across the surface. A similar situation exists at the bottom of the Jeff Flood lift.

The Glade and Alpine Trails cutting across the area have erosion occurring on them as well.

All of these situations can be changed in order to reduce the erosion occurring in each one.

Effects Analyzed

Trail and Skills Park Construction:

There are two main things that would happen to the soil in the trail alignments and skills park. First, soil would be exposed through the loss of its groundcover as the trail locations and skills park are roughed in. Second, the trail treads themselves would be compacted in order to establish the running surface. The result would be bare and bare/compacted soil surfaces that are at risk of erosion. The beginner level trails, which are the widest, would be at highest risk simply due to the amount of bare ground exposure and because they are constructed with heavy equipment. This would be followed by the intermediate level trails (slightly narrower, smaller machine); and finally at lowest risk would be the expert trails, which are hand constructed and the narrowest of the three types.

Project Design Criteria that minimize environmental impacts caused by trail and skills park:

Preface: It is always preferable to minimize erosion through proper use of various techniques than to try and manage sediment once soil has left the site. Under this premise, the following PDC's have been developed.

PDC Soil-1
Stabilization of mountain bike trail surface would be accomplished through a combination of rock armoring and wooden features or other similar protective measures. Any rock used for armoring would be sourced from either the bike park/ watershed restoration construction limits or from an approved offsite source. No quarrying of rock materials would take place.

PDC Soil-2
The spacing of surface water control structures along the length of the bike trail network would be per Forest Service Handbook guidelines at a minimum. The spacing of surface water control structures (e.g., grade reversals, drain dips, water bars) along mountain bike trails within 200 feet of a stream crossing would be no less than 50 feet to minimize extension of the stream drainage network and to minimize sediment delivery to riparian reserves. Water bar placement along decommissioned roads would be determined in the field based on site conditions and approved by the Forest Service Permit Administrator.

PDC Soil-3
Wood features (e.g., ladder bridges, boardwalks), native soil causeways, and/or rock armoring would be incorporated into mountain bike trails to avoid impacting sensitive resources such as steep slopes, tree roots, vegetation, and wet areas. Wood materials would be sourced from local suppliers and would be free of invasive species.

PDC Soil-4
Additional surface water controls, rock armoring, wooden features, or other acceptable measures would be installed on trails that exhibit unacceptable erosion.

PDC Soil-5
Bike park staff (RLK) would monitor trail conditions throughout the hours of operation on a daily basis to ensure that erosion or sediment mobilization away from the trail corridor is not occurring and/or to implement corrective action in accordance with the project design criteria.

PDC Soil-6

A Travel Route Plan would be required and included in the SWPCP/Construction Plan for the project to minimize compaction of soils by limiting equipment to designated travel-ways (e.g., existing roads, bike trails that are under construction) as approved by the Forest Service .

PDC Soil-7

All exposed mineral soil not included in bike trail tread width would be mulched with certified weed-free Woodstraw or equivalent at a rate to achieve 70% ground cover (approximately 7 tons per acre) or mulched with a certified weed-free straw, at approximately 3,000 pounds per acre and seeded with approved seed at a predetermined rate. Application rates would be validated and verified in the field to ensure that mulch application is not too sparse or too excessive.

PDC Soil-8

Temporary erosion and sediment control measures (e.g., plastic sheeting, mulching) would be in place prior to the end of each work day or prior to any rain event (as defined by when the National Weather Service, or other accepted source, predicts a 50% or higher chance of measurable precipitation for the local area).

PDC Soil-9

The bike park staff (RLK) would patrol the park on a daily basis to ensure that re-vegetated areas are not disturbed, or to remedy disturbance to re-vegetated areas (see also Soil-5). Project areas with any ground disturbance would be surveyed annually to ensure success of re-vegetation efforts. If seeding or other re-vegetation efforts are not successful in re-vegetating disturbed areas, the Forest Service Permit Administrator would be contacted and a site-specific, alternative, re-vegetation solution would be developed.

PDC Soil-10

In cleared areas, topsoil would be carefully removed and stockpiled for placement onto the cleared area outside of the trail tread width. During construction, topsoil would be carefully stored using approved erosion and sediment control methods. Additional measures (e.g., plastic covering) to cover exposed soils would occur during inclement weather. Excess topsoil from trail construction may be hauled to other construction/restoration sites for placement.

PDC Soil-11

RLK would install a rain gauge near the middle elevation in the bike park. The rain gauge would be accessible and monitored by RLK and the Forest Service via the internet. Earth-disturbing operations (construction and/or bike park operations) would be suspended if there is more than 1inch of rain in a 24-hour period and/or the Bull Run River above the reservoirs exceeds 200 cubic feet per second (suggesting a rise in base flows in the watershed). Operations would remain suspended until the Bull Run River drops below 200 cubic feet per second and there is less than 1 inch of rain in a 24-hour period or onsite conditions are dry enough to allow operation. Prior to suspending all bike park operations, the Forest Service Permit Administrator may decide to close certain trails, or portions of trails, to allow continued operation of the bike park in locations where trail conditions are dry enough for operation and there is no risk of sediment delivery to the stream system. (See also Soil-5)

PDC Soil-12
Stockpile areas, temporary roads, and other areas where soil compaction has occurred from this project would be ripped or scarified prior to the start of re-vegetation.

PDC Soil-13
Activities for the season would be suspended if soil moisture is recharged and stream flows rise above baseflow levels and are predicted to stay above baseflow levels (i.e., 200 cfs in the Bull Run River, upstream of the reservoirs) and/or if onsite conditions warrant closure of the park. (See also Soil-11).

Restoration Actions Implementation:

The following list of restoration actions are proposed to address specific observations made during the field reconnaissance in summer 2010. Some of the problems observed were summarized in the section above titled 'Observed Road and Trail Erosion'. An observable reduction in human caused erosion would result when these projects are implemented.

1. Surface identified native surface roads with at least a 6" lift of gravel, a proven method to reduce erosion potential by over 90%.
2. Form 'fit in the field' rolling dips and waterbars on identified roads, which is another proven technique to reduce erosion from roads and similar to PDC Soil-2 above.
3. Define and keep all vehicle access needs for lift mtc to the narrowest possible. Decompact and revegetate the remainder.
4. Design and implement a long term erosion control plan for the Glade and Alpine Trails.
5. Evaluate road mtc backlog to address blocked pipes, ditches, etc.

Cumulative Effects

This proposal adds to several existing trail and road systems in the ski area. However, the restoration actions have been modeled and evaluated to reduce sediment risk by a two to one ratio, a substantial improvement over the current condition. In addition, the restoration actions are scheduled to occur either slightly before or concurrently with the proposed trail construction, thereby offsetting potential impacts in both time and space. The restoration projects are in fact, so essentially important to offsetting the impacts of the proposed trails that they themselves are included in the proposed action. Proven effective in other locations on the mountain, it is with the highest confidence that they will be fully effective as designed.

References

Interdisciplinary Field Reviews. Summer 2010

Howes, Steve. 1979. Soil Resource Inventory, Mt. Hood National Forest. Mt. Hood National Forest. Sandy, OR

Soil Scientist Reports for Mt Hood Meadows Ski Area. 1991-Present. Hood River Ranger Station Office. Parkdale, OR

/s/ John Dodd
Soil Scientist, Hood River and
Barlow Ranger Districts
February 25, 2011.

APPENDIX C

WATESHED RESOURCES REPORT

GEOLOGY

The underlying geology within and adjacent to the Study Area in described as a large pyroclastic-flow (volcanic-flow) and debris flow deposits in the report entitled, "Preliminary Geologic Map of the Mount Hood 30-Minute by 60-Minute Quadrangle, Northern Cascade Range, Oregon" (U.S. Geological Survey, 1995). These highly permeable pyroclastic and debris flow deposits covered older volcanic deposits to create the smooth fan that is currently discernable between Zigzag Canyon and White River Canyon. The thickness of this debris fan is largely undocumented, however a test well located just south of Timberline Lodge revealed a measured thickness of 120 feet (USFS, 1992). The dominant materials found within this layer include poorly sorted pebbles, cobbles, and boulders in a reddish-gray sandy matrix (U.S. Geological Survey, 1995). It is likely that the young age and high permeability of these deposits are the dominant factors responsible for the limited stream development above Timberline Lodge and the large amount of shallow groundwater flow. Finally, it is thought that the older volcanic deposits found under the permeable pyroclastic and debris flow materials have low permeability and act to concentrate groundwater flow and create groundwater springs at specific elevations where bedrock is exposed (DeRoo, Pers. Comm., July, 2004).

WATER RESOURCES

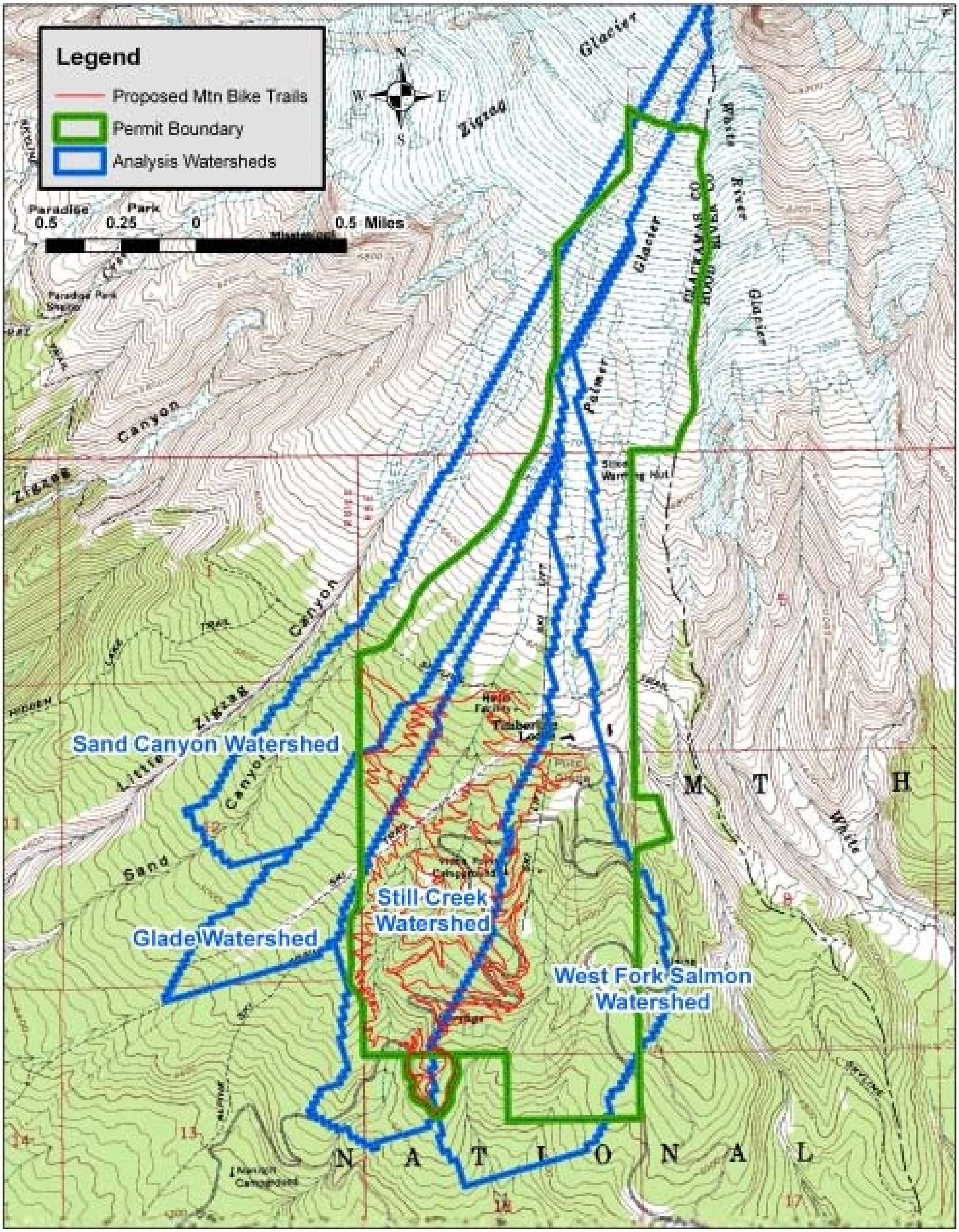
Management Direction

For analysis purposes a hydrologic planning area was identified for this project. The hydrologic analysis area (analysis area) extends from the uppermost extent of any drainage that is intersected by trail construction to the bottom of the drainage associated with trail construction. For this project the hydrologic planning area is 1732 acres.

Table 1 Analysis Subwatersheds

Watershed	Acres
Glade	199
Sand Canyon	495
Still Creek	464
West Fork Salmon	573
TOTAL	1732

Figure 1 Watershed Resources Analysis Area



There are 4 land allocations in the analysis area that address water resources. These allocations are detailed in Table 2

Table 2 – Land Allocations related toWatershed Resources

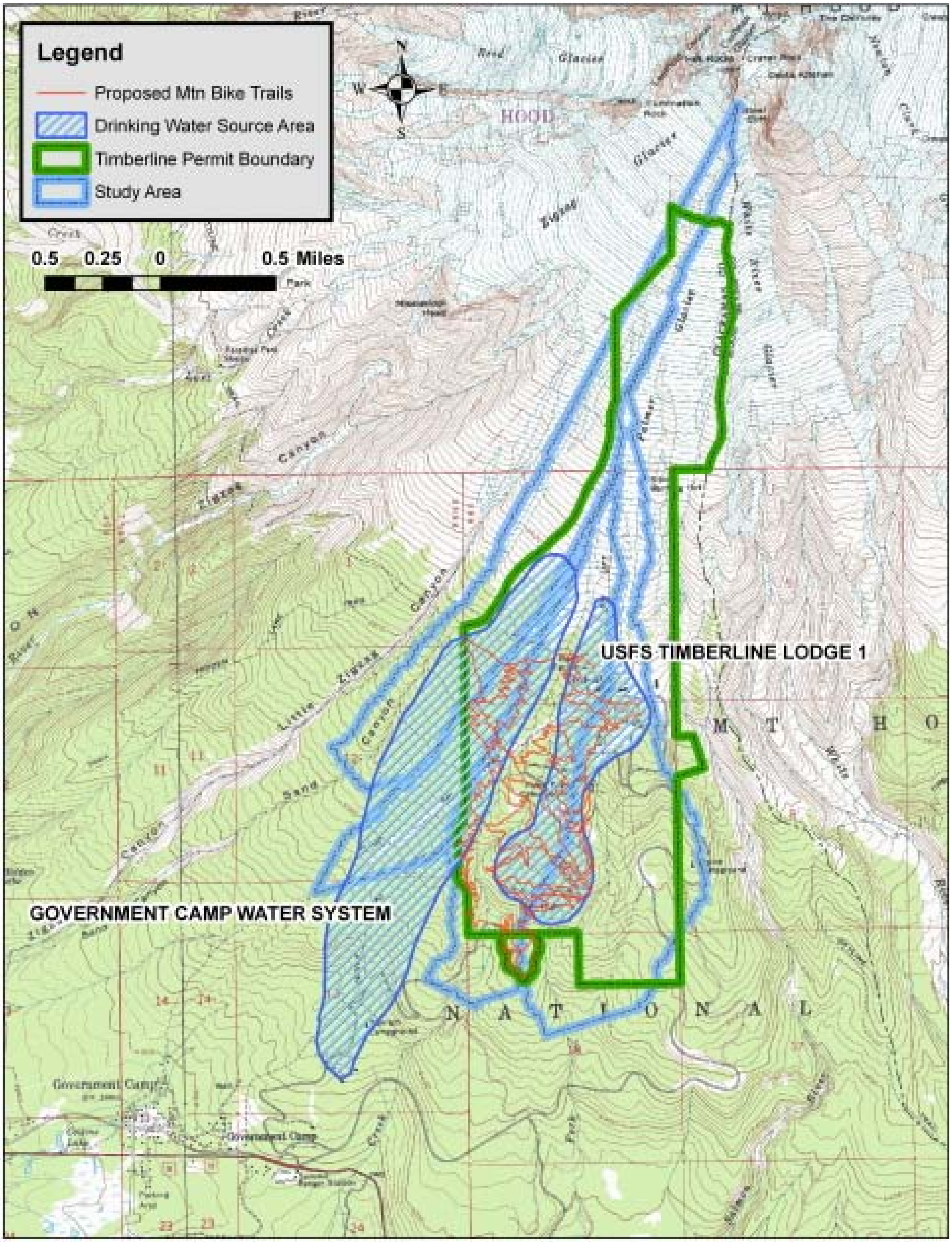
Allocation	Management Direction
Special Emphasis Watershed	Maintain or improve watershed, riparian, and aquatic habitat conditions and water quality for municipal uses and/or long term fish production.
Wild and Scenic River	Protect and enhance the resource values for which a river was designated into the Wild and Scenic Rivers System
Riparian Reserve	Riparian resources receive primary emphasis and special standard and guidelines apply
B7 General Riparian Area	Achieve and maintain riparian and aquatic habitat conditions for the sustained, long-term production of fish, selected wildlife and plant species, and high quality water for the full spectrum of the Forest's riparian and aquatic areas.

In addition to the land allocations listed above the Salmon River Fifth Field Watershed is a Tier 1 Key Watershed under the Northwest Forest Plan. There are 573 acres of the analysis area in the Key Watershed. The objective of Key Watersheds is to contribute directly to conservation of at-risk anadromous salmonids and resident fish species. The emphasis within Key Watersheds is to reduce existing system and non-system road mileage and receive priority for restoration.

The Study Area also contains a portion of the Government Camp Drinking Water Protection Area (DWPA) and the entire Timberline Lodge DWPA. Although the boundaries of the Government Camp and Timberline Lodge DWPA have been identified, Drinking Water Protection Plans have not been developed, and therefore, no management guidelines or protection standards have been established.

Drinking Water Protection Area	Total Acres	Acres in Planning Area
USFS TIMBERLINE LODGE 1	243.3	243.3
GOVERNMENT CAMP WATER SYSTEM	582.4	385.3

Figure 2 – Drinking Water Protection Areas



Climate

Average yearly temperatures within the analysis area were 37 degrees Fahrenheit during the period of record. Temperature ranged from average highs of 54 degrees in August to average lows of 27 degrees in December, January, and February. Average annual precipitation within the Study Area is 106.6 inches, ranging from a high of 152.6 inches observed in 1997 to a low of 68.4 inches recorded in 2001. An average of 65 inches falls as snow within the Study Area, measured as a snow water equivalent at the SNOTEL site. With approximately one half of the annual precipitation arriving as snowfall, the flow characteristics of channels draining the analysis area are dominated by snowmelt.(Timberline Express FEIS)

Data from the Mt Hood Test Site site from 1981 through 2004 is summarized in Table 3.

Table 3 – Mt Hood Test Site Climate Summary

	Total Precipitation	Snowpack measured as inches of Snow Water Equivalent	% of Total Precipitation contained in the Snowpack
Average	106.6	67.1	63
Minimum	68.4	37.9	39
Maximum	152.6	102.4	81

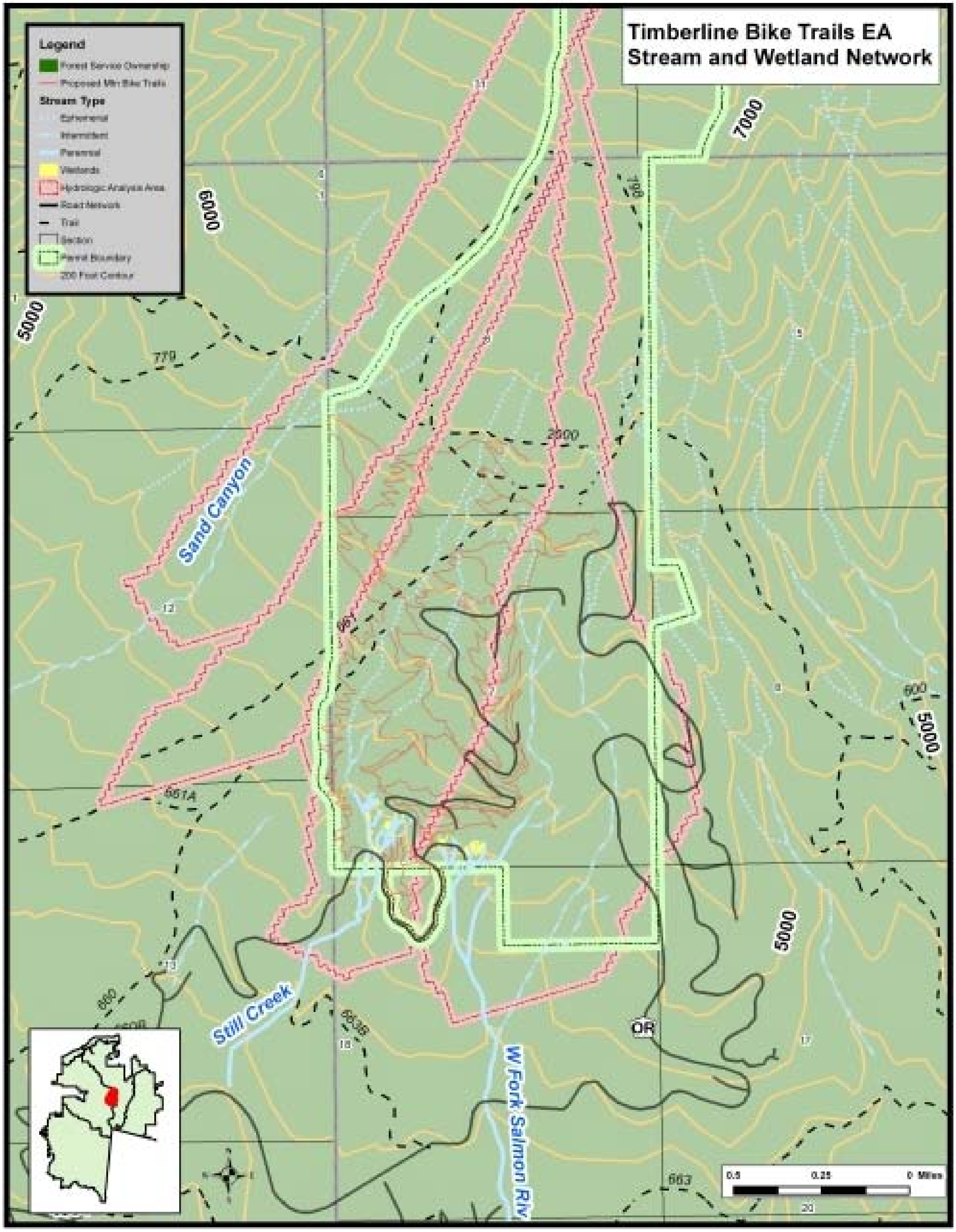
Surface Water Resources

The analysis area includes portions of two Fifth Field Watersheds (Zigzag and Salmon River) and three Sixth Field Watersheds (Still Creek, Little Zigzag Canyon, and Upper Salmon River)

The total length of streams in the analysis area is approximately 12.0 miles. The stream system in the analysis area is based on field validated streams during the planning process for the Timberline Express FEIS.

Watershed	Ephemeral	**Intermittent**	**Perennial**	**TOTAL**
Glade	0.1	0.0	0.0	0.1
Sand Canyon	1.7	0.7	0.0	2.4
Still Creek	3.0	0.5	1.4	4.8
West Fork Salmon	0.7	2.7	1.3	4.7
Grand Total	5.4	3.9	2.7	12.0

Figure 3 – Stream and Wetland Network



Geomorphology

The headwaters of Still creek emerge out of a set of perennial and ephemeral wetland seeps originating at about 4800 feet elevation on the south side of Mt Hood. Fed by snowmelt surface runoff and groundwater flow emanating from the Palmer Snowfield, these numerous wetland seeps join together at the 4800' elevation level and form the mainstem channel of Still Creek (Timberline Express FEIS).

Thick pyroclastic flow and debris flow deposits from approximately 1,500 years ago comprise the surface material in the project area. These permeable deposits filled in over the older topographic surface (including stream channels) and created the present smooth fan on the southwest side of Mt. Hood (USGS, 1995). The age and permeability of this material explains the limited stream development above Timberline Lodge; the buried topography (including stream channels) probably helps to concentrate groundwater flow in certain areas and partially explains why springs are located where they are (DeRoo, Pers. Comm).

LIDAR HILLSHADE MAP

The topography of the land around these seeps and wetlands is very steep (30 to 50 percent slope), and because of the steep slope, these tributary streams all are moderately to highly incised and have distinct stream morphology with limited floodplain development. The perennial reach of the mainstem of Still Creek in the vicinity of the project area is classified as a Rosgen A4a+ channel type. The A4 stream types typically have a high sediment supply which is combined with high energy streamflow to produce very high bedload sediment transport rates. The A4 stream types are generally unstable, with very steep rejuventated banks that contribute large quantities of sediment. A4a+ stream types are usually located in slump/earthflow landforms and are often associated with debris avalanches and debris torrent erosional processes. (Rosgen 1996).

Similar to Still Creek, West Fork Salmon River is in the area affected by pyroclastic flow and debris flow deposits from approximately 1,500 years ago. West Fork Salmon River is very similar to Still Creek in that it is fed by snowmelt surface runoff and groundwater flow emanating from the Palmer Snowfield, into numerous wetland seeps that join together at the 4800' elevation level and form the channel of the West Fork of Salmon River.

The perennial reach of the West Fork of the Salmon River in the vicinity of the project area is classified as a Rosgen A4a+ channel type. The A4 stream types typically have a high sediment supply which is combined with high energy streamflow to produce very high bedload sediment transport rates. The A4 stream types are generally unstable, with very steep rejuventated banks that contribute large quantities of sediment. A4a+ stream types are usually located in slump/earthflow landforms and are often associated with debris avalanches and debris torrent erosional processes. (Rosgen 1996).

However, significant stream bed and bank erosion in the lower perennial reachs of Still Creek and West Fork Salmon River within the Study Area was not observed during stream mapping and characterization surveys associated with the Environmental Impact Statement associated with the Timberline Express Project that were conducted in 2002 and 2003 (SE Group, 2004a). The 1998 stream survey of Still Creek in the vicinity of the project area notes 0.8% of the stream reach with unstable banks. The lack of observed bank erosion and instability that would be expected in this sensitive stream type from existing lift and trail development in the Study Area is likely due to the moderating affect of groundwater contributions to the stream hydrograph, the well-connected floodplain wetlands, and the dense overbank vegetation along both sides of the channel. However, some bank instability approximately 1.5 miles downstream of the Study Area was noted during a survey of Still Creek near the Still Creek Campground (USFS, 1996) and another area of bank instability was noted in the West Fork of Salmon River in the vicinity of Timberline Road where an abundance of road sand and gravel was observed within and adjacent to the channel and from a natural slope failure zone that is approximately 75 feet in length and 50 feet high adjacent to the streambank approximately 500 feet upstream of the Timberline Road (SE Group, 2004d).

Flow Regime

With the lowest elevation in the hydrologic planning area at 4,800feet and the highest elevation area at 10,000 feet (however the majority of the analysis subwatersheds only extend up to 7,000 feet) at least 50% of the annual precipitation is contained in the snowpack based on data from adjacent SNOTEL sites. Based on the amount of precipitation associated with the snowpack a snowmelt dominated hydrograph would be expected for this area. Figure 1 details the mean daily values for the Salmon River stream gage at 3,445 feet which measures a watershed of 8 square miles. This gage is approximately 1 mile east of Trillium Lake. Figure 4 clearly details the influence of the melting snowpack (staring in early April and peaking in late May) on the annual hydrograph. Baseflows at this site generally occur from mid July through mid November.

Figure 4 – Daily Average Streamflow Salmon River at 3445 feet

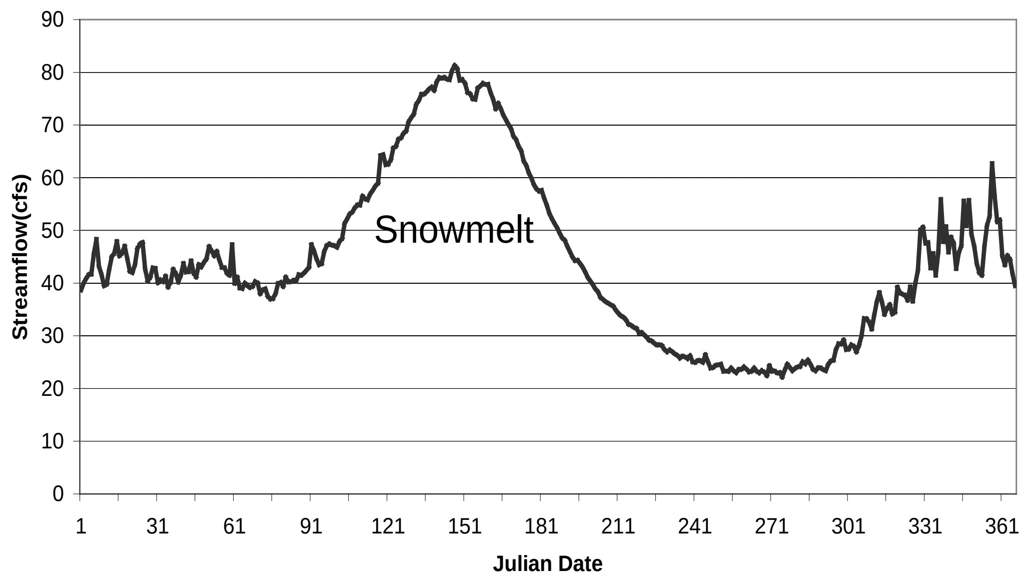
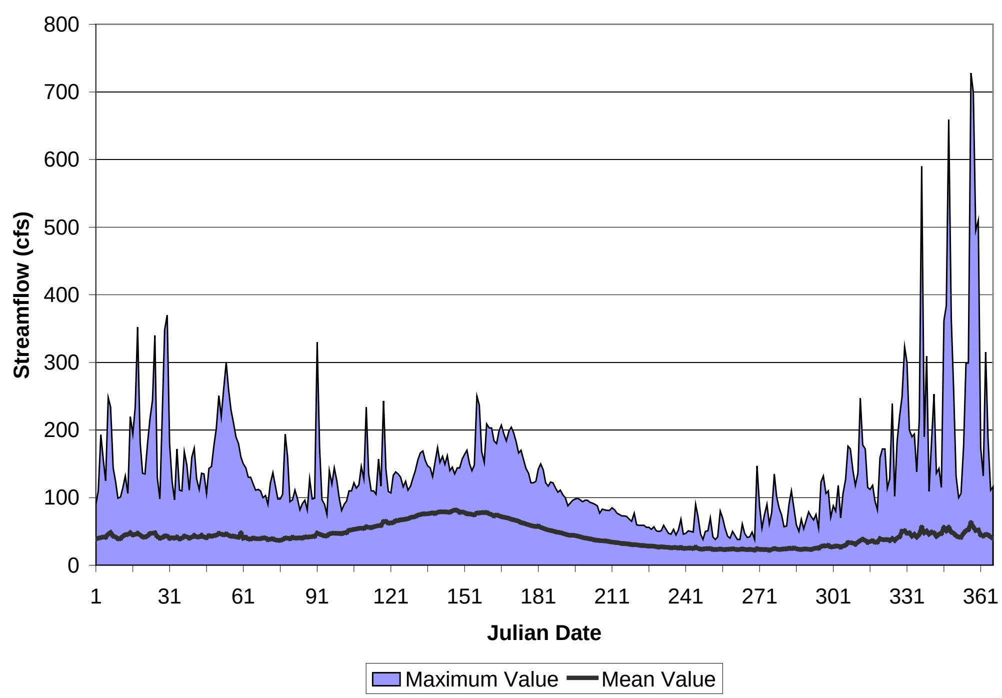


Figure 5 details the maximum daily streamflows for the 67 years of record for the Salmon River gage at 3445 feet. This figure details that the maximum streamflows occur from late November to early March. This would indicate that peak streamflows are associated with runoff from rapid snowmelt and rainfall during rain on snow events.

Figure 5 – Daily Peak Streamflow Salmon River at 3445 feet



Current streamflow data from Still Creek in the vicinity of Still Creek Campground indicates Still Creek differs from the Salmon River, as it is fed primarily by groundwater rather than direct run-off from the snowfield. Seepage from the upper snow fields travels through the near surface geology and expresses itself in the springs that provide the source of perennial flow.

Still Creek flow regime is “buffered” by the constant influx of groundwater. Pulses of surface runoff during rain events occur primarily when the ground surface becomes saturated and the ephemeral reaches of Still Creek carry water.

Water Quality

A Total Maximum Daily Load (TMDL) has been established for stream temperature in the Sandy Basin. The federal Clean Water Act requires DEQ to develop a plan with goals and pollution control targets for improving water quality in the watersheds where water quality standards are not met. DEQ is doing this by establishing TMDLs for each pollutant entering the water. In this case, heat is considered a pollutant because it raises water temperature. A TMDL describes the amount (load) of each pollutant a waterway can receive while maintaining compliance with water quality standards. An important step in the TMDL process is determining how much stream heating results from natural sources and how much heat comes from human activities.

Oregon requires that a water temperature management plan (TMP) be developed and implemented by sources that contribute to stream heating. The TMP will identify the technologies, best management practices, and/or measures and approaches to be implemented by each source to limit stream heating. Stream heating and sedimentation from forestry activities will be controlled through implementation of measures in the state Forest Practices Act on private lands, the Western Oregon State Forests Management Plan in state forests, and federal Northwest Forest Plan on federal forestlands.

Sediment

The Watershed Analysis for the Zigzag Watershed identifies moderate problems with turbidity and sediment associated with highway sanding and road surface erosion in Still Creek.

The Watershed Analysis for the Salmon River Watershed also identifies sedimentation of streams in upper watershed as a process of concern. The Watershed Analysis recommends restoration priorities to reduce sediment within the watershed should focus on the greatest potential sources: highway sanding and roads. Reducing sediment from roads can be further prioritized by proximity to streams, surfacing type, cut and fill slope vegetation and landform.

Wolman pebble counts collected in the summer of 2010 quantify concerns with sedimentation in the project area in both Still Creek and the West Fork of Salmon River. In Still Creek surface fines (material less than 1 mm) were at 21% and in the West Fork Salmon River surface fines were at 44% (the Mt Hood LRMP Standard is less than 20% surface fines).

A major source of sediment input to the West Fork was observed in the vicinity of Timberline Road where an abundance of road sand and gravel was observed within and adjacent to the channel and from a natural slope failure zone that is approximately 75 feet in length and 50 feet high adjacent to the streambank approximately 500 feet upstream of the Timberline Road (SE Group, 2004d)

Below the project area the 1996 Still Creek stream survey details problems with sedimentation in the area near Still Creek Campground and in the upper portion of the Key Site Riparian area. These observations were validated with pebble counts from that survey that detail surface fines (material less than 1 mm) at 52% and 35% respectively in these reaches (the Mt Hood LRMP Standard is less than 20% surface fines).

Water Temperature

Still Creek and West Fork Salmon River are identified by the Oregon Department of Environmental Quality as core cold water habitat for salmonids with a water temperature standard of the seven-day-average of the daily maximum temperature may not exceed 16.0 degrees Celsius (60.8 degrees Fahrenheit).

In the Watershed Analysis for the Zigzag Watershed Still Creek was not identified with stream temperature problems. This was validated by temperatures taken during stream surveys.

According to Golder (2003), Still Creek at elevation 5,000 feet exhibits an average temperature of 3°C. Outside of the Study Area at 3,600 feet, the average temperature is 6.8°C. Since water temperature in streams is cumulative and temperature typically becomes higher downstream, it can be deduced that the stream temperatures within the reaches in the Study Area are between 3°C and 6.8°C (Golder, 1998), which is below the 16.0°C in-stream maximum temperature criterion mandated by ODEQ. Golder (1998) indicates that the perennial reach of Still Creek is fed by a series of groundwater seeps and springs that serve to buffer the stream from changes in the watershed. (Timberline Express FEIS)

In Still Creek temperatures taken during the 1998 survey from July 6th to August 31st varied from a maximum of 15^0C at river mile 2.4, 2.7, and 3.3 to a minimum of 4^0C from river mile 14.0 to the end of the survey at river mile 14.4. Within the analysis area water temperatures were at 4^0C upstream of river mile 14.0.

In the Upper Salmon River at 3,445 feet in elevation, the average water temperature is 8.0°C (Golder, 1998), which is below the 16.0°C in-stream maximum temperature criterion mandated by ODEQ. Similar to the perennial reach of Still Creek within the Study Area, the headwaters of Upper Salmon River within the Study Area are dominated by a series of springs and seeps in the vicinity of Timberline's pumphouse. As a result, the flows in downstream reaches would also be buffered from changes in the upslope watershed. (Timberline Express FEIS)

Groundwater Resources

Wetlands

Executive Order (EO) 11990, Protection of Wetlands, calls for the identification, assessment, and protection of wetlands by requiring Federal agencies to avoid, if possible and practicable, adverse impacts to wetlands and to preserve and enhance the natural and beneficial values of wetlands. Section 401 of the Clean Water Act includes provisions that ensure compliance with the Clean Water Act and state water quality laws with respect to activities that are federally permitted. Jurisdictional wetlands and streams are subject to the regulations of the Clean Water Act, in particular, Section 404, which regulates discharges of fill to wetlands and streams.

In order to satisfy conditions of EO 11990, wetlands were identified and mapped throughout the entire Study Area to assist with project design and impact analysis. Wetlands were identified and mapped using the three-parameter approach outlined in the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory, 1987). Wetlands within the Study Area were also classified using the Hydrogeomorphic (HGM) approach to wetland classification (Brinson, 1993). The wetlands in analysis area are grouped according to their HGM class: slope wetland or riverine wetland. The wetlands are further characterized by whether they are in a natural or modified (historically disturbed) condition. Wetlands in a modified condition contain modified or nonnative vegetation, modified soil profiles, and/or modified hydrology through ditching or levee construction. (Timberline Express FEIS)

The Study Area contains 22 wetlands that encompass a total area of 2.46 acres

Watershed	Riverine Wetland	Slope Wetland	Total
Still Creek	0.3	1.0	1.3
West Fork Salmon River		1.2	1.2
Grand Total	**0.3**	**2.2**	**2.5**

Nineteen slope wetlands with a total of 2.15 acres are located within the Study Area, most of which are generally located in the middle to lower elevation (4,850 feet to 5,050 feet in elevation) portions of the analysis area. Two of the slope wetlands in the analysis area are adjacent to the mainstem of Still Creek, a Class II stream. The vegetation in these slope wetlands is typically dominated by herbaceous plant communities with limited shrub and tree dominated components along the margins of the wetlands. The composition of the soils observed in the slope wetlands ranges from organic soils (i.e., histosols) to mineral soils with sandy loam texture classes.

Most of the slope wetlands in the analysis area originate from a series of groundwater seeps that form the headwaters of Still Creek and unnamed tributaries of the Upper Salmon River. A review of geologic literature for the surrounding area (Wise, 1969) indicates that the flow from these seeps is relatively constant due to the groundwater flow from Palmer Snowfield.

A total of 0.32 acre of riverine wetlands are present in the analysis area. The three riverine wetlands in the analysis area are located along perennial reaches of Still Creek and tributaries to Still Creek on narrow floodplains and terraces. The primary hydrologic input to the riverine wetlands is surface water that floods out of the Still Creek channel and onto adjacent floodplains during high flow events (e.g., spring melt). Secondary hydrology sources to these wetlands include surface flow from intermittent and perennial streams from adjacent hillsides and groundwater from seeps in the inner gorge of Still Creek. Native hydrophytic shrub species dominate the vegetation communities in the riverine wetlands in the Study Area. Herbaceous communities make up a minor component of the wetland vegetation in one of the riverine wetlands and forest communities are not present in any of the riverine wetlands. The soils within the riverine wetlands are typically mucky mineral soils with loamy sand texture (SE Group, 2004a).

Direct and Indirect Effects

Table 4 - Comparison of Alternatives – Water Resources

Items of Comparison	Proposed Action	Current Condition
Water Resources		
Flow Regime		
Channel Network Expansion by Roads and Trails	Still Creek: 24%	Still Creek: 23%
	WF Salmon: 10%	WF Salmon: 16%
	Total: 14%	Total: 15%
SE Custom Model Changes in 2-year peak flow	Still Creek: 4.7%	Still Creek: 4.3%
	WF Salmon: 4.5%	WF Salmon: 4.3%
SE Custom Model Changes in low flow	Still Creek: 19.8%	Still Creek: 18.2%
	WF Salmon: 19.0%	WF Salmon: 18.2%
Sediment Yield		
Number of Stream Crossings	Still Creek: 34	Still Creek: 12
	WF Salmon: 8	WF Salmon: 8
	Total: 42	Total: 20
Stream Crossings Sediment Delivery (tons/year)	Still Creek: 0.2	Still Creek: N/A
	WF Salmon: 0	WF Salmon: N/A
	Total: 0.2	Total: N/A
Road related Sediment Delivery (modeled tons/year) for properly maintained roads	Still Creek: 14.4	Still Creek: 13.3
	WF Salmon: 5.0	WF Salmon: 10.3
	Total: 20.7	Total: 23.5
Sediment Reduction from Projects not Captured in road modeling	Still Creek: 26.6	Still Creek: N/A
	WF Salmon: 8.9	WF Salmon: N/A
	Total: 35.4	Total: N/A

Introduction

The effects to water resources will be addressed by two elements:

- Flow Regime, and
- Sediment Yield

Streamflow Regime

Peak streamflows (flood events)

Peak streamflows have important effects on stream channel morphology, sediment transport, and bed material size. Peak streamflows can affect channel morphology through bank erosion, channel migration, riparian vegetation alteration, bank building, and deposition of material on floodplains. The vast majority of sediment transport occurs during peakflows as sediment transport capacity increases logarithmically with discharge (Ritter 1978; Garde and Rangu Raju, 1985).

The ability of the stream to transport incoming sediment will determine whether deposition or erosion occurs within the active stream channel. The relationship between sediment load and sediment transport capacity will affect the distribution of habitat types, channel morphology, and bed material size (MacDonald, 1991). Increased size of peakflows due to urbanization have been shown to cause rapid channel incision and severe decline in fish habitat quality (Booth, 1990).

Another important consideration is the impact of bankfull flow, often described as the high flow during two out of three years, or as a stream discharge having a recurrence interval of 1.5 years (Dunne and Leopold, 1978). The shape of the channel more closely reflects the bankfull width and height than it does the less frequent floods. If the bankfull flow is raised above the range of natural conditions, excess scouring can occur. If lower, the stream may not have the power to move its natural sediment load, causing sediment deposition within the watershed.

The Aquatic Conservation Strategy (ACS) gives clear direction that "the distribution of land use activities, such as timber harvest or roads, must minimize increases in peak streamflows" (ROD B-9) to create and sustain riparian, aquatic, and wetland habitats, and to retain patterns of sediment, nutrient, and wood routing.

Peak streamflows of large magnitude in the analysis area are generally generated by rain-on-snow events. The transient rain-on-snow zone is normally considered to be from 2400 to 4800 feet. Even though the analysis area is slightly above the transient rain-on-snow zone 71% of the of the entire analysis area is below 6000; 81% of the Still Creek and 85% of theWest Fork Salmon River analysis area watersheds are also below 6000 feet. Record floods occur predominantly during November through January, caused by: accumulated snow at lower elevations followed by a rapid rise in temperature, unusually high-elevation freezing levels, and heavy rainfall. In some instances, the ground is frozen prior to snow accumulation, producing more favorable conditions for high runoff (SCS 1976).

The 2006 large peak streamflow event, estimated at a 25 year recurrence interval flood event in the Upper Sandy River Basin, was entirely rain generated. This type of event is consistent with predictions associated with climate change. A recent review of the effects of climate change on salmon (ISAB 2007) identified the following probable consequences of global warming along the Pacific coast of North America: (1) warmer temperatures will result in more precipitation falling as rain rather than snow, (2) snowpack will diminish and streamflow timing will be altered, (3) peak river flows will likely increase, and (4) water temperatures will continue to rise.

There is a class of changes in hydrologic processes that consists of those that control infiltration and the flow of surface and subsurface water. This class is dominated by the effects of forest roads. The relatively impermeable surfaces of roads cause surface runoff that bypasses longer, slower subsurface flow routes. Where roads are insloped to a ditch, the ditch extends the drainage network, collects surface water from the road surface and subsurface water intercepted by roadcuts, and transports this water quickly to streams. The longevity of changes in hydrologic processes resulting from forest roads is as permanent as the road. Until a road is removed and natural drainage patterns are restored, the road will likely continue to affect the routing of water through watersheds. (FEMAT V-20)

For this analysis it is assumed that the Mountain Bike trails are similar to roads in the way that they impact hydrologic process associated with streamflow.

The relatively impermeable surfaces of roads cause surface runoff of rain and snowmelt water to bypasses longer, slower subsurface flow routes in soils. Where roads are in-sloped to a ditch, as most of the roads in this project are, the ditch extends the drainage network, collects surface water from the road surface and subsurface water intercepted by road cuts and transports this water quickly to streams. This process increases flow routing efficiency and may result in increased magnitude of peak stream flows.

For this analysis peak flows are related to the increase in the channel lengths caused by road ditches connected to streams. Based on recent research on two basins in the Western Cascades of Oregon 57% of the road length is connected to the stream network by surface flowpaths including roadside ditches and gullies below road drainage culverts (Wemple, 1996). It is assumed that all road ditches and culverts are properly maintained.

The increase in channel length due to the ditch length as just described is expressed as a percent of the stream drainage network. For the current condition it was assumed that the stream network was expanded: 50 feet for trail stream intersections, 350 feet for paved system road stream intersections, 500 feet for gravel user roads stream intersections, and 750 feet of native use road stream intersections.

With project implementation stream network would be expanded by 50 feet for trail stream intersections, 350 feet for paved system road stream intersections, 500 feet for gravel user roads stream intersections, and 150 feet of native use road stream intersections.

Table 5 – Stream Drainage Network Enhancement All Streams

Analysis Subwatershed	Current Condition	Proposed Action
Glade	0	0
Sand Canyon	0	1

Still Creek	23	17
West Fork Salmon River	16	8
Grand Total	15	10

Table 5 details that roads currently in the project area increase the channel network length by 15%. Increases in stream drainage network enhancement vary from 0 to 23% based on analysis area.

Implementation of the proposed action would decrease the stream drainage network by 5% over the entire project area, 8% in the West Fork Salmon Watershed, and 6% in the Still Creek Watershed. The reductions are realized through decommissioning and installation of more frequent drainage structures on user roads. Results from Glade Watershed are suspect because of the very limited miles of stream in this area (0.07 miles)..

There are no expected adverse effects for peak flow increases up to 10%, given the inherent error in peak flow prediction methods and the fact that changes in peak flows of up to 10% are usually below detection limits using standard stream gauging methods. Peak flow increases greater than 10% offer the possibility for adverse effects (DNR, 1993). Therefore, a 10% increase in stream drainage network enhancement is used a threshold for the potential adverse effects.

Still Creek is above the 10% threshold under both the current condition and proposed action. However, implementation of the proposed action will reduce stream drainage network enhancement by 6% in the Still Creek analysis watershed. It should be noted that the research associated with this process was completed in significantly larger watersheds than that associated with this project (15,320 to 29, 405 acres compared to 1,732 acres).

Associated with the Environmental Impact Statement for the Timberline Express Project a custom stream flow model was created to estimate the potential changes in stream flow conditions as a result of land cover changes from the Proposed Action and other Action Alternatives in the two analysis watersheds (similar in size and position to Still Creek and West Fork Salmon River analysis areas used for this project). This model was used to assess potential changes in 2 year peak flows and low flows associated with implementation of the proposed action.

Table 6 – Changes in 2 Year Peak Streamflows Timberline Express Streamflow Model

Analysis Area	Current Condition	Proposed Action
Still Creek	4.3%	4.7%
W.F. Salmon River	4.3%	4.5%

There are no expected adverse effects for peak flow increases up to 10%, given the inherent error in peak flow prediction methods and the fact that changes in peak flows of up to 10% are usually below detection limits using standard stream gauging methods, in addition clearing associated with the current project not expect to have any impact on the 2 year peak flow using the customized stream model.

Table 7 – Changes in Low Flows Timberline Express Streamflow Model

Analysis Area	Current Condition	Proposed Action
Still Creek	18.2%	19.8%
W.F. Salmon River	18.2%	19.0%

With respect to low flows the streamflow analysis for the Timberline Express Project concludes “The hydrographs of Still Creek and the West Fork Salmon River within the Flow Model Analysis Area are largely controlled by groundwater influx from shallow groundwater from the Palmer Snowfield (Golder, 1998 and DeRoo, Pers. Comm., July, 2004). As stated above, this stream flow model does not account for significant groundwater contributions to the hydrograph. During the summer low flow period, the dominant source of hydrology for Still Creek and the West Fork Salmon River is shallow groundwater. No effects to shallow groundwater are anticipated from the proposed project because no permanent roads would be constructed, utility trenching would be 3 to 4 feet deep, and the documented shallow groundwater table is between 50 and 150 feet below the soil surface in the vicinity of proposed grading activities (Golder, 1998).” With respect to low flows the same logic would apply to this project since any areas where groundwater is exposed are avoided or bridged by the proposed action.

Sediment Yield

Road networks are the most important sources of accelerated delivery of sediment to fish-bearing streams. Road-related landslides, surface erosion, and stream channel diversions often deliver large quantities of sediment to streams, both catastrophically during large storms and chronically during smaller runoff events. Older roads in poor locations and with inadequate drainage systems pose high risks of future sediment production. Road surfaces and ditches can also serve as extensions of the stream network, thereby increasing flood peaks and efficiently delivering road-derived sediments to streams. (FEMAT II-40)

Accelerated rates of erosion and sediment yield are a consequence of most forest management activities. Road networks in many upland areas of the Pacific Northwest are the most important source of management-accelerated delivery of sediment to anadromous fish habitats. The sediment contribution to streams from roads is often much greater than that from all other land management activities combined, including log skidding and yarding. Road related landsliding, surface erosion and stream channel diversions frequently deliver large quantities of sediment to steams, both chronically and catastrophically during large storms. Roads may have unavoidable effects on streams, no matter how well they are located, designed or maintained. Many older roads with poor locations and inadequate drainage control and maintenance pose high risks of erosion and sedimentation of stream habitats. (FEMAT V-16)

Increased levels of sedimentation often have adverse effects on fish habitats and riparian ecosystems. Fine sediment deposited in spawning gravels can reduce survival of eggs and developing alevins. Primary production, benthic invertebrate abundance, and thus, food availability for fish may be reduced as sediment levels increase. Social and feeding behavior can be disrupted by increased levels of suspended sediment. Pools, an important habitat type, may be lost due to increased levels of sediment (FEMAT V-19).

Road crossings of stream channels create a potential for sedimentation due to the immediate proximity of the road to the stream being crossed. Where roads are insloped to a ditch, the ditch extends the drainage network, collects surface water from the road surface and subsurface water intercepted by road cuts and transports this water quickly to streams. This more rapidly flowing water is moving across a ditch which may not be vegetated, picking up sediment as it erodes. After road construction, this impact lessens, but still persists during storms due to the risk of overtopping of the crossing structure, most commonly culverts. Plugging of the structure by large woody debris or boulders in the streambed can reduce its capacity, and if severe, cause overtopping of the structure and damage to the fill on the downstream side of the road. Just as in the Flow Regime section, considering the number of drainage crossings is useful in assessing the risk of erosion and sedimentation from roads.

The erosive power of water increases at the sixth power of its velocity. Therefore, reducing the concentration of runoff and thereby its velocity is important to preventing erosion and the risk of sedimentation to streams.

In a study completed by the U.S. Geological Survey that assessed variations in stream turbidity within the Bull Run Watershed (LaHusen 1994), it was determined that the most visible sites of erosion are stream channels, streambanks, and roadside ditches.

Table 8 - Stream Crossings by Alternative

Subwatershed	Current Condition	Proposed Action
Glade	0	2
Still Creek	12	34
West Fork Salmon River	8	8
Total	20	44

Within the analysis area the proposed action results in approximatley a 100% increase in the number of stream crossings. It should be noted that the number of stream crossings associated with roads decrease by 1 crossing and 2 crossings in Still Creek and West Fork Salmon River Watersheds respectively. The increase in the stream crossings is associated with the proposed mountain bike trails. Modeling results associated with the Government Camp Trails EA (USDA 2005) indicated a sediment yield of approximately 16 pounds per crossing which would result in 368 pounds of sediment delivery to Still Creek and associated tributaries, and 32 pounds of sediment delivery to West Fork

Salmon River and associated tributaries and 32 pounds to the ephemeral stream in the Glade analysis watershed that is not connected on the surface to the rest of the downstream drainage network in this area. For this process the sediment yields are very small, 1 ton of sediment is approximately equal to 1 cubic yard of erosion so the total yield for the entire project is 0.2 cubic yards or 5.4 cubic feet of material

Modeled Sediment Yield from Road Network

Sediment yield from the proposed trails and existing roads in the analysis area was assessed using the Washington Department of Natural Resource's Standard Methodology for Watershed Assessment Surface Erosion Module. Key input factors for this model include road surface type, soil erodibility, road use, age of road and proximity of the road to the stream system. It does not assess effects from unmaintained road ditches and culverts, but assumes they are functioning properly. For this analysis it was assumed that roads or trails constructed under this project within 80 feet of a stream would have the potential to deliver sediment to the stream system. This assumption was based on recommendations associated with Washington Department of Natural Resource's Standard Methodology for Watershed Assessment Surface Erosion Module that was delevoped from Idaho research (Ketcheson and Megahan unpublished) that showed that sediment flow from most cross drains extends less than 200 feet, and that 90% of the sediment volume was deposited within the first 40% of the maximum length, so for this analysis 80 feet (200 feet *40%) was used for the delivery zone.

The road based model was used because many of the trails to be build will be constructed by machine (11.4 miles of the 17.2 miles of trail construction) with these machine built trails having a tread up to 6 feet wide (not including the cut or fill slopes). In addition the machine built trails will be insloped with a ditchline much like a road system.

Table 9 - Modeled Road Related Sediment Delivery to Streams (tons/year) from DNR Sediment Model

Analysis Watershed	Current Condition	Proposed Action
Glade	0.0	0.9
Sand Canyon	0.0	0.3
Still Creek	13.3	14.4
West Fork Salmon	10.3	5.0
Total	23.5	20.7

Since the sediment yields in the Glade and Sand Canyon analysis watersheds are very small and the Glade analysis watershed that is not connected on the surface to the rest of the downstream drainage network in this area the discussion will focus on the Still Creek and West Fork Salmon analysis subwatersheds.

Based on the results of the model, implementation of the proposed action will result in a reduction of 2.8 tons of sediment delivery to the stream system per year through administrative user road decommissioning, surfacing with drainage, and road to trail conversion.

In addition, analyzing road based restoration projects that are outside the sediment delivery zone but are delivering sediment to the stream system and additional projects at the bottom of the Stormin Normin chairlift, Jeff Flood chairlift, Pucci chairlift and adjacent to Westleg road that are also delivering sediment to the stream system (using the same assumptions and methodology from the DNR Sediment Model as used with the road based modeling) there is an additional 21.2 tons of sediment reduction in the analysis area.

Watershed	Sediment Reduction From Additional Sediment Reduction Projects
Still Creek	15.4
West Fork Salmon	5.8
TOTAL	21.2

In the first two years after construction the trail system is predicted to yield 15.0 tons of sediment per year which would be reduced to 8.2 tons per year annually after that. For the first two years after construction 12.6 tons per year would be delivered to Still Creek and associated tributaries and 1.1 tons per year would be delivered to West Fork Salmon River and associated tributaries, after two years the yields would be reduced to 6.9 tons per year and 0.6 tons per year respectively. The sediment yield associated with the trail construction would be offset by more than a 2 to 1 ratio by improvements in the user road system and additional projects at the bottom of the Stormin Normin chairlift, Jeff Flood chairlift. Pucci chairlift, and adjacent to Westleg road. This suite of projects results in a 14.0 ton per year reduction on Still Creek and 7.8 tons per year reduction in West Fork Salmon River.

Watershed	Sediment from Trails	Sediment reduction from Road Surfacing/Decom	Sediment reduction from projects	Total Sediment Reduction	Sediment Reduction Ratio
Still Creek	12.6	11.2	15.4	26.6	2.1
West Fork Salmon	1.1	3.1	5.8	8.9	8.4
TOTAL	13.7	14.2	21.2	35.4	2.6

Sediment yield analysis was completed for the Timberline Express FEIS using the Water Erosion Prediction Project (WEPP) model (a physically-based soil erosion model, particularly suited to modeling the conditions common in forests). Table 11details sediment yield associated with anthropogenic sources. The subwatersheds analyzed are similar in size and position to Still Creek and West Fork Salmon River analysis areas used for this project

Table 10 – Predicted Sediment Yield Timberline Express Project

Analysis Area	Sediment Yield to Streams (tons/year)
Still Creek	11.5
W.F. Salmon River	3.5

The Sediment Model Technical Report associated with the Timberline Express FEIS concludes: "*The Disturbed WEPP model provides accurate estimates of soil erosion and sediment yield rates for the existing and proposed conditions of the 20 hill slopes that were modeled in the Sediment Model Analysis Area. While this model provides accurate background erosion and sediment estimates for the hill slopes modeled, it does not provide any estimate of total background sediment yield to the two watersheds in the Analysis Area due in to the high erosion rates above the treeline and the unpredictability of snowmelt driven erosion on bare soils. It is difficult to put the estimated increases in soil erosion and sediment yield from the Action Alternatives into the proper context with respect to background sediment yield rates occurring throughout the Analysis Area. … Rather, soil erosion and sediment yield numbers represent condition in the modeled hillslopes only. As such, the model is used to predict the effects of development alternatives on a series of modeled hillslopes.*

Based on rough extrapolation of average sediment yield rates for the Riparian Reserves modeled, the total background sediment yield for the Analysis Area may occur within the range of 114 tons/year to 526 tons/year."

Using the range of background sediment yield from the Timberline Express Project the modeled sediment associated with the implementation of the proposed action (trails contribution less restoration project reduction resulting in a 21.7 tons/year reduction) would result in a 4% to 19% decrease in sediment yield from background levels in the project area.

Compliance with the Clean Water Act, Mt Hood Land and Resource Management Plan, and Aquatic Conservation Strategy Objectives

Clean Water Act

It is the responsibility of the Forest Service as a Federal land management agency through implementation of the Clean Water Act (CWA), to protect and restore the quality of public waters under their jurisdiction. Protecting water quality is addressed in several sections of the CWA including sections 303, 313, and 319. Best Management Practices (BMPs) are used to meet water quality standards (or water quality goals and objectives) under Section 319. (Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Act Section 303(d) Listed Waters (http://www.fs.fed.us/r6/water/protocol.pdf)

Current statewide Water Quality Standards for the State of Oregon state: “Pursuant to Memoranda of Agreement with the U.S. Forest Service and the Bureau of Land Management, water quality standards are expected to be met through the development and implementation of water quality restoration plans, **best management practices** and aquatic conservation strategies. Where a Federal Agency is a Designated Management Agency by the Department, implementation of these plans, practices and strategies is deemed compliance with this Division”. (Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Act Section 303(d) Listed Waters) (http://www.fs.fed.us/r6/water/protocol.pdf)

In addition the Mt. Hood Land and Resource Management Plan contains the following Standards and Guidelines with respect to the implementation of BMP’s.

- Compliance with State requirements shall be met through planning, application, and monitoring of Best Management Practices FEIS (Appendix H). Best Management Practices (BMPs) describe the process which shall be used to implement the State Water Quality Management Plan on lands administered by the USDA Forest Service. **FW-055, FW-056**

- Individual, general Best Management Practices which may be implemented (i.e. on a project by project basis) are described in General Water Quality Best Management Practices, Pacific Northwest Region, 11/88. Evaluations of ability to implement and estimated effectiveness shall be made at the project level. **FW-057, FW-058**

- The sensitivity of the project shall determine whether the site-specific BMP prescriptions are included in the environmental analysis, the project plan or the analysis files. **FW-059**

Site specific Water Quality Best Management Practices, with the express purpose of limiting non-point source water pollution, are incorporated into the proposed action and associated project design criteria for this project.

Section 303D

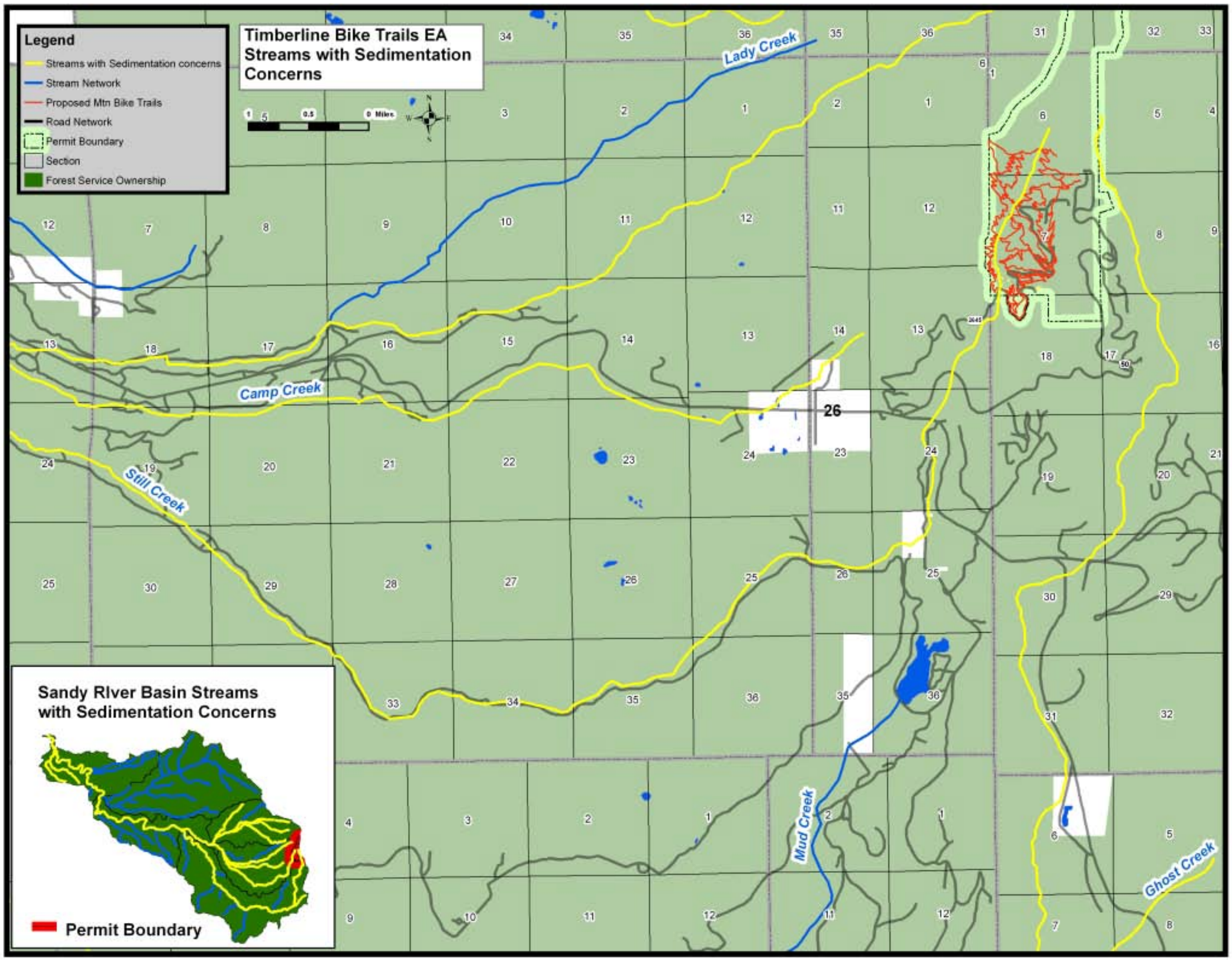
Section 303(d) of the CWA requires that waterbodies violating State or tribal water quality standards be identified and placed on a 303(d) list. The Environmental Protection Agency (EPA) regulations also allow States and tribes to include threatened waters (that is, waters that display a downward trend that suggests water quality standards will not be met in the near future).

For each listed waterbody, the CWA requires States to establish a Total Maximum Daily Load (TMDL) for the parameter(s) causing beneficial use impairment. A TMDL is the sum of the waste load allocation for point sources of pollution (for example, outflow from a manufacturing plant) plus the load allocation for nonpoint sources of pollution, including “natural” background levels, plus a margin of safety to allow for uncertainty.

For water quality limited streams on National Forest System lands, the USDA Forest Service provides information, analysis, and site-specific planning efforts to support state processes to protect and restore water quality.

Table 11 – Water Quality Limited (303D) Streams in or Adjacent to the Analysis Area

NAME	MILES	PARAMETER	STATUS
Still Creek	0 to 16	Sedimentation	Insufficient data
Still Creek	0 to 16	Temperature	Cat 2: Attaining some criteria/uses
Salmon River	0 to 33.9	Sedimentation	Insufficient data
Salmon River	0 to 33.9	Temperature	Cat 4A: Water quality limited, TMDL approved



Within the analysis area Still Creek and Salmon River are on the 2004/2006 State of Oregon 303(d) list for stream temperature. Sedimentation in both of these stream systems has been listed as a concern but the streams were not included on the 303D list because of insufficient data.

A temperature TMDL has been developed for the Sandy River Basin with the following requirement for federal forest lands. All management activities on federal lands managed by the U.S. Forest Service (USFS) and the Bureau of Land Management must follow standards and guidelines as listed in the respective Land Use and Management Plans, as amended, for the specific land management units. In the Mount Hood National Forest, management activities are guided by the Northwest Forest Plan (USDA Forest Service, 1994) and the Mt Hood National Forest Land and Resource Management Plan (Mt. Hood Forest Plan, USDA Forest Service, 1990). A Reconciliation Document was drafted in 1995 (USDA Forest Service, 1995). This document indicates that all standards and guidelines in the Mt. Hood Forest Plan apply unless superseded by the Northwest Forest Plan standards. When standards and guidelines from both documents apply, the one which controls is the one more restrictive or which provides greater benefits to late-successional forest related species.

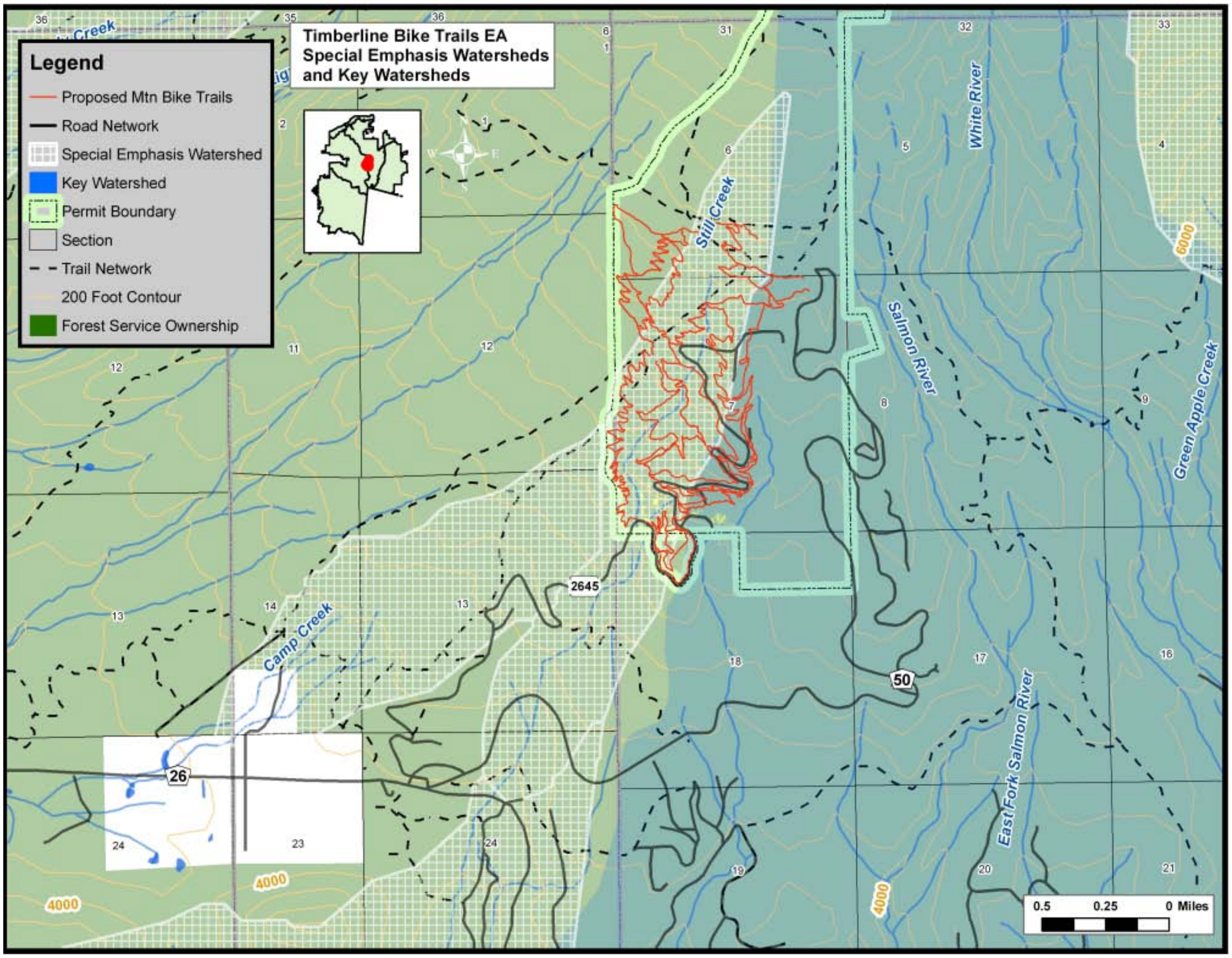
ODEQ and USFS signed a memorandum of Understanding (MOU) in May 2002. The MOU defines the process by which ODEQ and the Pacific Northwest Region of the USFS will cooperatively meet State and Federal water quality rules and regulations. In its review of these management plans, ODEQ believes that they meet the requirements of a TMDL management. Although developed before the completion of this TMDL, both the Mt. Hood Forest Plan and the Northwest Forest Plan address proposed management measures tied to attaining system potential shade. As part of the public involvement process for the development and approval of both plans, most of the other requirements of a TMDL management plan have also been addressed. As they have in the past, it is expected that the Mt. Hood National Forest will continue to work with the ODEQ, NMFS, USFWS, and ODFW in best management practices, research opportunities, training, etc.

Implementation of the project (trails contribution less restoration projects) would result in a 14.0 tons per year reduction of sediment in the Still Creek Watershed and a 7.8 tons per year reduction in the West Fork Salmon River Watershed. In light of the sediment reductions associated with this project is not anticipated to have an adverse impact on stream sedimentation.

Consistency with Mt Hood Land and Resource Mangement Plan Standards and Guidelines

Key Mt. Hood Land and Resource Management Plan allocations with respect to protection of the aquatic environment include: Key Watersheds, Special Emphasis Watershed, Riparian Reserves and Riparian Area.

Figure 6 - Key Watersheds and Special Emphasis Watersheds



Key Watersheds

Key Watersheds are a system of large refugia comprising watersheds that are crucial to at-risk fish species and stocks and provide high quality water. The Aquatic Conservation Strategy includes two designations for Key Watersheds. Tier 1 (Aquatic Conservation Emphasis) Key Watersheds contribute directly to conservation of at-risk anadromous salmonids, bull trout, and resident fish species. They also have a high potential of being restored as part of a watershed restoration program. The network of 143 Tier 1 Key Watersheds ensures that refugia are widely distributed across the landscape. While 21 Tier 2 (other) Key Watersheds may not contain at-risk fish stocks, they are important sources of high quality water.

Standards and guidelines for Key Watersheds include:

- Reduce existing system and nonsystem road mileage. If funding is insufficient to implement reductions, there will be no net increase in the amount of roads in Key Watersheds.

- Key Watersheds are the highest priority for watershed restoration.

The Salmon River fifth field watershed is a Tier 1 Key Watershed so the West Fork Salmon River is included in this area. Project activities are consistent with Standards and Guidelines by reducing existing nonsystem road mileage by 0.5 miles.

Special Emphasis Watersheds

The goal of Special Emphasis Watersheds is: Maintain or improve watershed, riparian, and aquatic habitat conditions and water quality for municipal uses and/or long term fish production. The Still Creek subwatershed is within this allocation. Major characteristics include that the transportation system design may be restricted to avoid sensitive watershed lands. Standards and guidelines include:

- New developed recreation sites, or expansions to existing sites, may occur provided watershed (i.e. water, soil, and fish) values are protected

- The development of new or expansion of existing recreation sites facilities and trails (hiking and cross-country skiing) may occur, but should avoid or protect sensitive watershed lands

- Developments or expansions should avoid special aquatic and terrestrial habitats (e.g. side channels, ponds, and wetlands). Interpretive facilities and trails may he an exception

- Where existing developments (e.g. recreation sites, and trails) are not consistent with riparian and/or watershed values, modification or rehabilitation of the site or facility should occur.

The proposed action with the incorporation of site specific project design criteria was designed to protect sensitive watershed lands and avoid special aquatic and terrestrial habitats. The watershed restoration activities associated with the project address existing developments that are depositing sediment in both the Still Creek and West Fork Salmon River systems.

Riparian Reserves

Riparian Reserves are portions of watersheds where riparian-dependent resources receive primary emphasis and where special standards and guidelines apply. Standards and guidelines prohibit and regulate activities in Riparian Reserves that retard or prevent attainment of the Aquatic Conservation Strategy objectives. Riparian Reserves include those portions of a watershed directly coupled to streams and rivers, that is, the portions of a watershed required for maintaining hydrologic, geomorphic, and ecologic processes that directly affect standing and flowing waterbodies such as lakes and ponds, wetlands, streams, stream processes, and fish habitats. Riparian Reserves include areas designated in current plans and draft plan preferred alternatives as riparian management areas or streamside management zones and primary source areas for wood and sediment such as unstable and potentially unstable areas in headwater areas and along streams. Riparian Reserves occur at the margins of standing and flowing water, intermittent stream channels and ephemeral ponds, and wetlands. Riparian Reserves generally parallel the stream network but also include other areas necessary for maintaining hydrologic, geomorphic, and ecologic processes.

Consistency with Riparian Reserve Standards and Guidelines for roads within the Riparian Reserves is assessed by addressing consistency with the Aquatic Conservation Strategy objectives. However, there are Riparian Reserve Standards and Guidelines that address:

- Minimizing disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow.
- Closing and stabilizing, or obliterating and stabilizing roads based on the ongoing and potential effects to Aquatic Conservation Strategy objectives and considering short-term and long-term transportation needs.
- Minimizing sediment delivery to streams from roads.

An assessment of consistency with the Aquatic Conservation Strategy objectives is completed later in this section. The Proposed Action with the incorporation of watershed restoration activities is designed to minimize disruption of natural, hydrologic flow paths and minimize sediment delivery.

General Riparian Area

The goal of General Riparian Area is to achieve and maintain riparian and aquatic habitat conditions for the sustained, long-term production of fish, selected wildlife and plant species, and high quality water for the full spectrum of the Forest’s riparian and aquatic areas. Key Standards and Guidelines include:

- The development of new, or expansion of existing, recreation sites, facilities, and trails (i.e. hiking and cross-country skiing) may occur and should be located to protect riparian values
- Trails and recreation sites should avoid special aquatic and terrestrial habitats (e.g. side channels, ponds, and wetlands).
- Where existing developments (e.g. recreation sites and trails) are not consistent with riparian values, modification, rehabilitation, or removal of the site or facility should occur.
- Whenever damage occurs to riparian resources, the damaged site shall be promptly restored. Rehabilitation and enhancement may be accomplished through revegetation and stabilization.

- Drainage systems for roads should incorporate practical features to minimize or eliminate sediment and/or other pollutants from discharging directly into streams, lakes, wetlands, springs, or seeps.
- Existing roads causing impacts to riparian values should be mitigated or relocated.
- Unneeded and/or abandoned roads should be rehabilitated.

The proposed action with the incorporation of site specific project design criteria was designed to protect sensitive watershed lands and avoid special aquatic and terrestrial habitats. The watershed restoration activities associated with the project address existing developments that are depositing sediment in both the Still Creek and West Fork Salmon River systems. The watershed restoration activities also address nonsystem roads through decommissioning, road to trail activities and surfacing with associated drainage. These activities are designed to reduced sediment delivery and restore nature flowpaths.

Aquatic Conservation Strategy Consistency Findings

The following is a summary of the projects consistency with the Aquatic Conservation Strategy objectives (ROD B-10).

Objective 1: Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

There are approximately 13 acres of clearing associated trail construction and 6 acres of restoration with revegetation associated with watershed restoration actions. This would result in a net disturbance of 7 acres. Forest clearing in the proposed trail corridors would be reduced to the extent practical through careful trail design and layout and trails would be laid out to avoid removal of trees with a diameter at breast height (DBH) greater than six inches.

Project design criteria have been developed to maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands including:

- Salvaging whole plants from proposed trails in advance of trail construction and transplant them in disturbed areas once construction is completed
- Propagate seedlings from vegetative propagules materials in a nursery for revegetating disturbed areas when whole plants cannot be removed for transplanting
- Collect seed from native plants in the special-use permit area and propagate seedlings from this seed in a nursery for restoration of disturbed areas in subsequent years and directly sow collected seed in disturbed areas for those species for which this method is effective

With the minimal amount of trail clearing and associated criteria to minimize disturbance the project is not anticipated to impact the diversity, and complexity of watershed and landscape-scale features.

Objective 2: Maintain and restore spatial and temporal connectivity in and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

The project is designed to avoid natural water courses and sensitive riparian areas (including wetlands). Where drainage network connections cannot be avoided by the mountian bike trail system an open channel crossing (bridge or low water crossing) will be installed. All crossings will be installed with the input of Forest Service fisheries biologists and/or hydrologists to maintain the function and bedload movement of the natural stream channel. Crossings will conform to the natural channel shape and elevation where possible.

Watershed restoration activities will restore natural drainage patterns (both surface and subsurface) by decommissioning user roads, installing more frequent and effective drainage structures on user roads, and addressing drainage issues that have the potential to impact drainage network connections at the bottom terminals of Stormin Norman, Pucci and Jeff Flood ski lifts and the area on Westleg Road directly above the seep and springs area associated with Still Creek.

Objective 3: Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

The project is designed to avoid natural water courses and sensitive riparian areas (including wetlands). Where drainage network connections cannot be avoided by the mountian bike trail system an open channel crossing (bridge or low water crossing) will be installed. All crossings will be installed with the input of Forest Service fisheries biologists and/or hydrologists to maintain the function and bedload movement of the natural stream channel. Crossings will conform to the natural channel shape and elevation where possible.

Watershed restoration activities will restore the physical intergrity of the aquatic system by decommissioning user roads with associated stream crossings, installing more frequent and effective drainage structures on user roads, and addressing drainage issues that have the potential to impact the physical intergrity of the aquatic system at the bottom terminals of Stormin Norman, Pucci and Jeff Flood ski lifts and the area on Westleg Road directly above the seep and springs area associated with Still Creek.

Through input by of Forest Service fisheries biologists and/or hydrologists using stream simulation methods in designing stream crossings natural streambank and streambed configurations will be established above, though and below the existing stream crossings.

Objective 4: Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain in the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

The project has the the objective of restoring or improving water quality by reducing existing chronic sediment sources (user roads and lift terminal areas).

There may be short-term impacts to water quality (increased sedimentation) when the project is implemented. All of the stream crossings associated with the new mountain bike trail network, user road decommissioning and user road surfacing and drainage improvement are on intermittent or ephemeral streams. The only area with activities planned near a perennial stream is the bottom of the Jeff Flood ski lift and project design criteria were developed to minimize these impacts and keep them to an acceptable level.

Objective 5: Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

The project has the the objective of restoring or improving water quality by reducing existing chronic sediment sources (user roads and lift terminal areas) and reducing sediment associated with the mountain bike trails by a ratio of 2 to 1 (project generated sediment will have associated restoration activies that reduce twice as much sediment as is generated by the project).

Stream crossings associated with the new mountain bike trails will be designed with input from Forest Service fisheries biologists and/or hydrologists using stream simulation methods that will allow for sediment transport through the stream system. Obstructions or pinch points where sediment transport is impeded associated by decommissioning user roads with associated stream crossings. .

Objective 6: Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

Watershed restoration activities will restore natural flowpaths by decommissioning user roads with associated stream crossings, installing more frequent and effective drainage structures on user roads, and addressing drainage issues that have the potential to impact the physical intergrity of the aquatic system at the bottom terminals of Stormin Norman, Pucci and Jeff Flood ski lifts and the area on Westleg Road directly above the seep and springs area associated with Still Creek. Restoring natural streamflow paths (surface and subsurface) will help to maintain and restore in-stream flows with respect to timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

Implementation of the proposed action would decrease the stream drainage network by 5% over the entire project area, 8% in the West Fork Salmon Watershed, and 6% in the Still Creek Watershed. The reductions are realized through decommissioning and installation of more frequent drainage structures on user roads.

Using the same analysis methodology as used for the Timberline Express EIS there are no impacts anticipated to peak or base streamflows associated with implementation of the proposed action. Since there are decreases in the stream drainage network associated with project implementation, there are no impacts to base or peak streamflows based on the methodologies from the Timberline Express EIS and restoration activities associated with proposed action are designed to restore natural flowpaths the project should maintain or restore in-stream flows.

Removal of stream crossings associated with user road decommissioning and design of decommissioned stream crossings and new stream crossing associated with the mountain bike trails using stream simulation techniques will provide for sediment, nutrient, and wood routing.

Objective 7: Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

The project is designed to avoid sensitive riparian areas (including wetlands and meadows) and was delineated in the field to avoid wetlands and indicators of wet soils in subalpine areas. Restoration activies are planned in the vicinity of the wetlands associated with Still Creek that should restore natural flowpaths in this area (by improving infiltration in this area).

Objective 8: Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

Project design criteria have been developed to maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands including:

- Salvaging whole plants from proposed trails in advance of trail construction and transplant them in disturbed areas once construction is completed
- Propagate seedlings from vegetative propagules materials in a nursery for revegetating disturbed areas when whole plants cannot be removed for transplanting
- Collect seed from native plants in the special-use permit area and propagate seedlings from this seed in a nursery for restoration of disturbed areas in subsequent years and directly sow collected seed in disturbed areas for those species for which this method is effective
- For restoration of disturbed trail segments and other areas, use only certified weed-free straw or certified weed-free wood fiber for mulch;
- Use only native plant materials (seed, seedlings, divisions, cuttings)

collected locally on the Mt. Hood National Forest. If supplies of locally collected native seed (e.g., blue wildrye grass) are low and erosion control or restoration of disturbed areas is urgent, use annual ryegrass (Lolium perenne spp. multiflorum), a non-invasive, non-persistent, non-native species.

- The preferred restoration tools, however, are (a) transplants of whole plants and vegetative propagules (divisions, cuttings) collected from proposed trails before trail construction begins and (b) nursery propagation of seedlings from seed and/or vegetative propagules collected in the proposed project area.
- Aggressively treat invasive plants by manual control or with herbicides. Consult Mt. Hood National Forest botanist on which method works best for which species**.**

In addition species composition and structural diversity of plant communities will be restored associated with watershed restoration activities.

Objective 9: Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

This project is designed to minimize impacts to natural drainage patterns (both surface and subsurface), avoid sensitive riparian areas, restore vegetation and reduce sedimentation. This will allow for protection of sensitive habitats and allow unimpeded flowpaths throughout the riparian network in the project area for plant, invertebrate and vertebrate riparian dependent species

Watershed Processes - Cumulative Effects

A cumulative effects analysis was not performed for watershed processes because adverse direct and/or indirect effects associated with the alternatives were not identified.

/s/ Todd Parker
February 24, 2011
Hydrologist
Zigzag Ranger District
Mt. Hood National Forest

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APPENDIX D

WILDLIFE REPORT

Timberline Bike Trails

Wildlife Specialist Report & Biological Evaluation

Headquarters
Mt. Hood National Forest

FOR THOSE WILDLIFE SPECIES LISTED AS THREATENED, ENDANGERED, OR PROPOSED UNDER SECTION 4 OF THE ENDANGERED SPECIES ACT & SENSITIVE SPECIES UNDER THE REGIONAL FORESTER'S LIST 2008
And Survey and Manage Species

DATE: February 28, 2011

Mt. Hood National Forest

Written by:_____/s/___ Alan Dyck ______________________ __Date:________ February 28, 2011___
Alan Dyck, Forest Wildlife Biologist

Introduction

A review of the Timberline Moutain Bike Project was made for the effects of the project on wildlife species.

A determination of No Impact for Sensitive species can be made at any step in the process, at which time the biological evaluation is complete. If the biological evaluation determinations indicate there may be an effect to proposed or listed species, conferencing or informal/formal consultation with USFWS, as outlined in FSM 2673.2, would be initiated.

Currently, threatened, endangered, proposed for listing, and sensitive species are collectively termed *special status* species by the Forest Service. Acronyms such as PETS (proposed, endangered, threatened, and sensitive) and TES (threatened, endangered, and sensitive) are synonymous with the term *special status* species. *Special status* species are those federally listed as threatened or endangered by the USFWS, those proposed for federal listing by the USFWS, and those listed as sensitive on the Regional Forester's Sensitive Species List for Region 6.

This report evaluates the potential effects of the proposed action on special status wildlife species in accordance with The National Environmental Policy Act (42 USC 4321 et seq.), the federal Endangered Species Act (16 USC 1531 et seq.), and the National Forest Management Act (16 USC 1604 et seq.). To comply with the above, the Forest Service has set forth guidance in FSM 2670 that is designed to ensure Forest Service actions (1) do not contribute to the loss of viability of any native or desired non-native species or cause a trend toward federal listing for any species; (2) comply with the requirements of the Endangered Species Act; and (3) provide a process and standard that ensure special status species receive full consideration in the decision-making process.

Project Area

The elevation range for this project is 4800 to 6000 feet. The elevation is an important aspect of this project for several reasons. Many species that are typically analyzed for effects are found below this elevation. There are specialized species that prefer to utilize these high elevations such as Clark's nutcrackers and American marten. There is persistent snow at these elevations for many months making it usable for habitat only during the summer for some species. And the summer growing months are very short so restoration efforts can be difficult due to the short growing season.

The project area is in the Mixed Montane Conifer Wildlife Habitat. The area is characterized by a mixture of older conifers from Mature to Late Successional interspersed with man-made openings (ske runs) that resemble montane meadow habitat. Some of this area was recently created for ski runs and is covered in down woody debris left over from the logging of the runs.

Because the area has not been part of normal forest management the forest is similar to natural forest at this elevation. The area is subject to heavy snows that sometimes create open stands of trees and there are some areas with suppression mortality due to overcrowding. The area has several small wet meadows scattered throughout the runs. The trails have been designed to avoid these habitats.

Project Design Criteria that are the Basis for the Wildlife Effects Determination.

Project design criteria (PDCs) and construction details are valuable in assisting in determining the effect of a project on natural resources. Project design criteria can ameliorate the effect of a project by incorporating designs that reduce impacts. The following PDCs were used in making a determination of the effects on wildlife by the project.

Project Design Criteria

PDC #	Project Design Criteria (PDC)	Construction or Operation?
	Monitoring (Mon)	
Mon-1	The Forest Service Permit Administrator will monitor construction and operations on regular basis and will have the authority to provide direction and/or take action if construction or operations are not conducted according to the project design criteria.	Both
Mon-2	RLK would provide a written annual report to the Forest Service detailing any trail damage, soil erosion, vegetation trampling, wildlife issues, "rogue riders," user conflicts, successes and issues, and restoration efforts in the mountain bike park. The Forest Service would review the report and, if need be, work with RLK to institute needed changes in the management of the mountain bike park.	Both
Heritage Resources (Her)		
Her-1	Trails and trail terrain features would be sited to be the least visible from West Leg Road, allowing for consideration of riparian protection.	Both
Her-2	No new man-made openings would be created for this project. Trail crossings would utilize naturally occurring or previously created clearings/openings.	Construction
Her-3	No cutting of trees larger than 6" dbh would occur along West Leg Road.	Both
Her-4	Historic culverts would be avoided; no trails would be placed adjacent to culvert locations.	Construction
Her-5	No treated lumber would be used for terrain features.	Both

Her-6	Vegetative screening, to the extent possible, would be utilized to lessen any visual impacts associated with the proposed development.	Both
Her-7	Deleted	
Her-8	As specified in the Signage Plan (see Rec-6), bike trail signs or any types of barriers along West Leg Road would be compatible with the character and design of the historic roadway. Wood posts or stone barriers are compatible options.	Both
Her-9	Wood or stone barriers would be used to delineate the skills park.	Both
Recreation (Rec)		
Rec-1	Parallel trails would be joined into one trail prior to crossing West Leg Road. Mountain bikers would enter each crossing through a chicane which would slow the rider down and give him/her clear sight lines down and up the road for at least 50 yards. Signage would be placed to warn mountain bikers and motorists of trail crossings over the road.	Both
Rec-2	Bike trail crossings of Forest Service trails and West Leg Road would include the use of chicanes (i.e., S-curves) and uphill grades to reduce the speed of bikers as they cross the road.	Construction
Rec-3	Bike trail crossings of Forest Service trails and West Leg Road would include signage directing bikers to stay on designated bike trails.	Operations
Rec-4	Forest Service trails and West Leg Road would include signage at bike trail crossings and throughout the bike park to warn trail users/motorists of the presence of cyclists and trail crossings.	Operations
Rec-5	A Spectator Management Plan would be prepared by RLK and approved by the Forest Service to address the management of spectators during different types of mountain bike park events. The plan would address the following: • Spectator viewing areas would be located in existing disturbed areas; location of viewing areas would be dependent on the event type and location (e.g., skills park or specific bike trail). • Defining spectator areas with rope, fencing, or other similar means. • Access corridors for spectators via West Leg Road, or other roads and trails. • Preventing spectator access to sensitive areas such as wetlands, meadows, subalpine-timberline	Operations

	environments, and designated riparian areas. • Restroom facility location (Porta Potties not allowed at the bottom terminal of the *Jeff Flood* chairlift.) The Forest Service Permit Administrator would review each upcoming event with RLK to assess spectator locations and access. The Forest Service Permit Administrator would review the site after each event to assess the success of the Plan and provide direction to RLK to address issues for future events.	
Rec-6	A signage Plan would be prepared by RLK and approved by the Forest Service prior to the installation of bike park signs, Forest Service trail signs, and signs along West Leg Road.	
Rec-7	The Glade Trail conversion from road to trail would meet Forest Service standards for trail construction as contained in the Forest Service Manual and Handbook. A qualified trails designer would oversee the trail layout and design and the final design would be approved by the Forest Service Permit Administrator. Trail maintenance for the converted Glade Trail within the Timberline SUP area would be carried out by RLK. The converted section of the Glade Trail would meet the Forest Wide Standards and Guidelines on page Four-115 and 116 of the Forest Plan for visual quality within five to ten years of conversion activities. Any new trail that is not converted on the road bed (e.g., new switchbacks in the trail that extend outside of the existing road bed) should meet standards within one year of construction.	Construction
Soil Resources (Soil)		
Soil-1	Stabilization of mountain bike trail surface would be accomplished through a combination of rock armoring and wooden features or other similar protective measures. Any rock used for armoring would be sourced from either the bike park/ watershed restoration construction limits or from an approved offsite source. No quarrying of rock materials would take place.	Both
Soil-2	The spacing of surface water control structures along the length of the bike trail network would be per Forest Service Handbook guidelines at a minimum. The spacing of surface water control structures (e.g., grade reversals, drain dips, water bars) along mountain bike trails within 200 feet of a stream crossing would be no less than 50 feet to minimize extension of the stream drainage network and to minimize sediment delivery to riparian reserves. Water bar placement along	Construction

	decommissioned roads would be determined in the field based on site conditions and approved by the Forest Service Permit Administrator.	
Soil-3	Wood features (e.g., ladder bridges, boardwalks), native soil causeways, and/or rock armoring would be incorporated into mountain bike trails to avoid impacting sensitive resources such as steep slopes, tree roots, vegetation, and wet areas Wood materials would be sourced from local suppliers and would be free of invasive species.	Both
Soil-4	Additional surface water controls, rock armoring, wooden features, or other acceptable measures would be installed on trails that exhibit unacceptable erosion.	Both
Soil-5	Bike park staff (RLK) would monitor trail conditions throughout the hours of operation on a daily basis to ensure that erosion or sediment mobilization away from the trail corridor is not occurring and/or to implement corrective action in accordance with the project design criteria.	Both
Soil-6	A Travel Route Plan would be required and included in the SWPCP/Construction Plan for the project to minimize compaction of soils by limiting equipment to designated travel-ways (e.g., existing roads, bike trails that are under construction) as approved by the Forest Service .	Construction
Soil-7	All exposed mineral soil not included in bike trail treadwidth would be mulched with certified weed-free Woodstraw or equivalent at a rate to achieve 70% ground cover (approximately 7 tons per acre) or mulched with a certified weed-free straw, at approximately 3,000 pounds per acre and seeded with approved seed at a predetermined rate. Application rates would be validated and verified in the field to ensure that mulch application is not too sparse or too excessive.	Construction
Soil-8	Temporary erosion and sediment control measures (e.g., plastic sheeting, mulching) would be in place prior to the end of each work day or prior to any rain event (as defined by when the National Weather Service, or other accepted source, predicts a 50% or higher chance of measurable precipitation for the local area).	Construction
Soil-9	The bike park staff (RLK) would patrol the park on a daily basis to ensure that re-vegetated areas are not disturbed, or to remedy disturbance to re-vegetated areas (see also Soil-5). Project areas with any ground disturbance would be surveyed annually to ensure success of re-vegetation efforts. If seeding or other re-	Both

	vegetation efforts are not successful in re-vegetating disturbed areas, the Forest Service Permit Administrator would be contacted and a site-specific, alternative, re-vegetation solution would be developed.	
Soil-10	In cleared areas, topsoil would be carefully removed and stockpiled for placement onto the cleared area outside of the trail tread width. During construction, topsoil would be carefully stored using approved erosion and sediment control methods. Additional measures (e.g., plastic covering) to cover exposed soils would occur during inclement weather. Excess topsoil from trail construction may be hauled to other construction/restoration sites for placement.	Construction
Soil-11	RLK would install a rain gauge near the middle elevation in the bike park. The rain gauge would be accessible and monitored by RLK and the Forest Service via the internet. Earth-disturbing operations (construction and/or bike park operations) would be suspended if there is more than 1inch of rain in a 24-hour period and/or the Bull Run River above the reservoirs exceeds 200 cubic feet per second (suggesting a rise in base flows in the watershed). Operations would remain suspended until the Bull Run River drops below 200 cubic feet per second and there is less than 1 inch of rain in a 24-hour period or onsite conditions are dry enough to allow operation. Prior to suspending all bike park operations, the Forest Service Permit Administrator may decide to close certain trails, or portions of trails, to allow continued operation of the bike park in locations where trail conditions are dry enough for operation and there is no risk of sediment delivery to the stream system. (See also Soil-5)	Both
Soil-12	Stockpile areas, temporary roads, and other areas where soil compaction has occurred from this project would be ripped or scarified prior to the start of re-vegetation.	Construction
Soil-13	Activities for the season would be suspended if soil moisture is recharged and stream flows rise above baseflow levels and are predicted to stay above baseflow levels (i.e., 200 cfs in the Bull Run River, upstream of the reservoirs) and/or if onsite conditions warrant closure of the park. (See also Soil-11).	Both
	Vegetation (Veg)	
Veg-1	All mountain bike trails would be designed to avoid the cutting of trees with a diameter at breast height (dbh) greater than 6” to reduce impacts to upland forest and riparian reserves. No whitebark pine would be cut.	Construction

	Bike park trails would be routed around large trees and, where possible, around the roots of larger trees to prevent damage to tree roots. (See also Soil-3).	
Veg-2	Clearing limits for bike park trail, including any trees greater than 6”dbh that cannot be avoided, would be reviewed in the field and approved by the Forest Service Permit Administrator.	Construction
Veg-3	If any new populations of special-status plant species are encountered during the construction process, work would be suspended in that area until the Forest Service Permit Administrator is consulted.	Construction
Veg-4	Clean heavy equipment either: A) prior to arrival on MHNF, to prevent the introduction of invasive plant seed or other vegetative propagules (e.g., stem and root fragments). The contract administrator or project activity coordinator would inspect all project equipment before it is allowed to operate at the project site. The equipment should be free of soil clumps and vegetative matter or other debris that could contain or hold seeds or other vegetative propagules. Cleaning of the equipment would include pressure washing and should be done outside of the National Forest boundary; or B) a self-contained heavy equipment cleaning station may be set up at the project site, for cleaning the equipment thoroughly in order to remove soil clumps and vegetative matter or other debris that could contain or hold weed seeds.	Construction
Veg-5	If gravel, soil, or wood is imported from outside the project area, it should be determined to be from a source approved by the Forest Service Permit Administrator, who will consult with the MHNF botanist to determine if the soil, gravel, or wood is free of invasive species.	Construction
Veg-6	Survey project areas with any ground disturbance or vehicular traffic annually, during the time of year when invasive non-native plants, including noxious weeds, are identifiable. Long-term control must include periodic removal of any invasive non-native plant species and reporting of their presence and exact location (UTM coordinates in NAD-83 datum), when found, to the Forest Service Permit Administrator, who will consult with the MHNF Forest botanist within one month of finding.	Both
Veg-7	Avoid daylighting the trail by protecting overstory vegetation and defining the limits of the bike trails with vegetation, wood, rocks, or other native materials.	Both
Veg-8	Aggressively treat invasive plants by manual control or with herbicides. The Forest Service Permit	Operations

	Administrator will consult with the MHNF botanist on which method works best for which species.	
Veg-9	Bike park staff (RLK) would monitor trail conditions throughout the hours of operation on a daily basis to ensure that unauthorized trails or terrain features are not created by riders.	Operations
Veg-10	RLK would prepare a Plant Salvage Plan in conjunction with the Forest Service. The plan will be approved by the Forest Service prior to construction. The plan will identify methods (outlined in the botany specialist report) and locations for the salvage of whole plants from proposed trails in advance of trail construction. The plan will also identify transplant locations for re-planting once construction is completed (e.g., areas along trails where excavated material has been sidecast, in restoration projects, or in sparsely vegetated areas in adjacent ski runs). The objective is to make use of (i.e., salvage) plants in the area that would needlessly be destroyed during trail construction.	Construction
Veg-11	Vegetation transplanting would be carried out as described in the section "Plant Propagation & Restoration" in the botany specialist report.	Construction
Veg-12	Collect seed from native plants in the special-use permit area and propagate seedlings from this seed in a nursery for restoration of disturbed areas in subsequent years. Directly sow collected seed in disturbed areas for those species for which this method is effective. Consult with Mt. Hood National Forest botanist for details.	Construction
Veg-13	Use only native plant materials (seed, transplants, seedlings, divisions, cuttings) collected locally on the Mt. Hood National Forest. If supplies of locally collected native seed (e.g., mountain brome, blue wildrye grass) are low and erosion control or restoration of disturbed areas is urgent, use annual ryegrass (*Lolium perenne* ssp. *multiflorum*), which is a nonpersistent nonnative grass species, or a mix of native species mixed with annual ryegrass.	Construction
Veg-14	Use GIS and GPS mapping technology and photopoints to provide an accurate and informative assessment of the impact of mountain bike riders on trails in the mountain bike park. Repeating the assessment at regular intervals (e.g., annually) can identify problems (e.g., trail	Both

	widening, excessive soil disturbance, vegetation trampling, informal trails), document informal trails, and determine where re-vegetation or other remedies are needed. Include this information in the Annual Monitoring Report (see Mon-2).	
Veg-15	Through signage, educate riders about the environmental consequences of unauthorized trail development, about the benefits of low-impact riding practices (e.g., avoiding skidding on the trail, riding within established trail corridors, avoiding impacts to vegetation) and about invasive non-native plants and the potential for the transport of invasive plant seed or vegetative propagules on mountain bikers (e.g., tires, wheels, spokes, frame, pedals, shoes, clothing). Educate riders that dirt and mud on their clothes and shoes from riding elsewhere before coming to the Timberline downhill mountain bike park could harbor and spread invasive plant seed or propagules.	Operations
Veg-16	RLK would provide a cleaning station for mountain bikes near the proposed skills park in the Wy'East parking lot area and require that all riders coming to the bike park for the first time from riding elsewhere (outside the park) ~~to~~ clean their bikes of mud, dirt, and other debris, which could harbor invasive plant seeds or propagules.	Operations
Veg-17	Open the mountain bike park each summer only after trails are snow-free and soils are not saturated. Snow drifts may be removed from the trails when the surrounding ground is snow-free, provided no earth or vegetation disturbance takes place.	Operations
Veg-18	Regulate access to trails and the skills park by use of physical barriers (e.g., boulders, fences, logs, vegetation).	Operations
Veg-19	Patrol for trash and clean up trash along trails and elsewhere in the mountain bike park.	Operations
Veg-20	Salvage plants currently occupying the proposed skills park and proposed bike park trails and transplant them in and around the historic Timberline Lodge. (See also Veg-11).	Construction
Veg-21	Confine soil disturbance around the skills park using entrances and barriers. Prevent soil disturbance and	Operations

	trampling/denudation of vegetation around and outside the skills park.	
Wildlife (Wild)		
Wild-1	A review of proposed hazard tree removal along the Bike trails would be conducted by RLK and a Forest Service Permit Administrator prior to implementation. Hazard trees that must be felled would remain on site for habitat purposes. For example, if a tree is felled across a trail, cut out a section of the log to allow riders to proceed along the trail, but leave the rest of the log in place for the ecological/ecosystem functions it provides and to confine riders to the trail.	Both
Wild-2	If any nest, den, or reproductive sites of vertebrate species are discovered along a mountain bike trail, a Forest Service Permit Administrator would be consulted and measures to ensure reproductive success at the site would be negotiated. Factors such as rarity, likelihood of disruption or reproductive failure, and timing would be considered.	Both
Wild-3	Mountain bike park operations would be limited to daytime use only (i.e., from one hour after sunrise to one hour before sunset) to minimize disturbance to nocturnal wildlife.	Both
Watershed Resources (WS)		
WS-1	Prior to construction, the Forest Service Permit Administrator and Forest Service specialists (watershed and/or fisheries) would walk the flagged trails with RLK to examine each proposed stream crossing and to determine the appropriate crossing type. Bridge length would span the distance 1.5 times bankfull width and no piers would be placed within this width. For higher-elevation, ephemeral streams, the Forest Service and RLK would apply the following criteria for placement of crossing structure (in order of most impactful to least): 1 – Use out-sloped ford, contoured native material and/or rock-fortified for all ephemeral channels with low-gradient approach (3-5%) 2 – Bridge all intermittent and perennial channels, and ephemeral channels with steep approach (>5%).	Construction
WS-2	No mountain bike trails would cross jurisdictional wetlands.	Construction
WS-3	Bike park patrol (RLK) staff would review the trails each day to locate wet soil areas or mud puddles. If the problem persists, the area would be crossed, if	Operations

	necessary, using a combination of raised mineral soil causeways, raised wooden boardwalks, and/or rock armoring.	
WS-4	A Construction Plan and Stormwater Pollution Control Plan (SWPCP) would be prepared for each year of construction to guide decision-making by contractors, RLK staff, and Forest Service staff during construction.	Construction
WS-5	A spill prevention and response plan would be developed and included in the Construction Plan/SWPCP. No fuels or construction machinery would be stored within riparian areas.	Construction
WS-6	Deleted	
WS-7	Turns in bike trails would generally be in-sloped to drain toward the uphill into a sediment trap or into a pipe under the tread that discharges to a sediment trap.	Construction
WS-8	Sediment traps would be rock-fortified. Drainage pipes would be located at least three inches from the bottom of sediment traps to allow for sediment to settle out. Sediment basins would be sized to accommodate a minimum of two significant rain events (e.g., 1” in 24 hours) before maintenance is needed. The outlets of sediment traps would not release water directly to any water bodies.	Both
WS-9	During sediment trap maintenance, sediment that is cleaned out of sediment traps would be returned to the mountain bike trails.	Operations
WS-10	The skills park would include perimeter drainage diversion structures, drainage ditches, and a sediment basin to capture silt.	Both
WS-11	During construction activities, a soil and water protection coordinator would be assigned by RLK and assigned the following duties, to be documented in the SWPCP/Construction Plan: 1.) Oversee the implementation of the soil and water protection design criteria; 2.) Conduct or oversee daily site inspections to ensure effectiveness of soil and water protection design criteria; 3.) Oversee the maintenance of structural soil and water protection design criteria; 4.) Ensure that any changes to the construction site plans are addressed by coordinating with the Forest Service aquatics staff and insuring that any new soil and water protection design criteria are implemented;	Construction

	5.) Coordinate job site activities with the RLK Project Manager, the Forest Service Project Coordinator, agency representatives, and contractors.	
WS-12	Prior to construction, a National Pollutant Discharge Elimination System (NPDES) permit with an associated Erosion and Sediment Control Plan (ESCP) would be obtained if required under current regulations. The permit would be included in the SWPCP/ Construction Plan.	Construction
WS-13	An erosion control plan would be included in the SWPCP/ Construction Plan and approved by the Forest Service prior to earth-disturbing activities and the plan would be revised annually to minimize erosion.	Construction
WS-14	Redundant erosion protection (such as two rows of silt fence, straw bales, and/or more permanent structures such as logs) would be provided between streams and construction areas close to stream channels.	Construction
WS-15	No access corridors, staging areas, spoils piles, or other construction-related materials would be staged or stored within riparian reserves.	Construction
WS-16	Stream turbidity would be monitored during construction in a manner that allows for evaluation of the effects of the project on turbidity (e.g., monitoring above and below construction, paired stream monitoring). If an increase in turbidity, as a result from project operations, exceeds 10 Nephelometric Turbidy Units (NTU's) for a period exceeding 30 minutes, operations would cease until a plan has been developed and approved to address the cause of increased turbidity. Operations would cease immediately if turbidity is over 100 NTU's and would not resume until a plan has been developed and approved to address the cause of increased turbidity.	Construction
WS-17	A water quality monitoring plan would be included in the SWPCP/Construction Plan and would be updated annually assessing project activities. At a minimum Still Creek and West Fork Salmon River would be monitored in the vicinity of the project.	Both

Design

All mountain bike trails on the conceptual plan have been designed with approximately 5%-10% average grade over the length of the trail. A 10% grade is generally considered sustainable in terms of resistance to erosion and damage. Moderately graded trails (<10%) work with most soil types, minimize erosion, and allow for flexibility of design. As it is the average grade, some trail segments would understandably be greater or less than 10% based on detailed design. For example, an expert trail may contain a jump or a drop, in which case the trail gradient may actually be vertical for a short segment.

The average gradient (i.e., 6% - 8%) has been established in the field by not aligning trails along the fall line. Rather, the trails typically run across the fall line. The Timberline Bike Park trails have been designed to include numerous rolling dips and grade reversals to both moderate speed and shed water at regular intervals. These would be sited and designed in the field during construction. As a result of the grade reversals and rolling dips, short trails segments ranging from 8%-20% may be present along the downward pitch of a rolling dip, for example. Depending upon the field conditions, these steeper pitches may be armored with wood and/or rock.

The Fish BE for the SkiBowl Mountain Bike Trails CE includes the following water bar criteria:

% Slope	Waterbar Frequency
10-20	200 feet
20-40	100 feet
40-55	60 feet
55+	30 feet

The Timberline Bike Trails would have an average gradient of 6% – 8%, as described above. However, grade reversals and rolling dips would be applied throughout the trail network. The distance between rolling dips and other drainage controls along the 6% - 8% gradient trail surface at Timberline would meet or exceed the criteria for SkiBowl – criteria designed for the treatment of 20% to 55% slopes at SkiBowl.

An important operational consideration is the management of surface water along the trail system. Grade reversals, bridges, and culverts would all manage water before it has a chance to gain enough velocity and volume to rill or recruit significant sediment. The field design of the trail is intended to minimize sediment mobilization that would cause damage to the trail surface.

Another important operational consideration is the management of biker velocity along the trails. Sharper turns such as corners and switchbacks are designed with grade reversals prior to the turn to reduce or eliminate aggressive braking, thereby reducing damage to the trail surface.

Wooden features such as bridges, boardwalks, wall rides, ladders, wood tables, rollers, and doubles (examples provided in the attached documentation) are used to avoid sensitive areas such as wet soils and tree roots. It is estimated that a total of 70-90 wooden features would be constructed in the Timberline Bike Park, providing a total protected trail length of approximately 2,400 linear feet, or 2% - 3% of the total trail length.

Three ability levels would be served by the mountain bike trail network. Similar to the ski terrain at Timberline, these include Beginner, Intermediate, and Advanced.

Beginner (Green) – Easiest. Gentle climbs and descents with obstacles such as rocks, gravel, roots, bridges and pot holes. Rider must have ridden a bike before using these trails.

Intermediate (Blue) – More difficult than Green. Challenging riding with steep slopes and/or obstacles, including narrow trail or elevated skills park with poor traction. Riders must have off-road riding experience.

Advanced (Black) – Most difficult. Mixture of steep descents, loose trail surface, numerous trail and man-made obstacles including jumps, ramps, elevated features, berms, drops, and rocks.

The development plan proposes a construction schedule of two years to provide enough trails to allow an entertaining Park Riding experience for a variety of ages, abilities and riding preferences during each year of construction. During construction, approximately three mini-excavators and/or mini-loaders and 5 - 10 trail crew would be used to construct trails.

Three types of mountain bike trails would be constructed: Wide- excavated trails, narrow-excavated, and single-track trails.

Wide-Excavated Trails - Average tread width of 66 inches and a construction corridor that averages 99 inches in width. The tread is graded primarily using excavators, which are capable of working around individual trees or other sensitive areas, subject to the Project Design Criteria (e.g. PDC Veg-1 and 2). Excavated trail features such as berms, jumps, drops, rocks, and elevated ladders are located during construction.

Narrow-Excavated Trails - Average tread width of 42 inches and a construction corridor of approximately 63 inches. The tread is graded primarily using excavators, which are capable of working around individual trees or other sensitive areas, subject to the Project Design Criteria (e.g. PDC Veg-1 and 2). Excavated trail features such as berms, jumps, drops, rocks, and elevated ladders are located during construction.

Single-Track Trails - Average trail width of 16 inches and a construction corridor of 24 inches. The tread is constructed primarily by hand, with some use of machinery where necessary, subject to the Project Design Criteria (e.g. PDC Veg-1 and 2).

In addition to the individual trails, a Skills Park would be constructed on approximately 0.2 (80 feet by 100 feet) acre in the vicinity of the *Brunos* chairlift. The Skills Park would include temporary, removable wooden structures built by hand tools on site and removed prior to winter operations (see attached documentation). These structures would consist of elevated ladder systems, teeter totters, rock structures and other obstacles. The skills parks offers practice areas for all skill levels.

The Skills Park would include entrance and exit gates and it would be encircled with native materials that would serve as a fence – this may include logs, rocks or actual fencing. The perimeter of the Skills Park would include drainage ditches that would convey surface water from the area to a sediment basin. Water leaving the sediment basin would be conveyed via a rock-lined channel to the existing sediment basin near the wastewater treatment plant (see attached Skills Park site plan).

Construction

The construction season would begin in May 2011, depending upon snowmelt, and extend through early October. Trails would be flagged in the field for approval by the Forest Service prior to any construction activity. In addition, the Construction Plan/SWPCP would be approved by the Forest Service prior to construction. Whether excavated or single-track, the first step in the construction of a bike trail would be grubbing the organic matter from the trail surface. The trail surface would then be shaped using native soil material and stone. Once the rough trail tread is established, trail features such as rock or wooden structures would be constructed, and surface water management structures would be installed. As final grading is completed, organic material would be broadcast onto slopes and other areas that are to be re-vegetated, and re-vegetation would take place according to the Project Design Criteria (PDC Veg-10 thru 14). The construction of wooden trail features may reduce the need for grubbing or disturbance to soil. For example, post-holes may be excavated for an elevated ladder, resulting in less ground disturbance than grubbing the entire trail (see above discussion regarding the percentage of the total trail network that would include wooden features).

Construction equipment, fuels, spill response materials and erosion control materials would be staged in disturbed areas throughout the project area, depending upon the location of trail work at any given time. Staging areas would include the ski area maintenance shop, the top and bottom terminals of the *Jeff Flood Express*, the bottom terminals of *Pucci* and *Stormin'Norman Express*, existing work roads, and other existing open areas. West Leg Road would provide access to the construction areas.

During Year 2, the Year 1 trails would be reviewed and maintained after snowmelt, and the Timberline Mountain Bike Park operation would begin. Construction of Year 2 trails would begin as described above. Staging and construction activities during Year 2 would be designed so that the construction equipment and activity results in the least amount of disturbance to mountain bikers. If necessary, segments of Year 1 trails may be closed temporarily to allow for Year 2 trail construction.

Operation Timing

Similar to the existing ski operations at Timberline, the Timberline Bike Park operations would be guided by weather and seasonal conditions. On a seasonal basis, the park would open once snowmelt is sufficient to allow trail maintenance crews to maintain the trails, entry/exit trails, and skills park (expected to be July 15 – 30 each summer). Closure of the park in the Fall would take place in October (usually by October 15) or when the first snow accumulation takes place on the trails.

On a daily basis, activity at the park would not take place until at least one hour after sunrise. Currently, RLK proposes to start public operations at 10:00 a.m., which allows trail maintenance crews several hours to conduct trail maintenance before riders enter the park. Activity at the park would cease at least one hour before sunset. Actual closure times in the evening would depend on the demand and level of use. However, park patrol staff would be given at least one hour to sweep the trail network after closing and before sunset.

How is this different than SkiBowl?

SkiBowl currently offers lift-served mountain biking. The trails that are offered at SkiBowl are comprised of steep, "downhill" trails and the road system. The downhill trails are intended for high-speed, fall-line descents. The road system is intended for experienced riders who are comfortable navigating the obstacles that are typical of a mountain work road at a ski area. In addition, the mountain biking terrain at SkiBowl is not focused on separating ability levels and providing a wide variety of terrain types. There is no focus on beginner riders and many of the trails are multi-use trails (hiking and biking). This overall mountain biking terrain is more indicative of the downhill-type biking that became popular in the late 90's. As a result, SkiBowl is able to host downhill mountain bike events such as the FluidRide Downhill Series, in which advanced competitors utilizing body armor and long travel full suspension bikes compete for fastest time down the steep course. Riders at SkiBowl ride up the Lower and Upper Bowl lifts, which are Riblet fixed-grip double chairlifts.

Conversely, the Timberline Bike Park focuses largely on beginner and intermediate level terrain, while providing excavated and single-track advanced trails. The Bike Park would be completely enclosed and patrolled by park staff, allowing only mountain bikers on the trails. *The Jeff Flood Express* is a detachable quad lift that makes access to and egress from the lift much easier than with fixed-grip technology.

Northern Spotted Owl

No northern spotted owl habitat is located in the project area. There are no known spotted owls nesting above 4600 feet elevation. The effects determination for this project is No Effect to the Northern spotted owl or its habitat from this project. No further analysis for Northern spotted owls is necessary.

Other Wildlife

Management Indicator Species

The 2005 planning rule for National Forest System Land and Resource Management Planning addresses management indicator species. (36 CFR 219.14f) "(f) *Management indicator species.* For units with plans developed, amended, or revised using the provisions of the planning rule in effect prior to November 9, 2000, the Responsible Official may comply with any obligations relating to management indicator species by considering data and analysis relating to habitat unless the plan specifically requires population monitoring or population surveys for the species. Site-specific monitoring or surveying of a proposed project or activity area is not required, but may be conducted at the discretion of the Responsible Official."

Management Indicator Species for this portion of the Mt. Hood National Forest include northern spotted owl, pileated woodpecker, American marten, deer, elk, salmonid smolts and legal trout (Forest Plan p. four-13).

Monitoring at the Forest scale has been documented in Annual Monitoring Reports available on the Forest's web site - http://www.fs.fed.us/r6/mthood in the Publications section. There is no requirement in the Mt. Hood Forest Plan as amended to survey for or gather project-scale population data for management indicator species prior to implementing a site-specific project. The Mt Hood Forest Plan as amended by the Northwest Forest Plan provides habitat to maintain viable populations of these species. Land allocations that provide habitat for these species include Pileated Woodpecker and American marten Habitat Areas (B5), Late-successional Reserves (LSR), and Riparian Reserves (RR) for American marten, pileated woodpecker and the northern spotted owl; Winter Range (B10) and Summer Range (B11) for deer and elk; and Riparian Reserves (RR) for fish. Of these land allocations, the project overlaps Summer Range (B11), Late-successional Reserves and Riparian Reserves. There are also numerous Forest-wide standards and guidelines that pertain to these species. This project has been designed to reduce the impact that wildfires would have on management indicator species.

Effects to Sensitive Species and Other Rare or Uncommon Species

The following table summarizes effects to species from the Biological Evaluation which is incorporated by reference.

Table 2: Sensitive Species and Other Rare or Uncommon Species

Species	Suitable Habitat Presence	Impact of Action Alternatives* Alt. B and C	Comment and Habitat Needs
Johnson's Hairstreak	Yes	MII-NLFL	Dwarf Mistletoe Habitat -no habitat alteration
Mardon Skipper	No	No Impact	No Locations detected on Forest
Oregon Slender Salamander	Yes	MII-NLFL	Up to 5570 feet potentially
Larch Mountain Salamander	No	No Impact	No know locations above 4000ft
Cope's Giant Salamander	Yes	MII-NLFL	Small cold water streams
Oregon Spotted Frog	No	No Impact	Larger wetlands required
Lewis's Woodpecker	No	No Impact	Lower elevation, eastside
White-Headed Woodpecker	No	No Impact	Ponderosa Pine Habitat
Bufflehead	No	No Impact	Open water ponds
Harlequin Duck	No	No Impact	Larger Fastwater Streams
Bald Eagle	No	No Impact	Large Bodies of Water
American Peregrine Falcon	No	No Impact	Cliff Sites
Red Tree Vole	No	No Impact	No removal of potential trees
Townsend's Big-eared Bat	No	No Impact	Cave Habitats
Fringed Myotis	Yes	No Impact	No habitat altering effects
California Wolverine	Yes	MII-NLFL	High Elevation Habitats
Malone's jumping slug	Yes	MII-NLFL	No threat to persistence at site

Oregon Megomphix	No	No Impact	Habitat below 3000ft
Puget Oregonian	No	No Impact	Low to Mid Elevations
Columbia Oregonian	Yes	No Impact	Known locations below 4000ft
Evening Fieldslug	No	No Impact	Wetlands and Moist Forest
Dalles Sideband	Yes	No Impact	Outside the range
Crater Lake Tightcoil	Yes	No Impact	Surveys were negative

"NI" = No Impact
"MII-NLFL" = May Impact Individuals, but not likely to Cause a Trend to Federal Listing or Loss of Viability to the Species

Effects to the species listed above include changes to habitat as well as potential harm to individuals caused by physical impacts of logging equipment, falling and dragging trees, noise, fuels treatment, road repair, and log haul.

Johnson's Hairstreak Butterfly
This butterfly is present in areas of dwarf mistletoe and utilizes nearby openings. The project area has some potential for dwarf mistletoe in western hemlock. There should be no significant effect to the habitat for this species from the trail construction.

Oregon Slender Salamander (Batrachoseps wrighti or wrightorum)
Oregon slender salamander occurs on both the east and west side of the Cascades primarily in older more mature stands of conifers. They can be found living under bark piles, down logs, or in rotten moist logs. The bike trail project would add to the habitat for this species by dropping small trees. There could be some alteration of the existing down wood to clear for the trail and some individual could be harmed but it there would be no affect to the persistence at the site from the proposed treatment. No Oregon slender salamanders were found during mollusk surveys so there is a small chance that this species is present in the project area. There would be no removal of coarse woody debris. If there are any undetected Oregon slender salamanders there would be substantial habitat for them following the project.

Cope's giant salamander
There are no stream crossings that would affect this species if present (PDC WS-1 & 2). No surveys were done for Cope's giant salamander because there were no anticipated impacts from the trails since they stay more than 10 yards from streams or would have hardened crossings to reduce impact.

Oregon Spotted Frog
Oregon spotted frogs are only known from one location on the Mt. Hood National Forest, that is outside of the project area on the southeast part of the Forest. This species requires larger wetlands than exist in the project area.

Fringed Myotis
There is a potential for fringed myotis to utilize the project area for foraging. There would be no substantial impact to the habitat that would alter the use by these bats.

Terrestrial Mollusk (Puget Oregonian, Columbia Oregonian, evening fieldslug and Crater lake tightcoil, Malone's jumping slug)

The Puget Oregonian, Columbia Oregonian, evening fieldslug and Crater lake tightcoil are the mollusk species with ranges that include the Zigzag Ranger District. Please see the section on Northwest Forest Plan Mitigation for details of this analysis.

California Wolverine (***Gulo gulo* –** Sensitive**)**

Habitat

Populations in the Cascade Mountains are small and scattered. Keith Aubrey, Lead Wildlife Biologist for the Pacific Northwest Research Staion, has reviewed wolverine records from the Oregon Cascades. Current records (1995–2005) are limited to north-central Washington, northern and central Idaho, western Montana, and northwestern Wyoming(Aubrey 2007). Wolverines are usually found in high temperate coniferous forests, from mid-elevation (around 4000 feet) to moderately high elevation (above timberline), depending on the season. Common tree species are subalpine fir and lodgepole pine. They prefer to feed along rivers and streams and in wet meadows. The den is usually in a rock crevice, cave, or beneath a talus slope. Territories may encompass 10 to 80 square miles. Wolverines are believed to prefer areas of minimal people presence and high levels of solitude and seclusion. They are usually associated with wilderness, chiefly because they are so vulnerable to the activities of humans and their association with persistent snow cover.

Pre-Field Review

Habitat available within the project area:

Wolverines have no real habitat preference but instead appear to seek high elevations for denning and solitude. Wolverines are dependant on carrion for a large part of their diet and key in on big game populations rather than on specific habitats. Historic sightings of wolverines both verified and unverified are within a few miles of the project area. Snow Bunny Snow Park had one verified track sighting in 1990. However, current thinking on wolverine distribution is that individual wolverines may invade the Oregon Cascades on occaision but that there is no breeding population this far south (Aubry 2007). It is unlikely but possible that a wolverine would be present in the project area.

Recent field surveys in the project area have not been accomplished. The last time broad based surveys were conducted over the watershed was during the winter of 1993-1994 and 1994-1995. Some survey efforts have been ongoing centered around Mt. Hood but at this point in time there have been no verifiable sightings of wolverine or sign of presence. A group of volunteers led by Cascadia Wild have performed tracking surveys and some remote camera work for the Forest since 2001. No wolverine tracks or photos have been located anywhere on the Mt Hood NF during that time. There are also no verified sightings in the Oregon Cascades for the last decade. The last verified sighting of a wolverine in the Oregon Cascades was a wolverine killed on Interstate 84 near Hood River in 1994. The specimen is housed at the Oregon Department of Fish and Wildlife in The Dalles.

Field Reconnaissance

No direct surveys were conducted based on a low potential for detecting species occurrence. No observations were made of wolverine or their tracks during field reconnaissance. The lack of sightings of this species is not a reliable indicator or species presence or absence. The home range of wolverines is documented to be in the hundreds of miles. Therefore any wolverine that is present in the Cascades of Oregon may potentially travel or forage in the project area.

Some survey efforts have been ongoing centered on Mt. Hood but at this point in time there have been no verifiable sightings of wolverine or sign of presence. A group of volunteers led by Cascadia Wild have performed tracking surveys and some remote camera work for the Forest since 2001. No wolverine tracks or photos have been located during that time.

Analysis of Effects/ Cumulative Effects

(No Action)
No effects to the Wolverine would occur with implementation of this alternative. The existing human use of this area would continue to limit opportunities for wolverines to utilize the area. However the area would continue provide potential habitat for the species for possibly far into the future.

Implementation of the Bike Trails

Effects to Habitat and Individuals
There is a potential for disturbance and loss of utilization of some of the potential wolverine habitat by implementing the bike trail proposal. Increasing human presence in currently unutilized areas would make degrade the habitat for this species if the species in fact still exist on the Mt. Hood National Forest.

Cumulative Effects
The primary cumulative effect predicted for this species is to increase both the number of visitors to this area and expand the area of human impact in the proposed action area. An increase in human use in this area could cause wolverines to discontinue utilizing the area. That is assuming that the current level of use has not already had that impact.

Currently, there are no planned foreseeable future actions within the watersheds that are predicted to impact wolverines and their habitat. However, the Ski Areas, Timberline, Ski Bowl, and Mt Hood Meadows combined with Government Camp increases in rental properties have increased human activity in the area and would add to the effect of disturbance ongoing in the area. Because there is already a high amount of human activity in the area from ski areas, businesses, a major highway, recreational uses and homes the effect of this project is not considered to be a sizeable increase in the summer activity.

Effects Determination

The effects determination for a species that is thought to be extirpated from an area but may still occur as a vagrant is more difficult to describe. The wolverine is a species that is uncommon in the areas where it still occurs. It is a specialist that lives at high elevations or areas with cold temperatures and good amounts of snowfall. Wolverines tend to use areas that are not associated with high concentrations of people. We know that wolverines used to occur down into California in the Sierras and throughout the Cascades at one time. It appears that trapping, hunting, and human presence may have reduced their populations in these areas and may have eliminated any sustainable populations in the Oregon Cascades and the California Sierras. With the current trends in climate change and reduction in persistent snow it is likely that these conditions will make reestablishment of wolverine populations in these areas highly unlikely. The huge increase in human population and human use of back country areas makes it even more unlikely that wolverines would persist in the Oregon Cascades. These factors are part of the effects determination for this species. It is important to consider that with what we understand about the wolverine population in the Cascades the chance that a wolverine would ever enter the project area is highly unlikely. It is also unlikely that a sustainable population exists on the Mt Hood but with a recent discovery of a wolverine at Mt Adams in Washington the concept that a wolverine could wander to the project area has to be considered. However, there is a high amount of activity currently on the south side of Mt Hood so this proposed bike trail is just additive to the high human presence that would discourage a wolverine from occupying habitat on the south side of Mt Hood.

Considering the above discussion on wolverines, the effects determination for the Government Camp Trails project is, "**May Impact Individuals but not likely to cause a trend to federal listing",** for wolverine or its habitat due to the low amount of potential for breeding wolverine populations in the Oregon Cascades and around Mt Hood and the low potential that a wolverine would enter the project area.

Conflict Determination

The action alternatives of the Timberline Bike Trails project would have "may impact individuals but not likely to cause a trend to federal listing or loss of viability" on the wolverine or their habitat.

Northwest Forest Plan Mitigation

Survey and Manage Species

The Northwest Forest Plan incorporated mitigation for activities that might impact species that may not be adequately protected for persistence by the system of late successional reserves and other land allocations that would limit impacts to the species. The mitigation was called "Survey and Manage". This mitigation required the agencies to conduct protocol surveys to determine to the best of their ability if a species was present and would be affected by the project. If persistence at the site would be jeopardized by the project then protection measures would need to be taken to manage the species at that site. Since many of these species were not well known by agency biologist and botanist there were training courses provided, voucher requirements, and management recommendations developed for the species. Because the knowledge of the extent of these species was not great even among taxa experts there was a process developed for annual species reviews to incorporate new knowledge and to remove species that were found to be more common or not dependant on late successional habitats.

Several Records of Decision have been signed since the Northwest Forest Plan the modified the original language and management of the species. Currently, the agency is implementing the 2001 Record of Decision. The following table shows the species that fall into the category of Survey and Manage for terrestrial wildlife that occur on the Mt Hood.

Table X. Summary of effects to Rare or Uncommon Species.

Species	Suitable Habitat Presence in an area that would be affected by proposed new trails	S&M Protocol	Surveys required or further analysis needed	Comments
Oregon Red Tree Vole (*Arborimus longicaudus)*	No	Red Tree Vole - Version 2.1 - Protocol Revisions to the "Survey Protocol for the Red Tree Vole", Version 2.0 IM OR 2003-003	No	No habitat. Project above protocol elevation
Great Gray Owl (*Strix nebulosa)*	No	Great Gray Owl-Version 3.0, March 2004 IM OR-2004-050	No	No habitat. No natural meadows 10 acres or greater at the site.
Larch Mountain Salamander (*Plethodon larselli)*	No	Amphibians - Version 3.0 IM OR 2000-004 and Conservation Assessment for the Larch Mountain Salamander (*Plethodon larselli*)Version 1.0 October 28, 2008	No	No habitat present and no known locations above 4200 feet.
Malone's Jumping Slug (*Hemphilia malonei)*	Yes	Mollusks - Terrestrial - Version 3.0 IM OR 2003-44	No	No impact to persistence at the site.
Oregon Megomphix (*Megomphix hemphilli)*	No	Mollusks - Terrestrial - Version 3.0 IM OR 2003-44	No	Project above protocol elevations of below 3000 ft
Puget	No	Mollusks - Terrestrial - Version 3.0 IM OR 2003-44	No	Project

Oregonian (*Cryptomastix devia*)**		Conservation Assessment for *Cryptomastix devia*, Puget Oregonian. September 2005.		above protocol elevations of 0-1500 feet.
Columbia Oregonian (*Cryptomastix hendersoni*)**	No	Mollusks - Terrestrial - Version 3.0 IM OR 2003-44 Conservation Assessment for *Cryptomastix hendersoni* Columbia Oregonian September 2005	No	No known locations above 4000 feet. (2600 and 3280 feet) elevation
Evening Fieldslug (*Deroceras hesperium*)**	No	Mollusks - Terrestrial - Version 3.0 IM OR 2003-44 Conservation Assessment for *Deroceras hesperium*, Evening fieldslug September 2005	No	No habitat
Dalles Sideband (*Monadenia fidelis minor*)**	No	Mollusks - Terrestrial - Version 3.0 IM OR 2003-44 Conservation Assessment for *Monadenia fidelis minor*, Dalles Sideband August 2005	No	Outside the range of this species
Crater Lake Tightcoil (*Pristiloma arcticum crateris*) **	Yes	Mollusks - Terrestrial - Version 3.0 IM OR 2003-44 Conservation Assessment for *Pristiloma arcticum crateris*, Crater Lake Tightcoil September 2004	Yes	Protocol surveys completed

Terrestrial Mollusks:
Surveys for Terrestrial Mollusk were completed for *Pristiloma arcticum crateris*. The entire bike trail area was walked by wildlife biologist from the Forest Service Enterprise Team in the fall of 2010. The Enterprise team acts much like an independent contractor. The enterprise team wildlife biologist used the established interagency protocols listed in Table X. The following species were identified as species to survey to protocol.

SNAILS:

Latin name	Common name
Pristiloma arcticum crateris	The Crater Lake Tightcoil

No target species were located during protocol surveys by the enterprise team wildlife biologist. However, the enterprise team biologist and the Forest wildlife biologist did locate a number of locations for Malone's jumping slugs near the trail location.

Terrestrial Mollusks: The Puget Oregonian, Columbia Oregonian, evening fieldslug and Crater lake tightcoil are the mollusk species with ranges that include the Zigzag Ranger District. The

Puget Oregonian and Columbia Oregonian are found at low to mid-elevations in old-growth forests. No known sites for the Puget Oregonian or Evening fieldslug are present on the district. However, several known sites exist for the Columbian Oregonian at elevations ranging from 2600 to 3280 feet in elevation. The project area's elevation ranges from 4800 to 6000 feet in elevation and is considered too high an elevation to be potential habitat for the Puget Oregonian, Columbia Oregonian, and Evening fieldslug. In addition, there is no habitat for these species in the project area.

Crater lake tightcoil: This snail is generally found in mid to high elevation habitat adjacent to perennial wet areas. Surveys were completed for this species between September 15 and October 15, 2010. This snail was not located in the project area during surveys for rare and uncommon species.

Malone's jumping slug

The Malone's jumping slug was not a target species for surveys for the Timberline Bike Trails Project. The project area was above the known location for this species and above the protocol elevation. The abundance of this species and its use of many habitats types and seral stages means that a trail project would not affect the persistence of this species at the site. During surveys for Crater lake tightcoil several locations of Malones jumping slugs were found. In a few of these locations 3-4 specimens were found under down wood. One location was 18 feet inside of the ski run under down wood created when the run was cut. At another location the specimens were found under rounds of wood on the edge of the ski run. Again, the rounds were created when the ski run was cut 2-3 years ago. There is an abundant supply of down wood both created naturally and from the process of creating the ski runs. The specimens were found near the proposed trail and away from the trail. The 2001 Record of Decision and Standards and Guidelines for the Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (hereafter referred to as the S&M ROD)(USDA Forest Service and USDI BLM 2001), states that, " Management Recommendations describe the habitat parameters (environmental conditions) that would provide for a reasonable likelihood of persistence of the taxon at the site". The S&M ROD also states that, "Management may range from maintaining one or more habitat componenets (such as down logs or canopy cover) to complete exclusion from disturbance for many acres, and may allow loss of some individuals, areas, or elements not affecting continued site occupancy."

The Management Recommendations for Terrestrial Mollusk states, "USDA, Forest Service, and USDI, Bureau of Land Management (1974: J2-349) under "Natural History" said, "Habitat is moist forest, not necessarily riparian areas." It is found under rotting logs, from approximately 60-1200 meters (200-4000 feet) elevation (Kozloff and Vance 1958). Branson and Branson (1984) found it at 180-1372 meters (590-4500 ft.) elevation, in Douglas-fir to *Hemphillia* sp. - Page 17 subalpine fir forests, among decaying wood, wood sorrel, ferns, and mosses. It is "Generally in open but uncut forest, at low to high elevations . . . . This species may co-occur with the Larch Mountain salamander . . ." (Frest and Johannes 1993). We have also found it on skunk cabbage and on the underside of bigleaf maple bark lying on the ground (Burke, personal observations).

At the time that the management recommendations were written there was very little known about the Malone's jumping slug. Habitat information was just unfolding as survey efforts continued. It is now understood that this species is locally abundant and can live in a variety of sites and habitats including very young stands, openings, disturbed sites and is most associated with dead and down wood. The species has been found extensively across the west side of the Forest in many seral stages. In doing surveys for the Crater Lake tightcoil, the Malone's jumping slug was found in the open and on the edge of the ski run. This demonstrates that the species is able to live in a much wider range of habitats than was found during the development of the Management Recommendations for the species. This species was found to be more common and not dependant on late successional habitat during the annual species reviews.

Due to the abundance of habitat and the quantity of Malone's jumping slugs both near the trail and away from the trail it is the wildlife biologist determination that the trails would not impact the persistence of Malone's jumping slugs at the site. The falling of small trees for trail construction would add down wood habitat that appears to be the most important factor in the species persistence.

Red-tree vole: Habitat for this species consists of conifer forests containing Douglas-fir, grand fir, Sitka spruce, western hemlock and white fir. Optimal habitat for the species occurs in old-growth Douglas-fir forests. Large, live old-growth trees appear to be the most important habitat component. Although part of the project area does contain mature old-growth stands, the species composition is different than what is preferred by the species. The mature stands in the project area are dominated by primarily mountain hemlock, western hemlock and pacific silver fir; with lesser amounts of Douglas-fir and Engelmann spruce. In addition, the lowest elevation of the project area is 4200 feet in elevation. Red-tree voles are relatively uncommon in the North Cascades Region, with most records of species located at the lower elevations along the Columbia River and the western foothills of the Cascades. The species appears to be uncommon at elevations above 2,500 feet and extremely rare above 4,260 feet in the Cascades. It is believed that red tree voles are rare in high elevation true fir forests because their arboreal nests do not provide adequate insulation against cold winter temperatures. It is also thought that tree voles find it difficult to forage in high elevation forests during winter, when tree branches are frequently covered with snow and ice for extended periods (Forsman 2004).

The project area occurs in high elevation true fir forests ranging in elevation from 4500 to 6000 feet in elevation. This area has long winters with abundant snowpacks. It is on the crest of the Cascades and has habitat more similar to the east side of the Cascades. There has not been a red tree vole documented in this area. For these reasons it is highly unlikely a red tree vole would be nesting in the project area. Surveys were not conducted due to lack of habitat and the fact that no trees large enough for tree vole nesting would be removed.

Great gray owl: There are no natural meadows larger than 10 acres in the project area. All of the larger meadows are manmade ski runs. Therefore, no surveys are necessary for great gray Owls. There have been no documented occurrences of great gray owls on the Mt Hood National Forest.

Larch Mountain salamander:
The Conservation Assessment (Crisafulli, Charles et al 2008) states, "The Larch Mountain salamander occurs in an area of 11,740 km^2 (4,550 mi^2) in the Cascade Range of Washington and Oregon (Figure 1, Crisafulli 1999, Nauman and Olson 1999). It has been found from 50-1280 m (~160-4200 ft) in elevation." This project is above that elevation. No habitat would be adversely affected by the trails or construction that would affect the persistence at the site. The Conservation Assessment cautions about trails requiring blasting and excavation. Some ground disturbance would take place as part of making these bike trails but the footprint is very narrow and would not affect the persistence at the site if a population appeared above the known elevation. Therefore no surveys were conducted for Larch Mountain salamanders. No salamanders were found while conducting surveys for mollusk.

Black-backed woodpecker: The Forest Plan has standards and guidelines for the white-headed woodpecker, black-backed woodpecker, pigmy nuthatch, flammulated owl, Canada lynx and bats. Of these species, the black-backed woodpecker is the only species potentially affected by the project. Habitat for this species is found in mixed conifer and lodgepole pine stands in the higher elevations of the Cascade Range. The project area is west of the potential habitat for the species. A standard and guideline requires an adequate number of large snags and green-tree replacements for future snags be maintained in sufficient numbers to maintain 100 percent potential population levels. The 100 percent population potential for black-backed woodpeckers is 0.12 conifer snags per acre in the hard decay stage. These snags would be at least 17 inches diameter or largest available if 17 inch diameter snags are not available. The black-backed woodpecker also requires beetle infested trees for foraging. With the action alternatives, snags would be removed for a safety to a limited degree. There has already been some hazard tree removal for the ski runs. Some snags would be retained in riparian areas. Within the bike trail project area the 100 percent potential population level for black-backed woodpecker would be met and there would be an abundance of snags. The project area is west of the normal distribution of black-backed woodpeckers but there is still potential for this species to invade into the project area if there is a large bark beetle outbreak or fire.

Snags and Down Wood

Existing Situation – The snag and down woody debris density data in the Zigzag River watershed analyses was based on Gradient Nearest Neighbor Analysis completed by Ecologist, Cindy McCain and summarized by Ecologist Jeanne Rice in unmanaged stands (late seral and naturally regenerated mid-seral stands) in the 2008-2010 Deadwood analysis project. This information is summarized below to give an idea of the levels of snags and down woody debris that can be expected in these types of stands.

Within the Timberline Bike Trail Project Area itself, it is apparent that there is a wide variation in the amount and size of snags and down wood. Many of the un-managed small diameter montane mixed conifer stands have been affected by insects and disease and currently have moderate to high levels of large and small-diameter conifer snags and down woody debris. Other stands have had hazard tree removal and have lower levels of snags but a high amount of downwood. The mature stands have medium to high levels of large diameter snags and down wood. The ski runs have varying levels of down wood based on the creation of the run.   The newest runs that were built as part of the timberline lift express project have a high degree of downwood in various conditions. Some of the wood is small diameter trees and some is slabs and rounds that are fine for mollusk but not high quality for woodpeckers.

The primary and secondary cavity nesting species for the montane mixed conifer stands are: pileated woodpecker, northern flicker, hairy woodpecker, red-breasted nuthatch, black-backed woodpecker, and northern three-toed woodpecker. The 100% biological potential level is 3.7 snags per acre (Austin 1995).

Many species in the Pacific Northwest evolved to use large snags and logs that were historically abundant in the landscape. The loss of snag and log density from managed stands affects biodiversity and potentially could cause a loss of critical function in the landscape such as control of forest insects.

DecAID Advisor

DecAID is a planning tool intended to help advise and guide managers as they conserve and manage snags, partially dead trees and down wood for biodiversity (Mellen 2003). It also can help managers decide on snag and down wood sizes and levels needed to help meet wildlife management objectives. This tool is not a wildlife population simulator nor is it an analysis of wildlife population viability.

A critical consideration in the use and interpretation of the DecAID tool is that of scales of space and time. DecAID is best applied at scales of subwatersheds, watersheds, subbasins, physiographic provinces, or large administrative units such as Ranger Districts or National Forests. DecAID is not intended to predict occurrence of wildlife at the scale of individual forest stands or specific locations. It is intended to be a broader planning aid not a species or stand specific prediction tool.

Modeling biological potential of wildlife species has been used in the past. DecAID was developed to avoid some pitfalls associated with that approach. There is not a direct relationship between the statistical summaries presented in DecAID and past calculations or models of biological potential.

Refer to the DecAID web site listed in the References section for more detail and for definition of terms. This advisory tool focuses on several key themes prevalent in recent literature:

- Decayed wood elements consist of more than just snags and down wood, such as live trees with dead tops or stem decay.
- Decayed wood provides habitat and resources for a wider array of organisms and their ecological functions than previously thought.
- Wood decay is an ecological process important to far more organisms than just terrestrial vertebrates.

Snags and Down Wood Levels Compared to DecAID Data

The Timberline Bike Trail project area is located within the habitat type identified in DecAID as the Montane Mixed Conifer Forest. The vegetation conditions are primarily *large trees stands* with mixtures of *open canopy* and *small trees*. Because of the high elevation high amounts of snow, the stands best fit the *large trees* category. DecAID offers several tolerance levels (30%, 50% and 80%) to give managers a range of options.

For snags in large tree stands in Montane Mixed Conifer stands (From DecAid):

80% tolerance level:

To manage snag habitat for American Marten at the 80% tolerance level, provide for snag densities of at least 36.0 snags/ha (14.4/acre) of which 11.2 snags/ha (4.5/acre) are larger than 50 cm (20 in. dbh). To provide den sites for American Marten areas of higher snag densities on part of the landscape. Data from Wyoming indicate the 80% tolerance level for American Marten den sites is 115 snag/ha (46/acre) > 20 cm (8 in) dbh of which 38/ha (15/acre) are > 40 cm (16 in) dbh. Unharvested stands in the MMC_L vegetation condition in Oregon and Washington provides snag densities at or above this level on up to 12% of the landscape. To manage densities of snags at the 80% tolerance level based on inventory data provide for densities of about 66 snags/ha ≥ 25.4 cm dbh (27/acre ≥ 10 in)), of which 38 snags/ha (15/acre) are ≥ 50.0 cm (19.7 in) dbh on parts of the landscape.

50% tolerance level:

To manage densities of snags at the 50% tolerance level based on inventory data provide for densities of about 38 snags/ha ≥ 25.4 cm dbh (15/acre ≥ 10 in)), of which 22 snags/ha (9/acre) are ≥ 50.0 cm (19.7 in) dbh, should be maintained on parts of the landscape. These snag densities are also similar to data for American marten from NE Oregon (Bull et al. 2005) for smaller snags but lower for the larger snags. The MMC_L vegetation condition provide snag densities above 60 snags/ha (24/acre) ≥ 25.4 cm (10 in) dbh of which 15 snags/ha (6/acre) are ≥ 50.0 cm (19.7 in) dbh on a significant proportion of the uharvested landscape. This level provides denning habitat for American Marten at the 50% tolerance level based on data from Wyoming.

30% tolerance level:

To manage densities of snags at the 30% tolerance level based on inventory data provide for densities of about 27 snags/ha ≥ 25.4 cm dbh (11/acre ≥10 in)), of which 16 snags/ha (6.5/acre) are ≥ 50.0 cm (19.7 in) dbh, should be maintained on the landscape. These levels are fairly similar to the 30% tolerance level for American Marten from NE Oregon, with densities of 29.4 snags/ha (11.8/acre) for snags ≥ 25 cm (10 in) dbh, and 9.2 snags/ha (3.7/acre) for snags ≥ 50 cm (20 in) dbh.

For down wood in large tree Montane Mixed Conifer stands from DecAid (only wood greater than or equal to 4.9 inches diameter in all decay classes):

80% tolerance level:

To manage down wood cover at the 80% tolerance level based on inventory data provide 10 percent cover of down wood ≥12.5 cm diameter (4.9 in) should be maintained on parts of the landscape. Even higher levels of down wood are likely to benefit and attract some species such as three-toed woodpecker; these high levels can be left opportunistically, but are likely not sustainable over the long-term.

50% tolerance level:

To manage down wood cover at the 50% tolerance level based on inventory data provide 5 percent cover of down wood >12.5 cm diameter (4.9 in) should be maintained on parts of the landscape. Clumps of down wood of 10% to 18% cover would benefit species such as three-toed woodpecker. About 12% of the unharvested area in the MMC_L vegetation conditions has down wood cover above 10%.

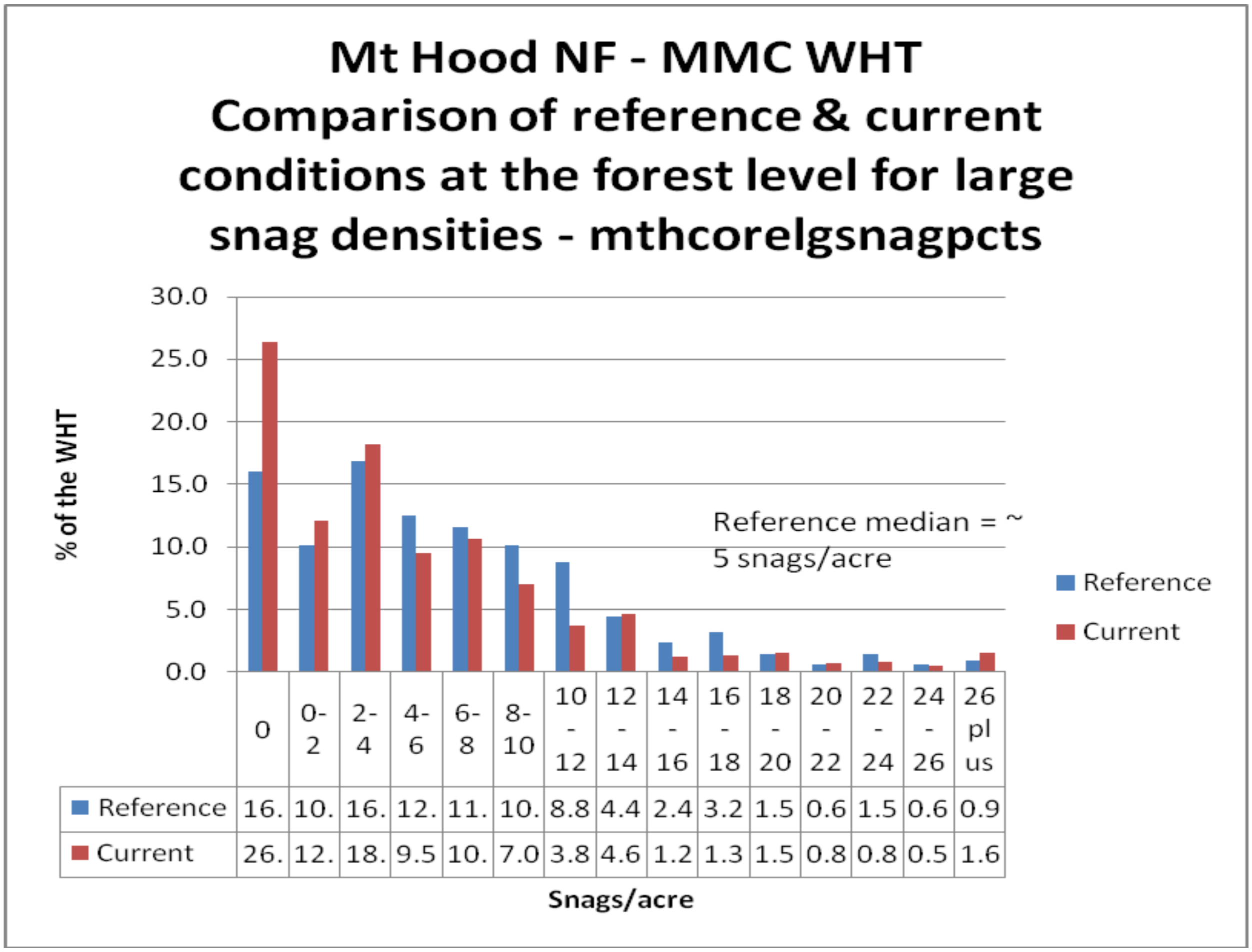
30% tolerance level:

To manage down wood cover at the 30% tolerance level based on inventory data provide 3.3 percent cover of down wood >12.5 cm diameter (4.9 in) should be maintained on parts of the landscape. Clumps of up to 6% cover would benefit species such as three-toed woodpecker. Approximately 1/4 of the unharvested area has above 6% down wood cover.

Table X Percent of the Zigzag watershed at the given tolerance levels.

Watershed Vs DecAID	30% Tolerance Level (limit)	50% Tolerance Level (limit)	80% Tolerance Level (limit)	100% Tolerance Level (limit)	No Data	Total Percent
Zigzag Watershed Percent of watershed at the different tolerance levels.	29%	21%	19%	14%	17%	100

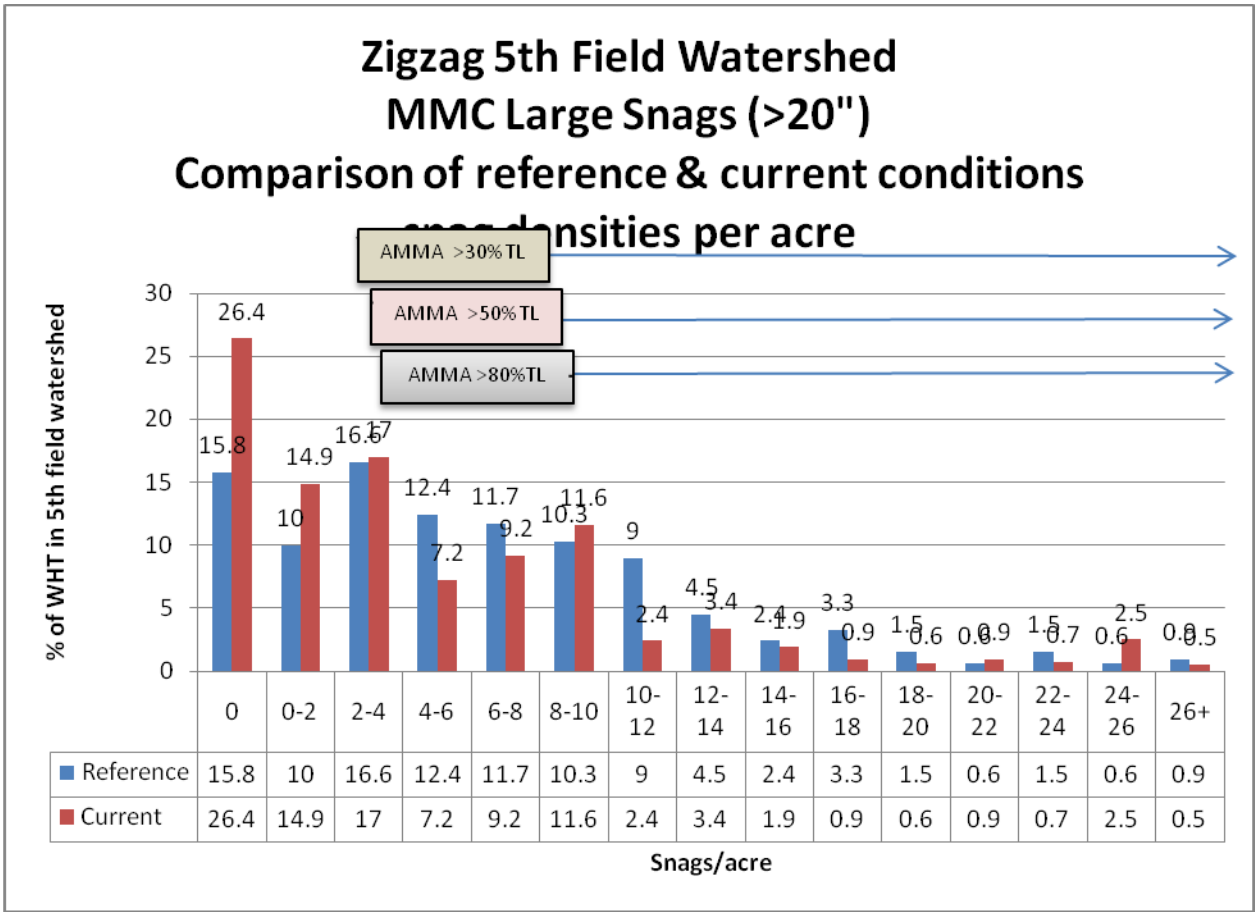
The following chart shows the relationship of the reference condition for the Montane Mixed Conifer habitat type to the current condition across the Mt Hood National Forest.



	0	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26 plus
Reference	16.	10.	16.	12.	11.	10.	8.8	4.4	2.4	3.2	1.5	0.6	1.5	0.6	0.9
Current	26.	12.	18.	9.5	10.	7.0	3.8	4.6	1.2	1.3	1.5	0.8	0.8	0.5	1.6

Comparing the condition of this habitat type across the Forest to the Zigzag watershed (in the chart below) where the Timberline bike trails proposed project would occur it is evident that the conditions are very similar.

The following chart shows the relationship of the reference condition of large snags for the Montane Mixed Conifer habitat type to the current condition in the Zigzag 5th field watershed.

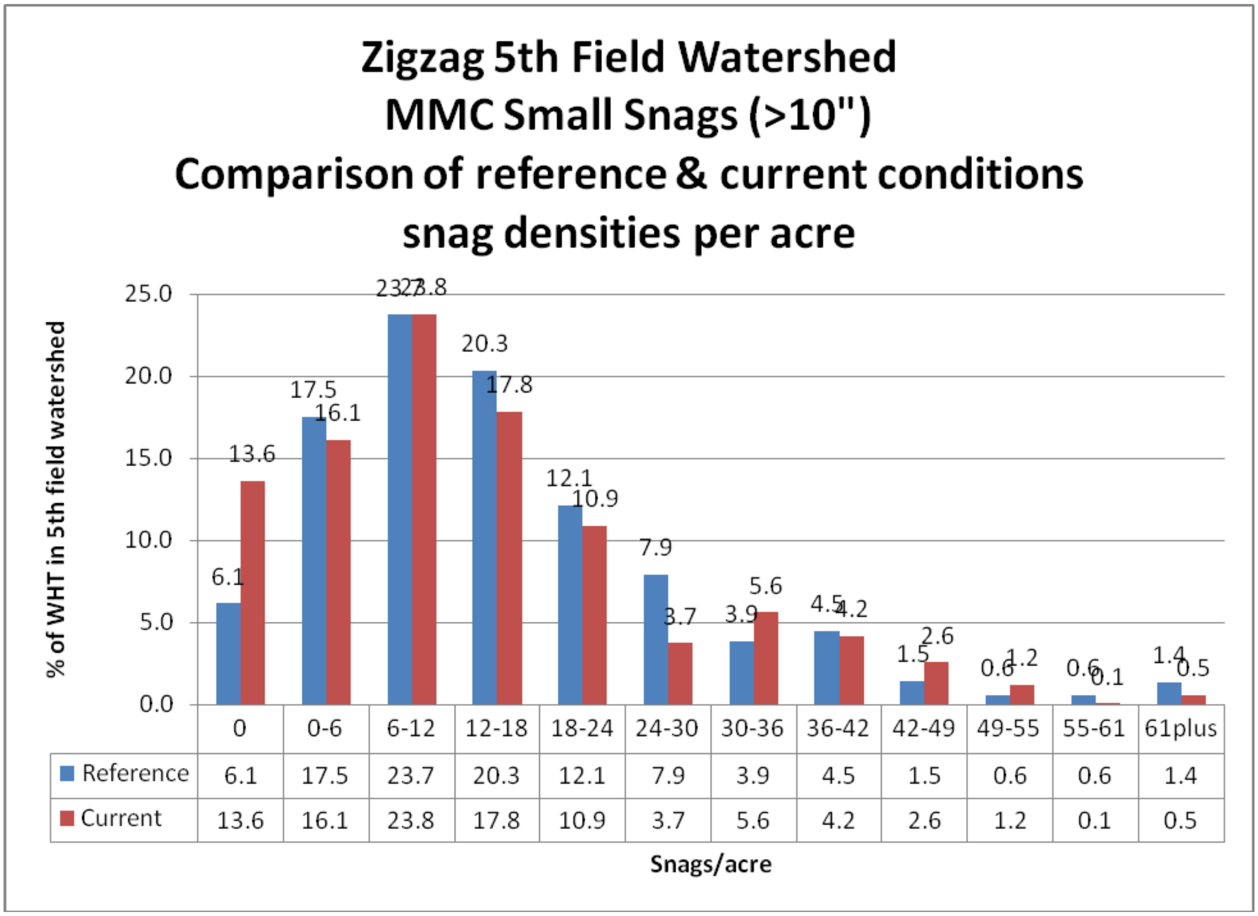


Note: AMMA = American marten.

For large snags it is apparent that the amount of the stands with 0 or 0-2 snags per acre is higher than the reference condition by about 15.5%. That 15.5% reduction in snags is spread across all of the density classes. The chart shows that approximately 50 percent of the watershed would meet the 80% tolerance level for American marten. That is an acceptable amount of the watershed compared to the approximately 70% for the reference condition. Especially since snags are only an indicator of denning sites and not an indication of less population potential for martens.

The project proponents have indicated that they do not intend to remove trees larger than 6 inches or remove snags unless absolutely necessary. Therefore, there is no indication that snag resources would be impacted to a degree that would cause concern for snag and cavity users.

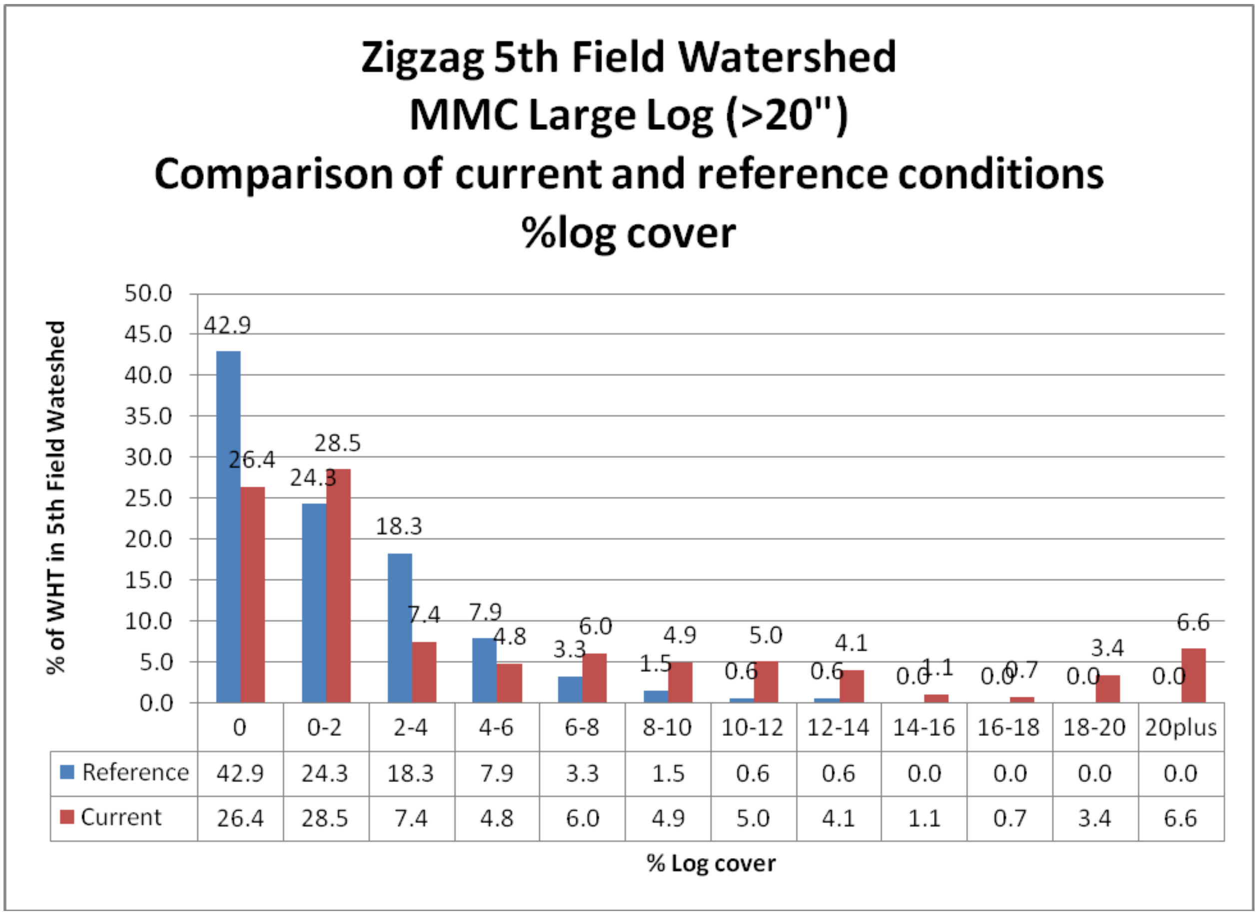
The following chart shows the relationship of the reference condition of small snags for the Montane Mixed Conifer habitat type to the current condition in the Zigzag 5th field watershed.



	0	0-6	6-12	12-18	18-24	24-30	30-36	36-42	42-49	49-55	55-61	61plus
Reference	6.1	17.5	23.7	20.3	12.1	7.9	3.9	4.5	1.5	0.6	0.6	1.4
Current	13.6	16.1	23.8	17.8	10.9	3.7	5.6	4.2	2.6	1.2	0.1	0.5

Looking at the comparison of the reference condition to the current condition for small snags in the Zigzag watershed the current condition is 6.1 percent higher for area with 0 to 0-2 snags per acre. That indicates there are about 6 percent less area with snags than the referrence condition would indicate. The chart also indicates that there are some instances of higher than referrence densities in the landscape. This would be good for species such as three-toed woodpeckers that prefer high densities of snags for foraging.

The following chart shows the relationship of the reference condition of large logs for the Montane Mixed Conifer habitat type to the current condition in the Zigzag 5th field watershed.



	0	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20plus
Reference	42.9	24.3	18.3	7.9	3.3	1.5	0.6	0.6	0.0	0.0	0.0	0.0
Current	26.4	28.5	7.4	4.8	6.0	4.9	5.0	4.1	1.1	0.7	3.4	6.6

The large log cover analysis shows that the current condition for down wood is higher than the reference condition. This could account for the reason that the snag levels are below reference. Because this area is not in an area of the Forest where there is any timber harvest the lack higher density of down wood or logs indicates that the snags have merely fallen and become logs. This condition is excellent for woodpecker foraging, small mammals and mollusk habitat. The current condition for down wood is better than referrence. This would not change due to this project. There may be some moving of logs and cutting gaps for the trail but there is no anticipation that there would be any removal of downwood. The area would continue to provide above average habitat for species that utilize this resource.

Elements of Proposal Analyzed – The proposed action involves the very little snag removal. It is not part of the proposal but it is anticipated that some hazard trees would be removed as the need presents itself. The project proponents stated that hazard tree removal is not a large part of this proposal but acknowledge that safety would drive the need to remove snags when necessary. These snags would be left in place and still serve as forage for woodpeckers and downwood for small mammals and mollusk and other am

Direct and Indirect Effects –

Alternative A – With no action, the mountain bike trails would not be constructed. There would continue to be some hazard tree removal for the ski runs. So some reduction in snag levels near the runs would continue.

Action Alternatives

The action alternatives do not have a great effect on the snag resource. There is a high amount of tree mortality evident in the area from insect and disease and suppression since there is no man made thinning occurring in the project area. The small amount of hazard trees that would be removed as a result of the bike trail contruction and maintenance would have a small effect on the resource but the effects would be minor. The DecAid analysis indicates that this watershed is in fairly good shape from a snag and down wood perspective. A high degree of the area is at the 80 percent tolerance level for American marten. This project would not affect that relationship.

The current snag and down wood analysis show that the snag levels are and would continue to be above the 100 percent biological potential.

Cumulative Effects –
Snags are utilized by species that have medium size home ranges so appropriate size analysis areas using topographic features have been developed to calculate cumulative effects for snags. Approximately one mile would be the action area for snag effects

Past, Present and Foreseeable Future Projects and Actions

Project Name	**Extent, Size, Type, & Distance**	**Overlap In Time Or Space**	**Alteration of snags**	**Meaning-ful Effect**	**Rationale For Inclusion Or Exclusion From Analysis Below**
Ski Bowl and Summit Ski Areas and associated ski trails.	Entire ski area	Nearby and within range of woodpecker and marten utilization area	Hazard tree removal and the permanent removal of snags.	Yes	Included due to similar range, scope and effect on woodpeckers and marten
Government camp construction	Throughout woodpecker and marten home range	Yes.	Permanent loss snags and down wood cover	Yes	Include. New buildings in the area reduces snags and down wood cover
Government Camp Land Exchange	Throughout woodpecker and marten home range	Yes.	Loss of snags and down wood cover	Yes	Include. Potential construction in the area would reduce snags and down wood cover
Timberline roads[1]	Throughout Analysis Area	Yes. Roads require maintenance and hazard tree removal on the way to Timberline.	High traffic requires higher than average hazard tree removal.	Yes	Include. Hazard tree removal in the area affects snags.
Mt Hood	Throughout	Yes. Some hazard	Removal for	Yes	Include. Reduces snag

Project Name	Extent, Size, Type, & Distance	Overlap In Time Or Space	Alteration of snags	Meaning-ful Effect	Rationale For Inclusion Or Exclusion From Analysis Below
Hiking trails[1]	Analysis Area	tree removal reduces snag resources along hiking trails.	human safety.		resource to a small degree.
Past – Power Line	Portions of Analysis Area	Yes. Power lines require some snag removal.	A loss of snags in all size classes has occurred.	Yes	Include. Some loss to reduce power outages so snags are removed along the lines.
Jeff Flood Project (Timberline Lift Express EA)	77+ acres of forest removed	Yes. A recent project that has long term effects.	Loss of snags on 77+ acres	Yes	Include. Loss of snags over a large area that would not be allowed to reestablish.
Govt Camp Fuels Reduction	Approx. 100 acres of fuels reduction consulted on in 2005-2006	Yes. A recent project to reduce fuels around Government camp to reduce the effect of wildfire.	Loss of snags on approximately 100 acres	Yes	Include. Loss of snags over a large area that would not be allowed to reestablish.
Ski Area Removal of trees for ski runs	Approx. 103 acres of forest removal since 1952.	Yes. This is forest removal for the ski runs since 1952 to present.	Loss of snags by creating the ski runs and maintaining them as openings.	Yes	Include. Removal of trees for ski runs has removed foraging and nesting areas for cavity users .

1. Quantitative Cumulative Effects of Roads and Trails Within a Half Mile of the Proposed Bike Trails

Type	Feet	Miles
Trails	58486	11.1
User Roads	31048	5.9
System Roads	39013	7.4
Timberline to Town Trail	17244	3.3

The current snag and down wood analysis show that the snag levels are and would continue to be above the 100 percent biological potential.

Forest Plan Goals, Standards and Guidelines

Snags -

FW-215 - For timber harvest units the goal is to have 60% of the full biological potential, which translates into 2.0 snags per acre in the lodgepole pine stands and 2.3 snags per acre in the Engellman spruce/mountain hemlock stands. There are other snag related standards and guidelines such as FW-163, 164, 165, 169, 218, 230 and 231.

This standard address timber harvest units (e.g. regeneration harvest and commercial thinning). The proposed mountain bike trail system is not a traditional timber harvest and is neither regeneration harvest nor commercial thinning. There are sufficient snags at the landscape scale to meet the needs of snag dependent species.

FW-216 indicates that snags at the landscape scale be at 40% of biological potential, which equates to about 1.4 snags in the lodgepole pine stands and 1.6 snags per acre in the Engelman Spruce/mountain hemlock stands. The table in s. 4.5.2.9 above shows that this level is currently being met throughout the entire planning area.

Down Wood -

FW-219 indicates that project activity areas should have 6 down logs per acre in decomposition class 1, 2, and 3. There are other down wood related standards and guidelines such as FW-166, 167, 169, 221-229.

The Northwest Forest Plan standard and guideline for the Matrix indicates that the amount of down logs left should reflect the timing of stand development cycles and that existing wood on the ground should not be disturbed to the extent possible. However subsequent watershed analysis and the LSR Assessment recommended fuel treatments in this area.

There is sufficient down wood at the landscape scale to meet the needs of dependent species.

Management Indicator Species

Deer and Elk Habitat (Management Indicator Species)

Habitat Characteristics – Elk herds on the Mt Hood exhibit a close association with riparian habitat in areas of gentle terrain and low road density. A study within the Clackamas River Ranger District from 1987 to 1992 recorded location and habitat type being utilized by radio-collared elk (Fiedler 1994). Seventy percent of all observations on these elk occurred within 100 meters of a stream or wetland. It was also noted that shrub/seedling stage clearcuts received more than twice as much use than they were proportionally available to elk as a habitat type. Also, elk were observed to browse on a wide range of native shrubs, trees, forbs and grasses as well as utilizing non-native grasses (Fiedler 1994). Ski runs mimic the open meadows and wetlands and have similar forage and are utilized by elk in the summer and fall.

The effect of mountain bike trails designed for high levels capacity of users would in effect be much like high traffic roads. Research has shown that high open-road densities lead to harassment of elk herds. Harassed elk move more often than elk left alone and use of habitat decreases as open-road density increases (Witmer 1985). The study mentioned above also reported that elk within or moving through areas of high open-road densities moved longer distances; several miles per day was not uncommon.

Recreational activity can affect wildlife in three main ways (Liddle 1997):

1. Stress/Disturbance: Wildlife becomes aware of human activity, and respond by becoming stressed, altering their behavior, avoiding (fleeing) areas of activity, or confronting/attacking humans. Such responses may detrimentally affect the fitness of an individual or a population. Displacement of animals by recreational disturbance may be short term (i.e., minutes or hours) or permanent.
2. Alteration of Habitat: The presence of human activity and/or infrastructure serves to remove or fragment habitat for wildlife, or can create artificial habitat which elicits change in population dynamics or encroachment of new species/populations.
3. Collision/Mortality: Wildlife is struck by humans or their vehicles, resulting in injury or death.

In an attempt to understand the comparative effects of different types of use, Taylor & Knight (2003) examined the response of bison (Bison bison), mule deer (Odocoileus hemionus), and pronghorn antelope (Antilocapra americana) to hikers and mountain bikers at Antelope Island State Park, Utah, by comparing alert distance, flight distance, and distance moved. The study did not reveal a significant difference between hikers and mountain bikers with respect to the reaction of any of the three species to their presence. A recent study by Naylor & Wisdom (2009), however, produced contrary results, albeit for a different species. In a controlled experiment, the behavioral changes by 13 female elk (Cervus elaphus) were monitored in response to four types of recreational disturbance: all-terrain vehicle riding, mountain biking, hiking, and horseback riding. Compared to control periods when elk spent most of their time feeding and resting, travel time increased in response to all recreational disturbance, but decreasing in the order listed above (i.e. ATV use eliciting the greatest increase in travel time, horseback riding eliciting the least). Both mountain biking and hiking activities were found to significantly reduce resting time for elk.

For this proposal, the following actions have the potential to affect deer and elk (negatively): actions that increase human presence would negatively affect deer and elk populations. Due to the major increase in human use along the proposed trail system during the summer deer and elk would most likely be displaced from the project area. Unlike some of the studies cited above where a small amount of mountain bike traffic was similar to hiking levels the proposed action would substantially increase human presence on a daily basis that would most likely reduce deer and elk use if not eliminate it entirely. Most use if it occurs would only be nocturnal. There is high quality forage for these species within the ski runs. So some use may still occur at night as the animals learn the pattern of use from the mountain bikers. There would be some reduction in forage opportunities at a time when forage is limiting for deer and elk on the Forest.

Mountain bikes can have several adverse affects on a variety of wildlife species. Construction of trails can disturb habitat and remove vegetative structure that could be used for nesting, denning, cover, microhabitat, and forage. But this is a minor effect compared to the effects of disturbance and nesting disruption. One Forest Service publication on the effects of linear routes on wildlife habitat states: “The most common interactions reported in the literature that we reviewed between nonmotorized trails and focal wildlife species were displacement and avoidance, which altered habitat use, and disturbance at a specific site during a critical period. The interactions of the focal species and motorized or nonmotorized trails were quite similar. Depending on the wildlife species, some were more sensitive to motorized trail use, whereas others were more sensitive to nonmotorized trail use. Based on our current understanding, both forms of recreation have effects on wildlife. Motorized trails had a somewhat greater magnitude of effects, such as longer distances in which wildlife were displaced, for a greater number of the focal species we reviewed." (Gaines, William et al. 2003)

Areas that are suitable for mountain bike are often the same areas that wildlife gravitate to because they are more gentle slopes and better soils. This means that some wildlife such as deer and elk may use these same areas as winter range at lower elevations and calving areas at higher elevations. Because the areas preferred by some wildlife species overlaps with areas utilized by off highway vehicles there can be consequences for wildlife productivity. The hypothetical model proposed by Gaines et al (Gaines, William et al. 2003) is that as recreation use increases wildlife species persistence decreases.

In Gaines et al review of the literature; they found that there were 12 types of interactions that affect wildlife. The types of interaction include disturbance, displacement or avoidance, poaching, trapping, hunting, habitat loss or fragmentation, collisions, negative human interactions, snag reduction, predation and collection. Disturbance and avoidance have the greatest number of focal species affected in their study area. It is anticipated that the use of mountain bike trail use will result in similar effects for the Mt. Hood National Forest.

For many species there is little research to document the actual effects of recreational use of mountain bike trails that can be sited. Therefore, wildlife biologists are often forced to use professional judgment and anecdotal evidence to make effects determinations concerning this type of recreation.

In general, deer and elk respond negatively to roads, trails, motorized trails and other types of human activities. (Cassier et al.1992, Ferguson and Keith 1982, Freddy et al. 1986, Leslie and Douglas 1980, MacArthur et al. 1982, Papouchis et al. 2001, Rowland et al. 2000). Human activities are of particular concern for deer and elk when they occur on their winter ranges or where young are reared (Canfield et al. 1999). Johnson et al. (2000) demonstrated that as the volume of traffic increased on roads, the mean distance that elk were located from roads also increased. Cole et al. (1997) showed that road closures are successful in reducing the effects of habitat displacement and increasing elk survivorship.

"The argument can be made that animals habituate to vehicles and other human impacts is valid when animals actually receive the level of protection that parks provide. But where ORV (OHV) use is widespread, they do not. In fact, the opposite situation is more likely to occur, in which hunting, poaching, and other threats cause herds to become more sensitive to human activities and bear higher energy costs to avoid disturbance." Gilbert, Barrie (2007).

To offset the harassment effects of the mountain bike project design criteria (PDC Wild-3) will reduce this harassment by implementing a timing restriction in the designated mountain bike project. This will allow deer and elk to utilize the habitat during the twilight and nocturnal time frame.

Existing Situation – The entire proposed project area is located within summer range (SR). Thermal cover for elk is defined as a stand of coniferous trees at least 40 feet tall with an average crown closure of 70 percent or more. Thermal cover for deer may include saplings, shrubs, or trees at least 5 feet tall with a 75 percent crown closure. Optimal cover is found mainly in multi-storied mature and old-growth stands. Hiding cover is present when there is vegetation capable of hiding 90 percent of a standing deer or elk from the view of a human at a distance of 200 feet. Forage includes all browse and non-woody plants available to wildlife for grazing. Thermal cover has not been found to be a significant issue for elk as previously thought. Openings are more limiting and elk use is more dependent on forage openings than cover.

The proposed bike trail project areas contain various levels of optimal, thermal, and hiding cover; as well as forage areas. The elk herds residing in the vicinity of the project area during the summer usually spend the winter in lower elevation areas off the Mt. Hood National Forest.

Deer have not been studied intensively on the Forest, but are generally considered to be wider ranging, more tolerant of human disturbance, and less dependent on riparian areas. Deer are more likely to be involved in bike/animal collisions during due to their higher tolerance levels.

Direct and Indirect Effects

No Action – There would be no change in forage utilization since there would be no increase in human presence. Deer and elk would continue to use the area at a moderate density.

Action Alternatives

The proposed action includes heavy human use within summer range for deer and elk. Elk and to some degree deer would shift use away from the project area and would reduce the amount of time they could forage in the area. Some shift to nocturnal use of the project area might occur to forage when bikers are not using the area. No proposal to use the area at night as been planned and so the deer and elk would utilize this area during non operations times. A Project Design Criteria (WILD-3) was incorporated to reduce impacts to deer and elk by restricting trail use during peak big game forage times at sunrise and sunset. The bike trails travel through the main stand of timber that would be used as hiding cover so animals would have to travel further to access the forage. The stream protection buffers would maintain their forest structure and continue to provide cover to some degree.

Cumulative Effects

Analysis areas for deer and elk were established using subwatershed boundaries and the winter/summer boundary. The effects of disturbance to a variety of elk and deer is approximately 0.5 miles so this is the action area for trails and roads for use in determining the extent of the disturbance issues for the bike trails.

Past, Present and Foreseeable Future Projects and Actions

Project Name	Extent, Size, Type, & Distance	Overlap In Time Or Space	Type Of Potential Effect	Measurable Effect?	Rationale For Inclusion Or Exclusion From Analysis Below
Ski Bowl summer operations	Entire ski area	Nearby and inside the range of the elk utilization area	Human disturbance	Yes	Included due to similar range, scope and effect on deer and elk
Government camp construction	Throughout Elk Range Analysis Area	Yes.	Permanent loss forage, cover, and increase in human disturbance	Yes	Include. New buildings in the area reduces forage and cover for deer and elk.
Government Camp Land Exchange	Nearby in elk forage and adjacent to other ski runs.	Yes.	Loss of forage and cover	Yes	Include. Potential construction in the area would reduce deer and elk forage and would disrupt use of the area.
Timberline Lodge Visitors	Throughout Analysis Area	Yes. Constant use by vehicles and human disturbance	High quantity of human disturbance	Yes	Include. Constant traffic and people using the upper part of the trail area reduces elk and deer forage opportunities.
Timberline roads[1]	Throughout Analysis Area	Yes. Roads require maintenance and hazard tree removal on the way to Timberline.	High traffic requires higher than average hazard tree removal.	Yes	Include. Hazard tree removal in the area affects snags.
Mt Hood Hiking trails[1]	Throughout Analysis Area	Yes. Constant use during summer and fall utilization times.	High quantity of human disturbance	Yes	Include. Constant use by hikers reduces elk and deer forage opportunities.
Past – Power Line	Portions of Analysis Area	Yes. Power lines require some snag removal.	The area maintained provide continuous forage opportunites.	Yes	Include. Forage that would be permanently maintained and would improve with time.
Jeff Flood Project (Timberline Lift Express EA)	77+ acres of forest removed	Yes. A recent project that has long term effects.	Addition of 77+ acres of forage area	Yes	Include. Increase in the amount of forage that would be permanently maintained and would improve with time.
Govt Camp Fuels Reduction	Approx. 100 acres of fuels reduction consulted on in 2005-2006	Yes. A recent project to reduce fuels around Government camp to reduce the effect of wildfire.	Increase in forage of approximately 100 acres	Yes	Include. Increase in forage near the project area due to opening the canopy.
Ski Area Removal of trees for ski runs	Approx. 103 acres of forest removal since 1952.	Yes. This is forest removal for the ski runs since 1952 to present.	Creation of forage openings used by deer and elk.	Yes	Include. The increase in forage has attracted a higher population of deer and elk to the area.

2. Quantitative Cumulative Effects of Roads and Trails Within a Half Mile of the Proposed Bike Trails

Type	Feet	Miles
Trails	58486	11.1
User Roads	31048	5.9
System Roads	39013	7.4
Timberline to Town Trail	17244	3.3

American Marten (*formerly Pine Marten*) & Pileated Woodpecker (Management Indicator Species)

The status and condition of management indicator species are presumed to represent the status and condition of many other species. This EA focuses on the habitat of certain key species and does not specifically address common species except to the extent that they are represented by management indicator species.

The pileated woodpecker was chosen as an MIS because of its need for large snags, large amounts of down woody material, and large defective trees for nesting, roosting and foraging. The American marten is an indicator species to mature or older forests with dead and defective standing and down woody material. It has a feeding area that utilizes several stand conditions that range from poles to old growth (USDA 1990a).

Existing Situation – The pileated woodpecker is associated with forest habitats that have large trees, especially snags for nesting and foraging. It would use both coniferous and deciduous trees, but tends to be most common in old-growth Douglas-fir forests in western Oregon (Csuti 1997).

American martens are associated with forested habitats at any elevation, but tend to prefer higher elevations similar to the project area. They prefer mature forests with closed canopies, but sometimes use openings in forests if there are sufficient downed logs to provide cover (Csuti 1997). American marten are observed regularly in the project area.

The project area provides potential habitat for both the American marten and pileated woodpecker. Both species are more likely to be found in the unmanaged stands that have a mature stand structure with abundant snags and down woody debris. Quality habitat exists for the American marten in these stands, and to a lesser extent the pileated woodpecker. The pileated woodpecker prefers stands with a heavy component of Douglas-fir. Although some of the stands have some Douglas-fir, most of them have various other species, such as pacific silver fir, mountain hemlock and lodgepole pine.

Both American Marten and Pileated woodpeckers have a high tolerance for human disturbance. Pileated woodpeckers often forage in people’s backyards. Although they would flush if approached to closely they continue to use the area. They may however choose not to nest in high traffic areas.

American marten have been seen inside Silcox Hut, the Timberline Amphitheater, and in Meadows Ski Area Lodge. They may shy away if approached but they regularly travel through areas where people congregate. They may be attracted to areas of human use where people feed golden mantled ground squirrels since they prey on this species.

Direct and Indirect Effects

No Action Alternative: No effects to the American marten or pileated woodpecker habitat would occur with this alternative.

With no action there would be no human disturbance to these species.

Action Alternatives:

The proposed bike project would have little effect on these two management indicator species. The impact of human use in the area may shift the areas selected for nesting and denning but would have little overall use of the area by pileated woodpeckers or American marten.

Forest Plan Standards and Guidelines

There are no applicable standards and guidelines for pine martin or pileated woodpeckers because none of the proposed actions are within B5- Pileated Woodpecker/American marten land allocation.

Migratory Birds

A Memorandum of Understanding (MOU) between the USDA-Forest Service and USDI – Fish and Wildlife Service has been developed to promote the conservation of migratory birds (USDA-USDI 2008). The MOU meets the requirements of the Executive Order 13186, January 17, 2001 on the responsibilities of federal agencies to protect migratory birds. The purpose of the MOU is to strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and minimize the take of migratory birds through enhanced collaboration between the Forest Service and the Fish and Wildlife Service, in coordination with state, tribal, and local governments. This MOU directs the Forest Service to protect, restore, enhance, and manage habitat of migratory birds, and prevent the loss or degradation of remaining habitats on National Forests land.

Existing Situation – Close to 30 species of migratory birds occur within the project, some of which are likely present within the project area during the breeding season. Some species favor habitat with late-successional characteristics while others favor early-successional habitat with large trees. Some of the species that prefer late-seral habitats are as follows: Hermit/Townsend's warbler complex, pine siskin, hermit thrush, golden-crowned kinglet, Pacific-slope flycatcher, rufous and calliope hummingbirds, olive-sided flycatcher, Hammond's flycatcher, etc. There are no known Important Bird Areas such as nesting, wintering or stop-over areas within the project area.

Direct and Indirect Effects

Alternative A - There would be no alteration of habitat for migratory birds unless a wildfire was to burn through the area.

Action Alternatives –

The proposed action would have little effect on habitat for birds. The greatest impact to birds would be disruption of nesting for ground nesters such as juncos, chipping sparrows, blue and ruffed grouse, and shrub nesting species such as MacGillvary's warbler. The constant traffic of mountain bikes would disrupt nesting of birds within 10 yards of the trail or possibly more. This would reduce nest habitat along the trails.

In general, viability of species dependent upon National Forest System lands is considered in determining if a species should be managed as a sensitive species. Current management guidelines are designed to provide for a diversity of habitats. Management direction is not specific to individual bird species, except for those designated as threatened, endangered or sensitive, and management is generally focused on habitats rather than individuals.

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APPENDIX E

BOTANY REPORT

BOTANY SPECIALIST REPORT
Proposed Timberline Mountain Bike Park

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Westside Zone Botanist

Botanical Biological Evaluation

for Proposed, Endangered, Threatened, and Sensitive
Vascular Plants, Bryophytes, Lichens, and Fungi

Proposed Timberline Mountain Bike Park

Zigzag Ranger District, Mt. Hood National Forest

I. INTRODUCTION

U.S. Forest Service policy requires that all actions be taken to "assure that management activities do not jeopardize the continued existence of sensitive species or result in an adverse modification of their essential habitat" (FSM 2670.3). Section 7 of the Endangered Species Act of 1973 (as amended in 1978, 1979, and 1982) directs federal departments/agencies to assure that actions authorized, funded, and/or conducted by them are not likely to jeopardize the continued existence of any threatened or endangered species or result in destruction or adverse modification of their critical habitat. The Act also directs each federal agency to confer or consult with the appropriate Secretary on any action that is likely to jeopardize or affect the continued existence of any species or its habitat. All Forest Service projects, programs and activities require review and documentation of possible effects on federally listed endangered and threatened species, as well as any species proposed for federal listing, and species listed as sensitive on the Regional Forester's Sensitive Species List for Region 6 of the U.S. Forest Service (FSM 2672.4 & 2670.44). In compliance with these directions and policies a biological evaluation must be performed for all ground-disturbing activities on national forest land.

No federally listed endangered or threatened plant species, or plant species proposed for federal listing, are known to occur on the Mt. Hood National Forest (MTH). Only one federally listed species, water howellia (*Howellia aquatilis*), which is a threatened species, is *suspected* to occur on the MTH but has never been found. There are, however, about 75 sensitive species *documented* as occurring and about another 47 sensitive species *suspected* to occur on the MTH (45 vascular plants, 43 bryophytes and lichens, and 34 fungi).

A 5-step process is used to summarize assessment procedures for species currently listed on the Regional Forester's Sensitive Species List for the MTH (FSM 2672.4). Species assessed in this process are based on the Regional Forester's List, last revised in

December 2007, and the current U.S. Fish and Wildlife Service (USFWS) Federal Species List.

The 5-step process consists of 1) pre-field review of existing information; 2) a field reconnaissance if listed species or habitats are determined to be present and potentially affected by the proposed action; 3) an evaluation of project effects on species and habitats; 4) an analysis of the significance of the project's effects on local and entire populations of Sensitive species; 5) if needed (due to lack of information), a biological investigation is completed.

A determination of No Impact for Sensitive species can be made at any step in the process, at which time the biological evaluation is complete. If the biological evaluation determinations indicate there may be an effect to proposed or listed species, conferencing or informal/formal consultation with USFWS, as outlined in FSM 2673.2, would be initiated.

Currently, threatened, endangered, proposed for listing, and sensitive species are collectively termed *special status* species by the Forest Service. Acronyms such as PETS (proposed, endangered, threatened, and sensitive) and TES (threatened, endangered, and sensitive) are synonymous with the term *special status* species. *Special status* species are those federally listed as threatened or endangered by the USFWS, those proposed for federal listing by the USFWS, and those listed as sensitive on the Regional Forester's Sensitive Species List for Region 6.

This report evaluates the potential effects of the proposed action on special status plant species in accordance with The National Environmental Policy Act (42 USC 4321 et seq.), the federal Endangered Species Act (16 USC 1531 et seq.), and the National Forest Management Act (16 USC 1604 et seq.). To comply with the above, the Forest Service has set forth guidance in FSM 2670 that is designed to ensure Forest Service actions (1) do not contribute to the loss of viability of any native or desired non-native species or cause a trend toward federal listing for any species; (2) comply with the requirements of the Endangered Species Act; and (3) provide a process and standard that ensure special status species receive full consideration in the decision-making process.

II. PROPOSED PROJECT

The proposed action is to construct a downhill mountain bike park adjacent to Timberline Lodge on Mt. Hood. The park would contain about 17.2 miles of downhill trails and a 0.2 acre skills park next to the Wy'East Lodge, totaling about 14 acres of ground disturbance.

The proposed project area is located on the Zigzag Ranger District in T.3 S., R.9 E., Section 7, Willamette Meridian, and consists of subalpine parklands and meadows and high montane forest. The upper portion of the proposed mountain bike is in subalpine parkland. Subalpine parkland occurs above the forest zone and is characterized by a mosaic of individual trees, tree clumps, and meadows (Henderson 1974, Franklin & Dyrness 1987). Vegetation within the subalpine zone of the proposed mountain bike park consists of the following plant associations: mountain hemlock-whitebark pine/Hitchcock's smooth woodrush (TSME-PIAL/LUGLH [Old Code: TSME-PIAL/LUHI CAG313]), mountain hemlock/Hitchcock's smooth woodrush (TSME/LUGLH [Old Code: TSME/LUHI CAG314]), and mountain hemlock-subalpine fir/Cascade aster (TSME-ABLA/EULE14 [Old Code: TSME-ABLA2/ASLE3 CAF312]) (McCain & Diaz 2002). Below the subalpine zone is high montane forest consisting of old-growth mountain hemlock and mature Pacific silver fir stands: Pacific silver fir/big huckleberry/beargrass (ABAM/VAME/XETE CFS251) and mountain hemlock/big huckleberry/beargrass (TSME/VAME/XETE-NWO CMS224) (McCain & Diaz 2002). The majority of the proposed project area consists of high montane forest.

Recommended Construction and Operation Measures

The following measures are recommended to reduce negative effects resulting from the construction, operation, and maintenance of downhill mountain bike trails. The essential components of these measures have been incorporated into the project design criteria (PDC) developed by the project's interdisciplinary team and included in the environmental assessment.

Trail Design, Construction, and Maintenance

- Construct trails that resist erosion (e.g., a rolling contour trail characterized by gentle grades, grade reversals, and an outsloping tread).
- Avoid the design of steeply sloped trails with many bends that encourage riders to brake and skid, riding behaviors that lead to increased soil damage (the formation of ruts, gullies, berms, and cupped trails), which can channel water flow and create severe erosion problems.
- Design trails so that water does not pool but discharges without carrying soil with it.
- Design and maintain trails that provide the experience that mountain bike riders seek to reduce their desire to venture off-trail and thereby create informal (unauthorized) trails or shortcuts between designated trails. Informal trails can be created rapidly with a substantial amount of vegetation and soil impact occurring in a relatively short period of time.

- Limit vegetation disturbance when constructing and maintaining trails. Hand construction is least disruptive. Mechanized construction with small equipment is less disruptive than full-sized equipment. Skilled operators do less damage than those with limited experience. Sidecast cleared soil and vegetation into as narrow a corridor as possible along trails (no more than 3-4 ft. to the side). Endhaul excavated materials to reduce sidecasting. The objective is to limit the disturbance footprint associated with construction and maintenance of trails as much as possible.
- While it is necessary to keep the trail corridor free of obstructing vegetation, such work should seek to avoid "day-lighting" the trail corridor. Excessive opening of the overstory or understory allows greater sunlight penetration that permits opportunities for undesirable changes in plant community composition—particularly colonization by invasive non-native plants.
- An active trail maintenance program that removes fallen trees and repairs degraded or damaged trail segments encourages riders to remain on the intended narrow trail. Additionally, a variety of maintenance actions can discourage trail widening, such as only cutting a narrow section out of trees that fall across the trail, limiting the width of vegetation trimming, and defining trail borders with logs, rocks, or other objects that don't impede drainage.
- Avoid large, older trees when constructing trails. Only fall trees 6 inches or less in diameter when constructing trails.
- Inspect mountain bike trails regularly for linear rut development (trail incision), trail widening (trail creep), the creation of informal (unauthorized) trails, trampling of vegetation outside trail corridors, soil erosion, areas needing restoration work, and invasion of non-native plants.
- Aggressively treat invasive plants by manual control or with herbicides. Consult Mt. Hood National Forest botanist on which method works best for which species.
- Design technical trail features (TTFs) (e.g., ladders, jumps, ramps, drop-offs, and see-saws) that can sustain high use without damaging soils and vegetation and that can be safely used by riders.
- Patrol trail system to ensure that informal (unauthorized) trails and informal TTFs are not created by riders.

Restoration

- Salvage whole plants from proposed trails in advance of trail construction and transplant them in disturbed areas once construction is completed (e.g., areas along trails where excavated material has been sidecast and in sparsely vegetated areas in adjacent ski runs).
- Transplants might include species such as big huckleberry, broadleaf lupine, Cascade aster, diffuse phlox, grasses, Hitchcock's smooth woodrush, Jacob's

ladder, mountain arnica, mountain mariposa lily, Mt. Hood pussypaws, Newberry's fleeceflower, Pacific lupine (dwarf lupine), Parry's rush, partridge foot, sedges, and others. Not all of these species may transplant well with survivorship variable depending on species. See section on "Plant Propagation & Restoration" for detailed information about transplants.

- When whole plants cannot be removed for transplanting, remove vegetative propagules (e.g., offset plants from runners, stem offshoots, rosettes with rhizome, rhizomes, cuttings, bulbs) from plants in proposed trail corridors in advance of trail construction. Propagate seedlings from these materials in a nursery for revegetating disturbed areas.
- Collect seed from native plants in the special-use permit area and propagate seedlings from this seed in a nursery for restoration of disturbed areas in subsequent years. Directly sow collected seed in disturbed areas for those species for which this method is effective. Consult with Mt. Hood National Forest botanist for details.
- Fulfill restoration commitments agreed to in the Timberline Express EIS (2005) by replanting ski runs, where forest was cleared, that still contain bare or sparsely vegetated ground using salvaged transplants, locally collected native seed, and nursery-grown plants. Many areas in the Timberline Express ski runs cleared in 2006-2007 remain sparsely vegetated with only wood strand (wood fiber mulch) atop the ground. Sparsely vegetated areas in the ski runs will require persistent restoration efforts. See section on "Plant Propagation & Restoration" for more information. Contact Mt. Hood National Forest botanist for assistance.
- For restoration of disturbed trail segments and other areas, use only certified weed-free straw or certified weed-free wood fiber for mulch. See link for a list of suppliers of certified weed-free restoration materials (http://www.oregon.gov/ODA/CID/weed_free_forage.shtml).
- Use only native plant materials (seed, seedlings, divisions, cuttings) collected locally on the Mt. Hood National Forest. Contact Mt. Hood National Forest botanist and restoration ecologist for assistance. The Mt. Hood National Forest is developing a supply of native plant materials for restoration projects on the national forest. If supplies of locally collected native seed (e.g., blue wildrye grass) are low and erosion control or restoration of disturbed areas is urgent, use annual ryegrass (*Lolium perenne* spp. *multiflorum*), a non-invasive, non-persistent, non-native species. Annual ryegrass will provide temporary cover for 2-3 years until native vegetation can be planted. The preferred restoration tools, however, are (a) transplants of whole plants and vegetative propagules (divisions, cuttings) collected from proposed trails before trail construction begins and (b) nursery propagation of seedlings from seed and/or vegetative propagules collected in the proposed project area.

Monitoring

- Fulfill monitoring requirements in the Timberline Express EIS (2005) for *Rhizomnium nudum* populations (a Region 6 Sensitive and Survey & Manage moss species) located in the riparian/wetland complex below the headwaters of Still Creek in the special-use permit area near the Jeff Flood ski chairlift terminal and regularly submit a report on their status as specified in the EIS to a Mt. Hood National Forest botanist.
- Use GIS and GPS mapping technology and photopoints to provide an accurate and informative assessment of the impact of mountain bike riders on trails in the mountain bike park. Repeating the assessment at regular intervals (e.g., annually) can identify problems (e.g., trail widening, excessive soil disturbance, vegetation trampling, informal trails), document informal trails, and determine where revegetation or other remedies are needed.
- Provide a written annual report to the Forest Service detailing problems (e.g., trail damage, soil erosion, vegetation trampling, wildlife issues, "rogue riders," user conflicts) and restoration efforts in the mountain bike park so that the Forest Service can review and, if need be, work with RLK & Company to institute needed changes in the management of the mountain bike park.

Education

- Educate riders about the environmental consequences of informal (unauthorized) trail development. Use education to discourage off-trail travel, which can quickly lead to the establishment of informal visitor-created trails or short-cuts between trails that unnecessarily remove vegetation cover and spread invasive non-native plants. Such routes can degrade rapidly and then be abandoned in favor of adjacent new routes, which unnecessarily magnify the extent and severity of trampling damage.
- Educate mountain bike riders about low-impact riding practices.
- Educate mountain bikers about invasive non-native plants and the potential for the transport of invasive plant seed or vegetative propagules on mountain bikes, shoes, or clothing to the Timberline mountain bike park from locations where riders have previously ridden. Preventing the introduction of non-natives is key; subsequent removal is difficult and costly.

Cleaning of Mountain Bikes

- Set up a cleaning station for mountain bikes near the proposed skills park in the Wy'East parking lot area and require all riders to clean their bikes of mud, dirt, and other debris, which could harbor invasive plants or their seeds, before allowing them to ride on trails in the mountain bike park. Require riders to also clean their shoes and clothing of mud, dirt, and other debris before allowing them to proceed on trails. This cleaning requirement is to prevent the transport and introduction of weed seed, which riders may have picked up from other mountain biking locations in the region or elsewhere, to the Timberline mountain bike park.

Management of Trails and Riders

- Open the mountain bike park each summer only after trails are snow-free and dry (varying each year sometime from late-June to mid-July) to prevent damage to trails (e.g., the formation of ruts, gullies, and berms) and trailside vegetation and to prevent excessive soil erosion. Use precipitation, soil moisture, and other environmental data to determine opening day. Consult with U.S. Forest Service permit administrator.
- Bring the mountain bike park riding season to a close in the fall (varying each year sometime from late September to mid-October) when fall rains or snow arrive and trail conditions deteriorate. Use precipitation, soil moisture, and other environmental data to determine closing day. Consult with U.S. Forest Service permit administrator.
- Temporarily close trails when they are wet and saturated with water following appreciable rain storms during the riding season to prevent trail damage and soil erosion. What constitutes "appreciable" is open to interpretation. Consult with U.S. Forest Service permit administrator.
- Regulate access to trails by use of physical barriers (e.g., boulders, fences, logs, vegetation).
- Use patrols to encourage responsible rider behavior.
- Patrol mountain bike trails daily for "rogue riders" who wander off the designated trails creating informal (unauthorized) trails, trample vegetation, or practice high-impact riding behavior (e.g., downhill skidding) that results in trail incursion, trail widening, or other excessive disturbance to soils and vegetation. Enforce compliance.
- Prevent the creation of informal (unauthorized) trails that would connect existing mountain bike trails (e.g., Alpine, Glade, Mountaineer, Timberline to Town) to trails in the downhill mountain bike park. Use physical barriers and patrolling to prevent the creation of such trails. Revegetate informal trails.

- Patrol for trash and clean up trash along trails and elsewhere in the mountain bike park.

Mountain Bike Skills Park

- Salvage plants currently occupying the proposed skills park and transplant them in the Timberline Welcome Plaza garden and in disturbed areas (e.g., along the sides of trails following construction) to revegetate them. Plants are sparse and isolated in the proposed skills park area (e.g., *Cistanthe umbellata* var. *caudicifera*, *Lupinus lepidus*, *Phlox diffusa*). Consult with Mt. Hood National Forest botanist.
- Confine denudation of vegetation to the skills park. Prevent soil disturbance and trampling/denudation of vegetation around and outside the skills park.
- Control rider entry into the skills park and egress from it to avoid the creation of a tangle of entrance and exit trails that would cause excessive soil disturbance and trampling of sensitive subalpine vegetation just outside the skills park. Such disturbance would not only destroy all native vegetation, which is patchily distributed in the area, but create abundant growing-space opportunities for invasive non-native plant species to move in. Options might include erecting a fence or placing physical barriers (e.g., boulders) around the skills park to control entry and egress, and erecting fencing along entrance and exit lanes or placing physical barriers along them to guide riders into and out of the skills park (similar to entrance and exit ramps on freeways).

Future Planning

- In the next forest plan revision (to be written sometime between 2015 and 2020), provide a long-term environmental management plan to control growth and development and to conserve and protect remaining forest and meadows in the special-use permit area.

III. Step 1. Pre-field Review of Existing Information

Management proposals are investigated to determine if potential habitat for special status species may exist within or adjacent to the project area. Sources include the Mt. Hood National Forest TES plant database, the Natural Resources Inventory System (NRIS) TES Plants database, species habitat and range information, scientific literature, technical manuals, species fact sheets, plant atlases, herbarium records, topographic maps, aerial photos, and knowledge provided by individuals familiar with the project area. Special status species that are known or suspected to occur on the Mt. Hood National Forest and that may have potential habitat in areas open to special forest products use/harvest are displayed in Table 1.

Table 1. Special Status Species Documented or Suspected to Occur on the Mt. Hood National Forest

Vascular Plants	Common Name	Documented or Suspected	Habitat in Proposed Project Area?
Agoseris elata	tall agoseris	Documented	No
Arabis sparsiflora var. *atrorubens*	sicklepod rockcress	Documented	No
Astragalus tyghensis	Tygh Valley milkvetch	Documented	No
Botrychium lunaria	common moonwort	Suspected	**Yes**
Botrychium minganense	gray moonwort	Documented	No
Botrychium montanum	mountain grape fern	Documented	No
Calamagrostis breweri	Brewer's reedgrass	Documented	**Yes**
Carex abrupta	abrupt-beak sedge	Suspected	**Yes**
Carex capitata	capitate sedge	Suspected	No
Carex diandra	lesser panicled sedge	Suspected	No
Carex lasiocarpa var. *americana*	slender sedge	Documented	No
Carex livida	pale sedge	Documented	No
Carex retrorsa	retrorse sedge	Suspected	No
Carex vernacula	native sedge	Documented	**Yes**
Castilleja thompsonii	Thompson's paintbrush	Documented	No
Cimicifuga elata var. *elata*	tall bugbane	Documented	**Yes**
Coptis trifolia	three-leaf goldthread	Documented	No
Corydalis aquae-gelidae	coldwater corydalis	Documented	No
Delphinium nuttallii	Nutall's larkspur	Documented	No
Diphasiastrum (=Lycopodium) complanatum	ground cedar	Documented	**Yes**
Elatine brachysperma	short-seeded waterwort	Suspected	No
Erigeron howellii	Howell's daisy	Documented	No
Eucephalus gormanii	Gorman's aster	Documented	**Yes**
Fritillaria camschatcensis	black lily	Documented	No
Lewisia columbiana var. *columbiana*	Columbia lewisia	Suspected	No
Lomatium watsonii	Wastson's desert parsley	Documented	No
Luzula arcuata ssp. *unalaschcensis*	Alaska curved woodrush	Documented	No

Lycopodiella inundata	bog clubmoss	Documented	No
Ophioglossum pusillum	adder's-tongue	Documented	No
Phlox hendersonii	Henderson's phlox	Documented	**Yes**
Potentilla villosa	villous cinquefoil	Documented	**Yes**
Ranunculus triternatus (=R. reconditus)	Dallas Mt. buttercup	Suspected	No
Romanzoffia thompsonii	Thompson's mistmaiden	Suspected	No
Rorippa columbiae	Columbia cress	Suspected	No
Rotala ramosior	lowland toothcup	Suspected	No
Scheuchzeria palustris var. *americana*	scheuchzeria	Documented	No
Sisyrinchium sarmentosum	pale blue-eyed grass	Documented	**Yes**
Streptopus streptopoides	kruhsea, small twistedstalk	Documented	**Yes**
Suksdorfia violacea	violet suksdorfia	Documented	No
Sullivantia oregana	Oregon sullivantia	Suspected	No
Tauschia stricklandii	Strickland's tauschia	Documented	**Yes**
Utricularia minor	lesser bladderwort	Documented	No
Utricularia ochroleuca	northern bladderwort	Documented	No
Wolffia borealis	dotted water-meal	Suspected	No
Wolffia columbiana	Columbia water-meal	Documented	No
Bryophytes	**Common Name**	**Documented or Suspected**	**Habitat in Proposed Project Area?**
Barbilophozia lycopodioides	giant fourpoint, maple liverwort	Suspected	No
Brachydontium olympicum	Olympic brachydontium moss	Documented	**Yes**
Bryum calobryoides	beautiful bryum	Suspected	**Yes**
Calypogeia sphagnicola	bog pouchwort	Documented	No
Chiloscyphus gemmiparus	alpine waterwort	Suspected	**Yes**
Conostomum tetragonum	ribbed mountain moss, helmet moss	Documented	**Yes**
Encalypta brevicollis	extinguisher moss	Suspected	No
Encalypta brevipes	candle snuffer moss, stubby extinguisher moss	Suspected	No
Gymnomitrion concinnatum	braided frostwort, pointy whiteworm	Documented	**Yes**
Helodium blandowii	Blandow/s feather moss	Suspected	No
Herbertus aduncus	common scissorleaf	Suspected	**Yes**

Lophozia laxa	bog palewort	Suspected	No
Polytrichum sphaerothecium	dwarf rock haircap	Documented	**Yes**
Rhizomnium nudum	moss	Documented	**Yes**
Rhytidium rugosum	crumpled leaf moss, pipecleaner moss	Suspected	**Yes**
Schistostega pennata	green goblin moss	Documented	**Yes**
Scouleria marginata	margined streamside moss	Suspected	**Yes**
Splachnum ampullaceum	purple-vased stink moss, small capsule dung moss	Suspected	No
Tayloria serrata	broad-leaved stink moss, serrate dung moss	Documented	**Yes**
Tetraphis geniculata	four-tooth bent knee moss	Documented	No
Tetraplodon mnioides	black-fruited stink moss, entireleaf nitrogen moss	Suspected	**Yes**
Tomenthypnum nitens	tomenthypnum moss, fuzzy hypnum moss	Suspected	No
Trematodon boasii (= *T. asanoi*)	Asano's trematodon moss	Suspected	**Yes**
Tritomaria exsectiformis	little brownwort	Suspected	No
Lichens	**Common Name**	**Documented or Suspected**	**Habitat in Proposed Project Area?**
Chaenotheca subroscida	pin lichen	Suspected	**Yes**
Dermatocarpon meiophyllizum	brook lichen	Suspected	No
Hypogymnia duplicata	ticker-tape lichen	Documented	**Yes**
Leptogium burnetiae	jellyskin lichen	Suspected	**Yes**
Leptogium cyanescens	blue jellyskin lichen	Suspected	**Yes**
Lobaria linita	cabbage lungwort	Suspected	**Yes**
Nephroma occultum	cryptic kidney lichen	Documented	**Yes**
Pannaria rubiginosa		Documented	**Yes**
Peltigera pacifica	fringed pelt lichen	Documented	**Yes**
Pilophorus nigricaulis	matchstick lichen	Suspected	No
Pseudocyphellaria rainierensis	specklebelly lichen	Documented	**Yes**
Ramalina pollinaria	chalky ramalina	Suspected	No

Stereocaulon spathuliferum	chalk foam, snow lichen	Suspected	**Yes**
Tholurna dissimilis	urn lichen	Documented	**Yes**
Usnea longissima	Methuselah's beard lichen	Documented	No
Fungi	**Common Name**	**Documented or Suspected**	**Habitat in Proposed Project Area?**
Alpova alexsmithii		Documented	**Yes**
Bridgeoporus nobilissmus	noble polypore	Documented	**Yes**
Choiromyces venosus		Suspected	**Yes**
Chroogomphus loculatus		Suspected	**Yes**
Cortinarius barlowensis		Documented	**Yes**
Cudonia monticola		Documented	**Yes**
Cystangium idahoensis		Suspected	**Yes**
Gastroboletus imbellus		Suspected	**Yes**
Gomphus kauffmanii		Documented	**Yes**
Helvella crassitunicata		Documented	**Yes**
Hygrophorus caeruleus		Suspected	**Yes**
Leucogaster citrinus		Documented	**Yes**
Macowanites mollis		Documented	**Yes**
Mythicomyces corneipes		Documented	**Yes**
Octaviania macrospora		Documented	**Yes**
Otidea smithii		Documented	**Yes**
Phaeocollybia attenuata		Documented	**Yes**
Phaeocollybia californica		Documented	**Yes**
Phaeocollybia olivacea		Documented	**Yes**
Phaeocollybia oregonensis		Documented	**Yes**
Phaeocollybia piceae		Suspected	**Yes**
Phaeocollybia pseudofestiva		Documented	**Yes**
Phaeocollybia scatesiae		Documented	**Yes**
Pseudorhizina (=Gyromitra) californica		Documented	**Yes**
Ramaria amyloidea		Documented	**Yes**
Ramaria araiospora		Documented	**Yes**
Ramaria aurantiisiccescens		Documented	**Yes**
Ramaria gelatiniaurantia		Documented	**Yes**

Ramaria spinulosa var. *diminutiva*		Suspected	**Yes**
Rhizopogon exiguus		Suspected	**Yes**
Rhizopogon inquinatus		Suspected	**Yes**
Sowerbyella rhenana		Documented	**Yes**
Stagnicola perplexa		Documented	**Yes**

IV. Step 2: Field Reconnaissance

I conducted field surveys along the proposed mountain bike trails for two-and-a-half months (from August through October 2010). The proposed trails were marked with pin flags placed in the ground. I hiked most of the trails three or, in some cases, more times looking for special-status (rare) botanical species, including Survey and Manage species (ROD 2001). Habitats surveyed included live tree and shrub boles and branches, downed branches, the forest floor, litter, large downed logs, snags, and rock.

The surveys were designed to detect epigeous (aboveground fruiting), but not hypogeous (belowground fruiting), fungi of the 31 special-status fungi identified as having potential habitat in Step 1 even though surveys for a number of these species, particularly the hypogeous fungi, are not considered practical. Positive identification of these species requires findng their aboveground fruiting bodies (mushrooms) or belowground fruiting bodies (truffles and false truffles) that do not fruit each year. Sporocarp (fruiting body) production is variable and unpredictable from year to year for all fungi (Vogt et al. 1992), so a one-time (e.g., 2010 fall) survey cannot reliably determine species presence or absence. Searching for truffle or false truffle species involves removing soil, duff, and litter by digging in the ground or raking the ground. Because of the challenges associated with surveys for fungi, surveys for many fungal species are considered to be impractical. Presence of a special-status fungal species is assumed if there is a documented site or if suitable habitat for a species was found in the proposed project area.

V. Step 3: Risk Assessment

BOTANY/ECOLOGY – VEGETATION EFFECTS ANALYSIS

Vegetation Effects

Compared to the clearing of forest and glades (a total of about 79 acres) in 2006-2007 for the Timberline Express ski runs, the proposed construction of about 17.2 miles of trails (totaling about 14 acres of ground disturbance) for a Timberline mountain bike park constitutes a much smaller environmental impact on forests and meadows in RLK & Company's special-use permit area (1,415 acres). As seen from a bird's-eye view, the proposed mountain bike trails would be comparable to narrow corridors threading their way across the landscape. Direct impacts from trail construction and subsequent mountain bike traffic on vegetation, soils, and soil biota (including mycorrhizal fungi that benefit trees and other plants) would be limited, for the most part, to trails, so long as mountain bike riders remain on designated trails and do not widen them. Trails have been laid out to avoid cutting any trees greater than 6 inches in diameter-at-breast-height during trail construction. Larger and older trees would not be impacted. All of that said, however, there are vegetation and habitat impacts associated with the proposed project that are of concern:

1. Disturbance of subalpine, meadow, and forest habitats
    - Incursion and disturbance in subalpine meadows and openings, high montane meadows, and high montane forest
    - Clearing of native plant cover, particularly sensitive subalpine vegetation
    - Potential for trail widening and damage (e.g., the formation of ruts, grooves, gullies, and berms)
    - Potential for the creation of informal (unauthorized) trails or shortcuts between designated trails
2. Alteration of forest structure
    - Removal of snags considered a potential hazard to mountain bike riders along trails
3. Damage to tree roots
    - Creation of entry wounds for disease pathogens
    - Increased tree mortality
4. Introduction of invasive non-native plants and disease pathogens by mountain bike riders
    - Presently there are only a few invasive non-native species (bird's-foot trefoil, oxeye daisy, prostrate knotweed, white clover) in the proposed project area. The likelihood that mountain biking will introduce more invasive plant species is moderate to high.
    - Invasive plant species that could be introduced include hawkweeds (orange, meadow, and common), knapweeds (spotted, diffuse, and meadow), garlic mustard, St. John's-wort, herb Robert, shining geranium, Canada thistle, tansy ragwort, oxeye daisy, and hairy cat's-ear.
    - Shift in composition of native plant communities and decrease in native plant diversity
    - Removal of rocks to line trails risks creating opportunities for invasive plants to establish
    - Risk of introducing native or exotic plant pathogens (e.g., root rots) leading to increased tree mortality
5. Increase in human detritus (litter and lost or discarded items)

Incursion by mountain bike trails in subalpine habitat (meadows and openings) and high montane forest in the proposed project area would add another layer of disturbance to these habitats following on the heels of a network of downhill ski runs (79 acres) cleared in the special-use permit area in 2006-2007. Trail construction would remove sensitive subalpine and high montane vegetation (e.g., alpine aster, broadleaf lupine, Cascade aster, diffuse phlox, Hitchcock's smooth woodrush, mountain arnica, mountain mariposa lily, Mt. Hood pussypaws, partridge foot, Newberry's fleeceflower, Pacific lupine [dwarf lupine], scarlet paintbrush) that have managed to sparsely populate these harsh environments. (See appendix for a complete list of botanical species in the proposed project area.) Lone individuals or small groups of plants grow isolated in many places in a matrix of open, bare, exposed, volcanic soil with sparse to no overstory. It takes a long time for such pioneering high-elevation plant species to colonize timberline environments characterized by a short growing season (July-September), long winters with persistent snowpacks (November-June), and extremely nutrient-poor soils. Plants in upper mountain zones are well adapted to short growing seasons, low summer air and soil temperatures, high interannual variability in climate, and intense ultraviolet radiation (Rochefort et al. 2006). Perennial plants of short stature often dominate these plant communities. The few annuals that do grow in this zone must be able to germinate, flower, and set seed within just a few weeks. Perennial plants often have high root/shoot ratios and have the ability to spread vegetatively. They establish in exposed areas with virtually no soil organic matter and bind soil particles, preventing soil erosion, particularly during snowmelt in June and July.

Such plants really do survive on the ecological edge. Future efforts to restore sparsely vegetated timberline habitat, once disturbed by trail construction and mountain bike traffic, will be challenging. Lower in elevation, high montane meadows, by contrast, support a lush cover of Cascade aster, broadleaf lupine, dwarf bramble, Hitchcock's smooth woodrush, mountain arnica, diffuse phlox, green false hellebore, sedges, rushes, grasses, and other species. These meadows remain undisturbed throughout the year, receiving few human visitors in the summer and lying under deep snow during the ski season. Mountain bike trails will clear vegetation, fragmenting and disturbing these meadows. There is a high likelihood that trampling of vegetation along the sides of trails or through the creation of informal (unauthorized) trails made by "rogue riders" will occur despite the best intentions of the trail designers and RLK & Company.

Removal of snags considered hazardous because they could potentially fall on riders along proposed trails would negatively alter forest structure in the proposed project area if quite a number of them are removed. There are many snags along the proposed trail system in the proposed project area. Snags are an important forest component, a source of coarse woody debris that provides a diversity of ecological functions (e.g., organic matter, nutrient cycling, water storage, and habitat for soil biota and wildlife). Construction of ski runs in the special-use permit area has already fragmented formerly contiguous forest into remnant patches. Removal of a large number of snags would further fragment these forest stands.

Even with careful armoring of trails to buffer impacts to root systems, mountain bike traffic will damage tree roots (through compaction or abrasion), making trees more susceptible to disease. The routing of some mountain bike trails through "stringers" (narrow bands of residual forest), particularly in the upper third of the proposed project area containing subalpine and high montane forest, which now function as important refugia for plants and wildlife and reduce soil erosion from wind, would compact the root zone (*rhizosphere*) of residual trees, damaging their roots and thereby making trees more susceptible to disease, leading to increased tree mortality in these remnant patches of forest.

Rocks of various sizes would be pried out and moved from locations nearby to armor the surface of trails, resulting in soil disturbance additional to that caused by trail construction, creating growing space opportunities for invasive non-native plants where rocks are pried out.

Risk of Introducing Invasive Non-Native Plants or Plant Pathogens

Mountain bikers can transport invasive non-native plants and seed on their bikes, shoes, or clothes, greatly increasing the risk of introducing invasive plants in the special-use permit area. Presently, there are only a few invasive non-native plant species (bird's-foot trefoil, oxeye daisy, and prostrate knotweed) in the proposed project area, all in areas that have been disturbed (ski runs, roadsides, trailsides, building perimeters). Populations of bird's-foot trefoil (*Lotus corniculatus*) and oxeye daisy (*Leucanthemum vulgare*) can be found along the perimeter of Wy'East Lodge. Populations of prostrate knotweed (*Polygonum aviculare*) and white clover (*Trifolium repens*) are scattered among wood stand (wood fiber mulch) in the Timberline Express ski runs, evidently introduced in the wood strand or the seed mix that was applied to these areas in 2007. Mountain biking will likely introduce more invasive non-native plant species into the proposed project area.

Disturbance of vegetation and soils from mountain biking, as with hiking and horse riding, is likely to introduce invasive non-native plants (weeds) although there appear to be no research studies yet documenting invasive plants on trails used for mountain biking (Pickering et al. 2010). Similarly, no studies examining mountain bikes as weed seed vectors have been found in searches of the scientific literature simply because few studies have been done yet (Pickering & Mount 2009). However, mountain bikes clearly have the potential to act as vectors for the transport of weed seed (Pickering et al. 2010). Studies on vehicles as weed vectors indicate that seed from over 505 invasive non-native plant species can be transported over long distances by vehicles (Pickering & Mount 2009). Ferguson (2008) expresses her distress over the spread of the invasive plant garlic mustard (*Alliaria petiolata*) in forests in Ontario by free-riding (off-trail riding) mountain bikers. Garlic mustard, regarded as an ecosystem-altering invasive non-native plant species because of its ability to completely overrun forest understories, has spread from the town of Corbett to hiking trails in the Columbia River Gorge by recreationists (e.g., hikers, golf frisbee players) and animals (e.g., deer and elk). A population was recently found on the south side of the town of Welches by biologists with The Nature Conservancy—the first and only sighting of the plant so far in the upper Sandy River Basin. Meadows and glades in the Timberline special-use permit area are vulnerable to invasion by orange and meadow hawkweed (*Hieracium aurantiacum* and *H. pratense*). Populations of these invasive plant species already occur along Lolo Pass Road (west of Mt. Hood), along the Pacific Crest trail near Lolo Pass, and in the Mt. Hood Wilderness Area. Increased human activity will increase the risk of transporting such invasive species from source populations to uninfested areas like the proposed mountain bike park.

Similarly, plant pathogens can be transported from infected areas to uninfected areas by hikers, vehicles, animals, and mountain bikers. For example, mountain bike tires have been found to carry the spores of *Phytophthora ramorum*, a root pathogen causing sudden oak death syndrome in oaks and other plant species in California and the Pacific Northwest (Cushman et al. 2007). Wildlife, cattle, hikers, and workers in the woods can transport the root pathogen *Phytophthora lateralis*, which attacks and kills Port Orford cedar in southwestern Oregon and northern California, by moving spore-infested mud on feet and boots (Jules et al. 2002). *P. ramorum* is restricted mostly to oaks and *P. lateralis* to Port Orford cedar, so neither of these two pathogens would affect plant species in the special-use permit area. But mountain bikers could transport similar plant pathogens into forest stands in the special-use permit area that are not present there now.

Mountain biking increases the risk of introducing invasive non-native plants and disease pathogens not present in the special-use permit area, especially given that mountain biking visitors to the special-use permit area will have likely been in other mountain bike parks or riding areas elsewhere in the United States, Canada, or abroad that may contain invasive plants or disease pathogens not found in the special-use permit area.

Increase in Human Detritus

Pickering et al. (2010) observe that if mountain bike riders go on overnight rides in natural areas, human waste may introduce a range of biophysical impacts into the environment. Although there will be no overnight rides in the proposed Timberline mountain bike park, the potential for introducing human waste into meadows and forest may increase substantially given that restroom facilities are only located at the Wy'East Lodge. Mountain bike riders may find it easier to stop along trails and relieve themselves outdoors rather than waiting until the chairlift ride back to the Wy'East Lodge. Lost or discarded human detritus (e.g., trash/litter, plastic water bottles, soft drink cans, clothing) along the trails would certainly increase. There are already beverage cans, plastic water bottles, clothing, and other human detritus that have been either lost or discarded by skiers scattered throughout the proposed project area. Trash is not only unsightly but degrades the subalpine and forest environment.

Scientific Research on Mountain Biking Effects

Overview

There is very little published research on the biophysical impacts of mountain biking (Pickering et al. 2010). Some research has been done on the effect of mountain biking on vegetation and soils, but much more is needed to evaluate mountain biking effects for a range of variable environmental conditions and circumstances (Davies & Newsome 2009). A number of recent studies, including literature reviews, summarize current knowledge about the environmental impacts of mountain biking (Pickering et al. 2010, Quinn & Chernoff 2010, Davies & Newsome 2009, Newsome & Davies 2009, Marion & Wimpey 2007, Sprung 2004, Vandeman 2004, Lathrop 2003). The present scientific consensus is that the environmental/ecological effects of mountain biking are not well-understood (White et al. 2006, Newsome & Davies 2009). As with all recreational activities, it is clear that mountain biking causes environmental damage, such as general trail erosion, reduction in water quality, disruption to wildlife, and changes to vegetation, but these impacts have rarely been quantified and there is room for additional work that attempts to understand the impacts of mountain bike activity on trails (Cessford 1995, Goeft & Adler 2001, Marion & Olive 2006, Marion & Wimpey 2007, Thurston & Reader 2001, White et al. 2006, Newsome & Davies 2009). Sprung (2004), White et al. (2006), and Marion & Wimpey (2007) conclude that mountain biking causes no more damage than hiking. In their study of mountain biking in the southwestern United States, White et al. (2006) concluded that the magnitude of ecological impacts attributed to mountain biking appears to be less than that from motorized trail use and equestrian use. By contrast, Vandeman (2004) and Lathrop (2003) contest the conclusion that mountain biking is no more harmful than hiking, arguing that important characteristics of mountain biking have been ignored, not considered in depth, or not rigorously tested or quantified in scientific studies: e.g., speed; increase in distance traveled; increase in numbers of visitors that bikes allow; increased trail-building with its attendant habitat destruction; sidehill as well as downhill displacement of soil; trail incision (the creation of ruts and grooves); damage to plant roots and soil organisms; effects on wildlife; high-impact riding (skidding, braking, acceleration, turning); tire tread; and noise. The increased distance of travel for the average mountain bike ride compared to the average hike translates into greater impacts to vegetation, soils, and wildlife (Vandeman 2004, Newsome & Davies 2009). There is a scarcity of data regarding the impacts of mountain bikers being able to travel much farther per trip than hikers and to make more trips per day than hikers, increasing the potential of their environmental impacts (Newsome & Davies 2009).

Curvilinear Use-Impact Relationship

Literature reviews of mountain biking studies are conducted within the framework of recreation ecology--the study of the biophysical effects of recreational activity (Quinn & Chernoff 2010). An important theoretical generalization in recreation ecology is the *curvilinear use-impact* relationship, which suggests that the greatest proportion of ecological effect occurs during the initiation and early use period of a new facility or infrastructural development (Quinn & Chernoff 2010). "Curvilinear" refers to an exponential or power curve—and, in the case of vegetation and soil disturbance caused by mountain biking, a downward-tending curve with successive runs/passes on a trail. The curvilinear use-impact phenomenon has been clearly established for a wide variety of soils and vegetation responses to activity, suggesting that the majority of environmental effects occur when a trail is first developed or constructed (Quinn & Chernoff 2010). Many studies have shown that the most damage to plants and soils occur with initial traffic and that the per capita increase in further impact diminishes rapidly with increasing subsequent traffic (Marion & Wimpey 2007). Bjorkman (1998) examined biophysical changes on newly opened mountain bike trails in a state forest over five seasons and found that soil and vegetative changes in trails occurred rapidly initially and then tapered off, exemplifying the curvilinear use-impact relationship found in past research (cited in Pickering et al. 2010). Slope was identified as the most important factor in influencing the changes in trail condition while the level of use did not play a significant role (Pickering et al. 2010). The curvilinear use-impact phenomenon observed with mountain bike use, however, is hardly astonishing: most vegetation is trampled or denuded, soil compacted, and trails incised with ruts or grooves during the early phase of a trail's life with subsequent bike runs (e.g., after a hundred or more riders have ridden the trail) causing less damage because the vegetation is already gone and the trail is already compacted or incised.

Mountain Biking: Environmentally Sustainable or Not?

Marion & Wimpey (2007) conclude that environmental degradation from mountain biking can be avoided or substantially minimized when traffic is restricted to well-designed and managed trails. The best trail systems avoid the habitats of rare flora and fauna and greatly minimize soil erosion, muddiness, and tread widening by focusing traffic on side-hill trail alignments with limited grades and frequent grade reversals (Marion & Wimpey 2007). In a study comparing effects of recreational mountain bike use versus mountain bike racing in southwestern Australia, Geoft & Alder (2001) concluded that mountain biking is sustainable, even with bike riders preferring downhill runs, steep slopes, and curves, as long as trails are appropriately designed, located, and managed. By contrast, recent work in western Australia by Davies and Newsome (2009) and Newsome and Davies (2009) found a range of specific social and biophysical impacts arising from mountain biking. These include trail impacts such as erosion from skidding, linear rut development, user conflict, and the addition of unauthorized constructed features to existing trail networks. In addition, a number of off- trail impacts were identified including the creation of informal (unauthorized) trails and creation of constructed features (technical trail features) with a potentially significant cost associated with this when management has to respond to such impacts. Furthermore, multiple linear rut incision, the addition of technical trail features, and informal (unauthorized) trail development are impacts specific to mountain biking (Davies & Newsome, 2009, Newsome & Davies 2009). The researchers identify impacts from mountain biking to be a significant management problem both on and off trails. Impacts such as the deliberate modification of existing trail networks and the creation of informal trails relate to particular riding styles, especially the thrill-seeking aspect of downhill riding, free riding, and dirt jumping.

Downhill Riding

Davies and Newsome (2009) and Newsome & Davies (2009) examine different rider styles: cross-country, touring, downhill, free riding, and dirt jumping. Downhill riding generally has greater potential for trail impacts than cross-country riding, due to more aggressive riding styles, steep slopes, heavy bikes, and and high spectator numbers (pedestrian traffic on trail sides) during racing events (Davies & Newsome 2009, Newsome & Davies 2009). The extent and severity of mountain biking impacts appear to be connected with different riding styles, with impacts likely to be greater when riding is faster, is less controlled, occurs on steeper slopes, and occurs in wetter conditions (Davies and Newsome 2009). Trail erosion can be dependent on site and soil conditions and riding behavior (Chavez et al. 1993). As with other forms of trail-based recreation (e.g., hiking, horseback riding), research has shown that the soil type (erodability), terrain relief, and amount of moisture have the greatest influence on the significance of mountain biking effects on soils (Quinn & Chernoff 2010). Researchers have reported that cycling technique and skill level influences the level of impact on soils, with braking/skidding and cutting switchbacks creating the most damage.

Mountain Biking Impacts Compared to Other Recreational Activities

When mountain bikers ride conservatively in controlled experiments over sections of trail the impacts are often comparable to those of a hiker (Marion & Wimpey 2007, Sprung 2004, cited in Newsome & Davies 2009); however, it cannot be assumed that all bikers will be conservative in their riding style and there is the risk of impacts becoming more severe on slopes and wet ground when mountain bikers engage in cornering, skidding, or braking (Cessford 1995, Chiu & Kriwoken 2003, Goeft & Alder 2001, cited in Newsome

& Davies (2009). Braking and skidding activities loosen the trail surface, displace soil down the slope, and create ruts, berms, or cupped trails, which can channel water flow and create severe erosion problems (Newsome & Davies 2009). Tire tracks can form continuous ruts and gullies through which it is easier for water to flow, exacerbating erosion (Foreman 2003, Horn et al. 1994). Mountain bikers of any style and experience level are more likely to skid and brake on steeply sloping trails that contain many bends. Erosional impacts can be minimized through the provision of sight lines, ensuring there are no abrupt changes in direction or surface material and using materials that are not susceptible to erosion. Surface water can greatly increase the rate of trail degradation so trails must be designed so that water does not pool but discharges from the trail without carrying soil with it (Webber 2007). The possibility remains that the construction of well-designed trails and technical trail features (TTFs) will not work in reducing environmental damage because a significant proportion of mountain bike riders are "extreme sport" enthusiasts who will never be satisfied with the trails and trail features provided in a bike park and so will instead seek new challenges and thrills through off-trail or high-impact riding (Newsome & Davies 2009). The aggressive and thrill-seeking approaches to mountain biking are likely to remain a constant management problem (Newsome & Davies 2009). Mountain bikers, like horse and vehicle users, travel farther than hikers due to their higher speed of travel. This means that their use on a per-unit time basis can affect more miles of trail or wildlife than hikers (Marion & Wimpey 2007).

Factors Contributing the Most Damage

Mountain bikes have the greatest potential to damage trails in wet and muddy conditions and on steep uphill (spinning tires) and downhill slopes (skidding, braking) (White et al. 2006). Prevention may prove problematic for managers because many mountain bikers prefer challenging technical sections (White et al. 2006). Goeft and Alder (2001) examined changes in soil compaction, erosion, trail width, and vegetation cover over one year on both recreation and racing trails in southwestern Australia. They noted that erosion was greatest on downhill slopes and at curves. Widening was also more likely on wet soils and during the rainy season (Goeft & Alder 2001). Consistent with previous mountain bike trail research (Goeft & Alder 2001, Wilson & Seney 1994), impacts (particularly trail incision) are greater with increasing slope (White et al. 2006). In their study in the southwestern United States, White et al. (2006) found that impacts were significantly lower for slopes less than 5% compared to slopes 5% to 10% and significantly higher for slopes greater than 10%. Greater impact (i.e., incision) occurred with increasing slope (White et al. 2006). Also, generally, as slope increases, trail width, too, increases (White et al. 2006). Heavy use and user behavior appear to contribute to increased width. Research suggests that as faster mountain bikers pass others on higher-use trails, they leave the main trail, disturbing soil and vegetation. Moderate to steep slopes are a management concern because of the likelihood of increased incision (White et al. 2006). Management is potentially problematic as studies have shown that mountain bikers tend to prefer trails with steeper slopes, downhill features, and sharp curves (Cessford 1995, Goeft & Alder 2001, Hollenhorst et al. 1995). Mountain biking impacts can vary depending on a complex of physical, ecological, and social variables (e.g., climate, soil types, slope, vegetation, level of use, and user behavior)(White et al. 2006).

Effects on Soils & Vegetation

Soils and vegetation are vulnerable to mountain biking. Damage to soils and vegetation can occur very quickly (Ferguson 2008). When soil is disturbed, the valuable upper layers of the soil become susceptible to erosion (soil loss). In contrast to the rapid loss of topsoil from mountain biking, hiking, or horse riding, it takes a long time (decades or much longer depending on the ecoregion) to create just a centimeter of topsoil (Ferguson 2008, Marion & Wimpey 2007). Loss of soil from erosion also means a loss of soil nutrients that are important to nutrient cycling in forests and meadows. Soil compaction, erosion, trail widening, and vegetation disturbance are commonly cited impacts associated with mountain biking that vary in severity with location, soil type, rainfall, and use (Sun & Walsh 1998).

Soil structure, slope, and environmental factors are as influential as type and amount of use in determining impacts such as soil loss. If managed properly, impacts such as compaction and vegetation loss can be confined to the trail, with minimal damage to trail peripheries (White et al. 2006). The creation and maintenance of trail corridors remove shrubs and trees, allowing greater sunlight exposure that favors a different set of groundcover plants within trail corridors (Marion & Wimpey 2007). Trampling (the action of crushing or treading upon vegetation, either by foot, hoof, or tire) causes a wide range of vegetation impacts, including damage to plant leaves, stems, and roots, reduction in vegetation height, change in the composition of species, and loss of plants and vegetative cover (Marion & Wimpey 2007, Leung & Marion 1996, Thurston & Reader 2001). Trailside trampling within trail corridors favors the replacement of fragile plants (e.g., broadleaved herbs) with those more resistant to trampling traffic (e.g., grasses, sedges) or those able to exploit disturbed ground (e.g., invasive non-native plants). Trail construction, use, and maintenance can be harmful when trails divide sensitive or rare plant communities. Trampling associated with avoidable off-trail traffic can quickly break down vegetation cover and create a visible route that attracts additional use (Marion & Wimpey 2007). Informal (unauthorized) trails can be created rapidly with a substantial amount of vegetation and soil impact occurring in a relatively short period of time (Webber 2007). Complete loss of vegetation cover occurs quickly in shady forested areas and less quickly in open areas with resistant grassy vegetation (Marion & Wimpey 2007). Studies have consistently revealed that most impact occurs with initial or low use, with a diminishing increase in impact associated with increasing levels of traffic (Hammit

& Cole, 1998; Leung & Marion, 1996). Once trampling occurs, however, vegetative recovery is a very slow process (Marion and Wimpey 2007, Ferguson 2008).

Compositional changes in vegetation along trails can have beneficial or adverse effects. Trampling-resistant plants (e.g., certain grasses and sedges) provide a durable groundcover that reduces soil loss by wind and water runoff and have root systems that stabilize soils against displacement by heavy traffic (Marion & Wimpey 2007). Invasive non-native vegetation can be introduced to and spread along trail corridors (Ferguson 2008). Many of these species are associated with disturbance and are naturally limited to areas where vegetation is routinely trampled or cut back. However, many non-native species, once introduced, are able to out-compete native plants and spread from the trail corridor into undisturbed habitats. Some of these species form dense cover that crowds out or displaces native plants. Removal or control of invasive plants is difficult and expensive. Restoration of the sides of trails where riders have physically damaged plants and trees is difficult (Ferguson 2008). Young trees (saplings and seedlings), shrubs, and forbs—all are vulnerable to trampling from a mountain bike pass. Native understory species, once knocked over or ridden over, may be damaged to the point of non-recovery within a growing season (Ferguson 2008). Additionally, plants that have been placed in the ground for restoration efforts are already faced with the challenge of survival due to their sensitivity to environmental stresses; coupled with damage from mountain bikes the risk of a transplant not surviving increases (Ferguson 2008).

Mountain Biking and the Spread of Invasive Plants

Little scientific research exists investigating the potential of mountain biking to introduce and spread invasive non-native (exotic) plants. Consequently, researchers have been cautious in making any generalizations or drawing any conclusions. For example, mountain bike trails as vectors for the spread of invasive non-native (exotic) plant species have been identified as a concern, but little empirical work is available to draw any conclusions beyond the knowledge that exists for other similar hiking and horse trails (Quinn & Chernoff 2010). Despite the considerable literature documenting the presence of weeds along roads and trails, there is a lack of experimental studies assessing the direct and indirect role of hikers, horse riders, and mountain bikers, respectively, in the introduction and spread of weeds; further research is required into the potential of mountain bikes, horses, and people to act as vectors for weed seeds and to cause environmental disturbance that favors weeds (Pickering et al. 2010). That said, however, there is an ample body of scientific literature in the field of weed ecology documenting that invasive plants are able exploiters of disturbed ground and increase at sites that have been disturbed (e.g., see Pickering & Mount 2010). It is also well established that people and animals are weed vectors. People introduce weeds into natural areas, transporting their seeds on motorized or non-motorized vehicles (e.g., tires, wheels, radiator grilles, undercarriages, bike chains, pedals), clothing, and shoes. Roads and trails are primary conduits for their spread. Soil disturbance allows for the invasion of undesirable non-native species by creating an unfavorable soil environment for native plants to reproduce and grow but one exploitable by opportunistic non-native plants (Ferguson 2008). Incursion by an invasive plant species can last a lifetime (the span of a human life) if there is no effort to prevent it from colonizing or to control it once present. Control of a species, once it has invaded, is much more costly than preventing it from establishing in the first place. Many invasive non-native plant species are associated with disturbance and are naturally limited to areas where vegetation is routinely trampled or cut back (Marion & Wimpey 2007); however, some non-native species, once introduced to trail corridors, are able to out-compete native plants and spread away from the trail corridor into undisturbed habitats (Ferguson 2008). Some of these species form dense cover that crowd out or displace native plants. Unfortunately, removal of invasive species is difficult and expensive. Control rather than eradication is the usually the most realistic outcome.

Cumulative Effects to Vegetation: Layers of Disturbance

Viewed in the larger context of both past and future disturbances, a Timberline mountain bike park would add another layer of disturbance to subalpine and high-montane forests and meadows in the special-use permit area (1,415 acres in size). Past disturbance (construction of ski runs, chairlifts, and service roads, including those recently constructed for the Timberline Express project in 2006-2007, and four existing mountain bike trails) has removed vegetation and disturbed soils in the special-use permit area. A 1952 aerial photo shows roughly 593 acres of forest in the special-use permit area at that time. Since then, roughly 103 acres of forest have been removed for ski runs, a 17 percent reduction in forest habitat, leaving roughly 490 acres of forest remaining. Future disturbance would likely include expansion of downhill mountain bike trails, if approval is granted to build a Timberline mountain bike park, expansion of ski runs, and possible construction of a day lodge lower down on the mountain near Highwy 26. Future expansion of recreational opportunities in the special-use permit area would be driven by population growth in the Portland metropolitan area (Portland is expected to double in population size by 2040). Expansion would remove more vegetation and disturb more soils in the special-use permit area, fragmenting meadows and forest, altering and reducing native plant communities in meadows and forest, and increasing the risk of introducing and spreading invasive non-native plants.

Ecologically, the cumulative disturbance to forest and meadows in the special-use permit area reduces their resiliency to future environmental stresses (e.g., climate change, summer drought, disease, insect attack, invasion by non-native plants). Future expansion of recreational opportunities in the special-use permit area would place additional environment stresses on forest and meadows. Structural fragmentation of residual forest and trail incursion in meadows lower the environmental quality and health of these habitats and devalue their aesthetic quality for the general visitor. Subalpine and high-montane forest and meadows (i.e., particularly in the upper half of the proposed project area) grow on shallow, volcanically derived soils low in organic matter and nutrients, which slow tree establishment and growth. Fragmentation of meadows and forest could expand from the special-use permit area into adjacent forest and meadows currently outside the permit area if approval were granted by the Forest Service to expand the permit area in the future. Cumulative disturbance (e.g., forest and meadow incursion, forest and meadow fragmentation, soil disturbance, removal of vegetation) adds up over time with successive projects, affecting forest and meadow resilience and affecting the ecosystem services and values they provide. Ecological restoration of disturbed areas in subalpine and high montane habitats on the south face of Mt. Hood caused by mountain biking (e.g., trail widening, linear rut development, creation and expansion of informal trails or shortcuts between designated trails) and other recreational development would be a challenging task given the harsh climate (long, cold winters and short growing season) and thin volcanic soils low in organic matter and nutrients that are characteristic for the area.

Forest Plan Revision: Addressing the Future of the Special-Use Permit Area

RLK & Company, the concessionaire at Timberline Lodge and the proponent of the mountain bike project, developed a master plan for the special-use permit area in 1975 that includes the creation, improvement, and expansion of recreational opportunities and existing facilities for all visitors (hikers, skiers, snowboarders, climbers, and mountain bikers). Future projects to improve or expand existing recreational opportunities in the area will undoubtedly be proposed as the population of Portland continues to grow (it is expected to double to two million people by 2040). Expanding human population growth will exert enormous pressure and stresses on the natural resources on the south face of Mt. Hood. Human population growth is beyond the control of the Forest Service; however, future recreational development on Mt. Hood’s south face is not. A forest plan revision, planned for some time during 2015-2020, would update the current forest plan (prepared in 1990), re-analyze the special-use permit area, and provide future management direction for the area in light of past development and the certainty of future development. The forest plan revision should provide the Forest Service’s long-term vision and management plan for the south face of Mt. Hood, finding an appropriate ecological balance between recreational development and conservation of remaining forest and meadows in the special-use permit area.

Recent expansion of wilderness area on Mt. Hood enacted by Congress certainly goes a long way in protecting the mountain’s natural resources. Supporters of the mountain bike park argue that any negative effects associated with the proposed project (e.g., meadow and forest incursion, alteration of forest structure, removal of vegetation, displacement of wildlife, introduction of invasive plants) will be buffered by the expanse of intact wilderness and habitat that surround the special-use permit area. Whatever the strengths or weaknesses of this argument, another layer of disturbance added to the special-use permit area would certainly result in additional impacts to the unique environmental and historical character of the area. Meadows and forest in the permit area, however fragmented and disturbed, remain an integral (interconnected) part of the network of subalpine and high montane ecosystems that encircle Mt. Hood, all of which are highly sensitive to environmental stresses and highly vulnerable to recreational development that test their resilience.

Survey Results

Federally Listed Threatened or Endangered Species

Howellia aquatilis is the only vascular plant species suspected to occur on the Mt. Hood National Forest that is federally listed as threatened by the U.S. Fish and Wildlife Service. *H. aquatilis* is generally confined to palustrine wetlands. There are no documented sites for it on the Mt. Hood National Forest. Wetlands are excluded from the proposed project; therefore, the proposed action would have **NO EFFECT** on this threatened species. There are no plants in Region 6 that are federally listed as endangered.

Special-Status Species

Bryophytes

Populations of the moss *Rhizomnium nudum* (both a Region 6 Sensitive and Survey & Manage species) were found in the proposed project area in the riparian/wetland complex associated with Still Creek and it tributaries adjacent to and above the Jeff Flood ski chairlift terminal. These populations were found during survey work for the Timberline Express EIS (2005). I did not attempt to refind these populations during surveys for the proposed mountain bike park because the proposed bike trails lie outside the riparian/wetland complex where the populations are located. I did find a population of *R. nudum* along the toe of the streambank for Still Creek about 50 ft. north of a proposed mountain bike trail; however, this proposed trail was later dropped by Gravity Logic for reasons other than the presence of *R. nudum*.

Fungi

Two special-status fungi, *Ramaria araiospora* and *Ramaria aurantiisiccesens*, were found within proposed mountain bike trails.

Ramaria araiospora is a mycorrhizal coral fungus endemic to the Pacific Northwest with 78 known sites documented on national forest lands in Region 6, two of them on the Mt. Hood National Forest (NRIS database, 2011). Habitat for the species is humus or soil in coniferous forests.

Ramaria aurantiisiccescens is a mycorrhizal coral fungus endemic to the Pacific Northwest with sites known from western Washington to northern California. Only nine known sites are now documented on national forest lands in Region 6, six of them on the Mt. Hood National Forest (NRIS 2010). Habitat for the species is humus or soil in coniferous (true fir, Douglas-fir, and western hemlock) forest.

Other Fungi

Because *Bridgeoporus nobilissimus* conks (sporocarps) are perennial and, therefore, detectable year-round, surveys for this species are practical and required in areas with suitable habitat for this species. No *B. nobilissimus* conks were found in the proposed project area during field surveys. Therefore, there will be **no impact** to this special-status fungal species.

Bridgeoporus nobilissimus is known from several sites on the Zigzag Ranger District (Larch Mountain, Wildcat Mountain, the Bull Run watershed), the far west side of the Clackamas River Ranger District (Goat Mountain, South Fork Mountain, and in the vicinity of Memaloose Lake and Williams Lake), and on nearby Salem District BLM-administered lands. There are 12 known sites on the Mt. Hood National Forest (NRIS 2010). It is certain that the perennial conk of *B. nobilissimus* is present elsewhere on the Clackamas River and Zigzag Ranger Districts in forests and within road prisms wherever large-diameter noble fir or Pacific silver fir stumps, snags, and live trees are present. This conk is present year-round, growing at the base of large-diameter noble fir or Pacific silver fir stumps, snags, and, occasionally, live trees—and sometimes out of the ground. It is known from road prisms (FS road 2609 on Wildcat Mountain) and young plantations, where it is always associated with large-diameter true (noble or Pacific silver) fir stumps or snags.

The following 30 special-status fungi have a reasonable likelihood of occurring in the proposed project area. Surveys for these species are not considered practical so they are simply assumed to be present in the proposed project area. A brief discussion is included below for each species. The proposed action may have an impact on individuals or their microhabitat, but neither the construction of mountain bike trails nor mountain bike traffic along trails, if they are constructed, are expected to lead to a trend toward federal listing of any of these species of fungi.

1. *Alpova alexsmithii*
2. *Choiromyces venosus*
3. *Chroogomphus loculatus*
4. *Cortinarius barlowensis*
5. *Cudonia monticola*

6. *Cystangium (=Martellia) idahoensis*
7. *Gastroboletus imbellus*
8. *Gomphus kauffmanii*
9. *Helvella crassitunicata*
10. *Hygrophorus ceruleus*
11. *Leucogaster citrinus*
12. *Macowanites mollis*
13. *Mythicomyces corneipes*
14. *Octaviania macrospora*
15. *Otidea smithii*
16. *Phaeocollybia attenuate*
17. *Phaeocollybia californica*
18. *Phaeocollybia olivacea*
19. *Phaeocollybia oregonensis*
20. *Phaeocollybia piceae*
21. *Phaeocollybia pseudofestiva*
22. *Phaeocollybia scatesiae*
23. *Pseudorhizina (=Gyromitra) californica*
24. *Ramaria amyloidea*
25. *Ramaria gelatiniaurantia*
26. *Ramaria spinulosa* var. *diminutive*
27. *Rhizopogon exiguous*
28. *Rhizopogon inquinatus*
29. *Sowerbyella rhenana*
30. *Stagnicola perplexa*

1. *Alpova alexsmithii*, in the false truffle group, forms fruiting bodies beneath the soil surface and is associated with conifer trees in the Pinaceae family, particularly western hemlock and mountain hemlock, from 1,200 to 3,200 meters in elevation. There are only four known sites on the Mt. Hood National Forest (NRIS 2010).

2. Choiromyces venosus, in the true truffle group, forms fruiting bodies beneath the soil surface under Douglas-fir and western hemlock at low elevations. Only two known sites were reported for this species in the Northwest Forest Plan area in 1999 (Castellano et al.). No known sites are documented on the Mt. Hood National Forest (NRIS 2010), but the species is suspected to occur on the Forest.

3. *Chroogomphus loculatus* is endemic to Oregon and forms fruiting bodies beneath the soil surface. This species is associated with various conifers in the Pinaceae family, particularly mountain hemlock, at mid-elevations. No known sites are documented on the Mt. Hood National Forest (NRIS 2010), but the species is suspected to occur on the Forest.

4. *Cortinarius barlowensis* is widely distributed, known from 16 sites in the western Cascade Range (Oregon and Washington), Coast Range, and Olympic Mountains. There are two known sites from the Mt. Hood National Forest (Zigzag Ranger District). Habitat is soil in coniferous forest.

5. *Cudonia monticola* is endemic to the Pacific Northwest and grows under conifers in the spring and summer. This earth tongue fungus is scattered to gregarious, growing on spruce needles, coniferous debris, humus, soil, or rotting wood. There are two known sites on the Mt. Hood National Forest (NRIS 2010).

6. ***Cystangium idahoensis*** (formerly *Martellia idahoensis*) forms fruiting bodies beneath the soil surface and is associated with the roots of Pacific silver fir, subalpine fir, noble fir, Engelmann spruce, and mountain hemlock from 1,200 to 1,650 meters in elevation. No known sites are documented on the Mt. Hood National Forest (NRIS 2010), but the species is suspected to occur on the Forest.

7. ***Gastroboletus imbellus*** is endemic to Oregon and only one site was reported for this species (on the Willamette National Forest) in 1999 (Castellano et al.). No known sites are documented on the Mt. Hood National Forest (NRIS 2010), but the species is suspected to occur on the Forest. This species forms fruiting bodies beneath the soil surface and is associated with the roots of grand fir, subalpine fir, and mountain hemlock at higher (5,000 ft. or more) elevations.

8. ***Gomphus kauffmanii*** is endemic to western North America and found in California, Oregon, and Washington along the Pacific coast or in the Cascade Range. There are six known sites for this mushroom on the Mt. Hood National Forest. Host trees for *G. kauffmanii* include true firs and pines. *G. kauffmanii* forms symbiotic associations with the fine-root systems of plants.

9. ***Helvella crassitunicata*** is endemic to Oregon and Washington and grows scattered to gregarious on soil, especially along trails, in montane regions with Pacific silver fir, noble fir, grand fir, and subalpine fir. There are only two known sites documented on the Mt. Hood National Forest (NRIS 2010).

10. ***Hygrophorus caeruleus*** is endemic to Oregon and Washington and occurs in soil with roots of conifer trees near melting snowbanks. The species epithet *caeruleus* refers to the blue-tinged color of the mushroom and its blue-green waxy gills. No known sites are documented on the Mt. Hood National Forest (NRIS 2010), but the species is suspected to occur on the Forest.

11. ***Leucogaster citrinus***, a false truffle**,** is endemic to the Pacific Northwest with 45 sites known from western Washington, western Oregon, and northern California. There are four known sites on the Mt. Hood National Forest (Zigzag Ranger District). This belowground-fruiting species is associated with the roots of white fir, subalpine fir, lodgepole pine, western white pine, Douglas-fir, and western hemlock from 280 to 2,000 meters in elevation.

12. ***Macowanites mollis*** is endemic to Oregon and Washington. There is only one known site on the Mt. Hood National Forest (Larch Mountain). This mushroom looks like a disfigured specimen of *Russula* or *Lactarius* and is found in association with the roots of grand fir, Douglas-fir, and western hemlock above 1,000 meters elevation.

13. ***Mythicomyces corneipes*** is widespread across western North America and northern Europe and was reported on the Mt. Hood National Forest (Castellano et al. 2003); however, no known sites are documented on the Mt. Hood National Forest in the NRIS database (2010). This species is in the Cortinariaceae family, is solitary to gregarious in habit, and grows along margins of bogs among mosses or on wet soil under conifers and alder species.

14. ***Octaviania macrospora***, a false truffle, is endemic to Oregon and found in association with the roots of western hemlock. One known site for the entire Northwest Forest Plan area is reported for the Mt. Hood National Forest (Twin Bridges Campground) by Castellano et al.

(1999); however, no known sites are documented on the Mt. Hood National Forest in NRIS (2010).

15. *Otidea smithii* is endemic to the Pacific Northwest, known from 10 scattered sites in western Washington, western Oregon, and northern California. It is also known from Idaho. One location is known on the Mt. Hood National Forest (Clackamas River Ranger District). *O. smithii* grows in soil, duff, or moss under Douglas-fir, western hemlock, and cottonwood.

16. *Phaeocollybia attenuata* is endemic to western North America from British Columbia south to Marin County (northern California) with 131 sites known from western Washington and Oregon to northern California. One known site is reported by Castellano et al. (1999) for the Mt. Hood National Forest (Larch Mountain); however, no known sites are documented in NRIS (2010). *P. attenuata* grows scattered to closely gregarious in humus and with mosses in moist coniferous forest (Sitka spruce, western hemlock, true firs, and Douglas-fir). It is recorded most frequently from Oregon coastal forests (Norvell & Exeter 2009).

17. *Phaeocollybia californica* is endemic to the Pacific Northwest with 34 sites known from western Washington, western Oregon, and northern California. There is one known site on the Mt. Hood National Forest (Larch Mountain) recorded in NRIS (2010). *P. californica* is terrestrial (mycorrhizal), fasciculate (growing in close bundles) to gregarious (growing in arcs) in habit, and occurs in humic soils of moist coniferous (true fir, hemlock, Douglas-fir) forest and mixed (true fir, Pacific madrone, oak, Douglas-fir, and hemlock) coastal and coastal montane forests.

18. *Phaeocollybia olivacea* is endemic to the Pacific Northwest with 106 sites known from western Washington, western Oregon, and northern California. There is only one documented site on the Mt. Hood National Forest (near Estacada) (NRIS 2010). This mushroom species is terrestrial (mycorrhizal), grows in clusters or is gregarious (growing in arcs), and associated with the roots of Douglas-fir, western hemlock, and Pacific silver fir.

19. *Phaeocollybia oregonensis* is endemic to the Pacific Northwest with 10 sites known from the Oregon Coast Range and the western Cascade Range. There are five known sites documented on the Mt. Hood National Forest (NRIS 2010). This mushroom species is terrestrial (mycorrhizal), occurring solitary to gregarious, and associated with the roots of true fir, western hemlock, and Douglas-fir.

20. *Phaeocollybia piceae* is endemic to the Pacific Northwest, known from 49 sites in western Washington, western Oregon, and northern California. One known site is reported by Castellano et al. (1999) for the Mt. Hood National Forest (Wildcat Mountain); however, no known sites are documented in NRIS (2010). This mushroom species is terrestrial (mycorrhizal), occurring solitary to scattered in small groups, and associated with coniferous (spruce, hemlock, Douglas-fir, true fir) forests.

21. *Phaeocollybia pseudofestiva* is endemic to the Pacific Northwest, known from British Columbia south through western Washington and western Oregon to California. There are 38 known sites in Washington, Oregon, and California. Only two sites are documented on the Mt. Hood National Forest (NRIS 2010). The species is terrestrial (mycorrhizal) and occurs solitary to densely gregarious in coniferous (spruce, fir, hemlock, and Douglas-fir) forest.

22. *Phaeocollybia scatesiae* is endemic to the Pacific Northwest with 17 sites documented in the Northwest Forest Plan area, three of those on the Mt. Hood National Forest (Zigzag Ranger

District). This species is terrestrial (mycorrhizal), grows densely caespitose (clumped) in erumpent mounds in woody humus in coastal and montane (<4,000 ft.) coniferous forests.

23. *Pseudorhizina (=Gyromitra) californica* is found from British Columbia south to northern California and east to Colorado, Montana, and Nevada. It is known in Washington, Oregon, and northern California from 35 sites, one of which is on the Mt. Hood National Forest (Hood River Ranger District). *G. californica* grows on well-rotted stumps and logs of conifers or in soil with rotted wood.

24. *Ramaria amyloidea* is endemic to the Pacific Northwest with 16 sites known from western Washington to northern California. There is one known site on the Mt. Hood National Forest (NRIS 2010). Habitat for the species is soil in coniferous forest.

25. *Ramaria gelatiniaurantia* is endemic to the Pacific Northwest with 24 sites known from western Washington to northern California. Three sites are reported by Castellano et al. (1999) for the Mt. Hood National Forest (Eagle Creek, junction of FSroads 4610 and 150, and Fish Creek Road); however, no known sites are documented in NRIS (2010). Habitat for the species is humus or soil in coniferous (true fir, Douglas-fir, and western hemlock) forest.

26. *Ramaria spinulosa* var. *diminutiva* has not been reported for the Mt. Hood National Forest, but it is suspected to occur here. Castellano et al. (1999) reported a site in Mendocino County (northern California) and a site on the Mt. Baker-Snoqualmie National Forest (Glacier Peak Wilderness). Habitat for the species is humus or soil in coniferous (true fir, Douglas-fir, and western hemlock) forest.

27. *Rhizopogon exiguus*, a false truffle, is endemic to Oregon with known sites from the Mt. Baker-Snoqualmie, Siuslaw, and Siskiyou National Forests. There are no known sites on the Mt. Hood National Forest although the species is suspected to occur here. This species is associated with the roots of Douglas-fir and western hemlock.

28. *Rhizopogon inquinatus*, a false truffle, is found in association with the roots of Douglas-fir and western hemlock from 500 to 1,400 meters elevation. There are no known sites on the Mt. Hood National Forest although the species is suspected to occur on the Forest. Castellano et al. (1999) report two sites on the Willamette National Forest.

29. *Sowerbyella rhenana* occurs in Europe, Japan, and northwest North America. In the Pacific Northwest, it is known from 63 sites in western Washington, western Oregon, and northern California, including two sites from the Mt. Hood National Forest (Eagle Creek, Rhododendron) according to Castellano et al. (1999); however, only one known site is listed in NRIS (2010) for the Forest. This species grows scattered to gregarious to caespitose (clumped) in duff of moist, relatively undisturbed, older coniferous forests (Castellano et al. 1999).

30. *Stagnicola perplexa*, in the Cortinariaceae family, grows in groups on rotten wood, occasionally buried deeply enough to appear “rooting” in wet (or recently) dried-up depressions in coniferous forest. One known site is reported for the Mt. Hood National Forest (middle fork of the Salmon River) by Castellano et al. (2003); however no known sites are listed in NRIS (2010) for the Forest.

Table 2 summarizes the effect of the proposed project on special-status species present or with potential habitat in the proposed project area. Individuals or the habitat of some special-status species may be impacted (MIIH rating). A no effect/impact (NI) rating is given for species whose habitat is not present in the proposed project area. It is assumed there will be no effect on species whose habitats are not present in the proposed project area.

Table 2. Biological Evaluation Process Summary by Species

SPECIES	**Step #1** **Prefield Review** **Habitat present in the proposed project area?**	**Step #2** **Field Reconn.** **Species present?**	**Step #3** **Conflict Determination** **Conflict?**	**Step #4** **Analysis of Effects** **Important?**	**Step #5** **Biological Investigation** **Needed?**
Vascular Plants					
Agoseris elata	No	No	No Impact	N/A	N/A
Arabis sparsiflora var. *atrorubens*	No	No	No Impact	N/A	N/A
Astragalus tyghensis	No	No	No Impact	N/A	N/A
Botrychium lunaria	**Yes**	No	No Impact	N/A	N/A
Botrychium minganense	No	No	No Impact	N/A	N/A
Botrychium montanum	No	No	No Impact	N/A	N/A
Calamagrostis breweri	**Yes**	No	MIIH	N/A	N/A
Carex abrupta	**Yes**	No	MIIH	N/A	N/A
Carex capitata	No	No	No Impact	N/A	N/A
Carex diandra	No	No	No Impact	N/A	N/A
Carex lasiocarpa var. *americana*	No	No	No Impact	N/A	N/A
Carex livida	No	No	No Impact	N/A	N/A
Carex retorsa	No	No	No Impact	N/A	N/A
Carex vernacula	**Yes**	No	MIIH	N/A	N/A
Castilleja thompsonii	No	No	No Impact	N/A	N/A
Cimicifuga elata var. *elata*	**Yes**	No	MIIH	N/A	N/A
Coptis trifolia	No	No	No Impact	N/A	N/A
Corydalis aquae-gelidae	No	No	No Impact	N/A	N/A
Delphinium nuttallii	No	No	No Impact	N/A	N/A
Diphasiastrum complanatum	**Yes**	No	MIIH	N/A	N/A
Elatine brachysperma	No	No	No Impact	N/A	N/A
Erigeron howellii	No	No	No Impact	N/A	N/A
Eucephalus (=*Aster*) *gormanii*	**Yes**	No	No Impact	N/A	N/A
Fritillaria camschatcensis	No	No	No Impact	N/A	N/A
Lewisia columbiana var. *columbiana*	No	No	No Impact	N/A	N/A
Lomatium watsonii	No	No	No Impact	N/A	N/A
Lycopodiella inundata	No	No	No Impact	N/A	N/A
Ophioglossum pusillum	No	No	No Impact	N/A	N/A
Phlox hendersonii	**Yes**	No	No Impact	N/A	N/A

Potentilla villosa	**Yes**	No	No Impact	N/A	N/A
Ranunculus triternatus (=R. reconditus)	No	No	No Impact	N/A	N/A
Romanzoffia thompsonii	No	No	No Impact	N/A	N/A
Rorippa columbiae	No	No	No Impact	N/A	N/A
Rotala ramosior	No	No	No Impact	N/A	N/A
Scheuchzeria palustris var.*americana*	No	No	No Impact	N/A	N/A
Sisyrinchium sarmentosum	**Yes**	No	No Impact	N/A	N/A
Streptopus streptopoides	**Yes**	No	No Impact	N/A	N/A
Sullivantia oregana	No	No	No Impact	N/A	N/A
Suksdorfia violacea	No	No	No Impact	N/A	N/A
Taushia stricklandii	**Yes**	No	No Impact	N/A	N/A
Utricularia minor	No	No	No Impact	N/A	N/A
Utricularia ochroleuca	No	No	No Impact	N/A	N/A
Wolfia boralis	No	No	No Impact	N/A	N/A
Wolfia columbiana	No	No	No Impact	N/A	N/A
Bryophytes					
Barbilophozia lycopodioides	No	No	No Impact	N/A	N/A
Brachydontium olympicum	**Yes**	No	MIIH	N/A	N/A
Bryum calobryoides	**Yes**	No	MIIH	N/A	N/A
Calypogeia sphagnicola	No	No	No Impact	N/A	N/A
Chiloscyphus gemmiparus	**Yes**	No	No Impact	N/A	N/A
Conostomum tetragonum	**Yes**	No	MIIH	N/A	N/A
Encalypta brevicollis	No	No	No Impact	N/A	N/A
Encalypta brevipes	No	No	No Impact	N/A	N/A
Gymnomitrion concinnatum	**Yes**	No	MIIH	N/A	N/A
Helodium blandowii	No	No	No Impact	N/A	N/A
Herbertus aduncus	**Yes**	No	MIIH	N/A	N/A
Lophozia laxa	No	No	No Impact	N/A	N/A
Polytrichum sphaerothecium	**Yes**	No	MIIH	N/A	N/A
Rhizomnium nudum	**Yes**	**Yes**	MIIH	**Yes**	**No**
Rhytidium rugosum	**Yes**	No	MIIH	N/A	N/A
Schistostega pennata	**Yes**	No	MIIH	N/A	N/A
Scouleria marginata	**Yes**	No	No Impact	N/A	N/A
Splachnum ampullaceum	No	No	No Impact	N/A	N/A
Tayloria serrata	**Yes**	No	MIIH	N/A	N/A
Tetraphis geniculata	No	No	No Impact	N/A	N/A
Tetraplodon mnioides	**Yes**	No	MIIH	N/A	N/A
Tomenthypnum nitens	No	No	No Impact	N/A	N/A
Trematodon boasii (= T. asanoi)	**Yes**	No	MIIH	N/A	N/A
Tritomaria exsectiformis	No	No	No Impact	N/A	N/A

Lichens					
Chaenotheca subroscida	**Yes**	No	MIIH	N/A	N/A
Dermatocarpon meiophyllizum	No	No	No Impact	N/A	N/A
Hypogymnia duplicata	**Yes**	No	No Impact	N/A	N/A
Leptogium burnetiae	**Yes**	No	MIIH	N/A	N/A
Leptogium cyanescens	**Yes**	No	MIIH	N/A	N/A
Lobaria linita	**Yes**	No	MIIH	N/A	N/A
Nephroma occultum	**Yes**	No	MIIH	N/A	N/A
Pannaria rubiginosa	**Yes**	No	MIIH	N/A	N/A
Peltigera pacifica	**Yes**	No	MIIH	N/A	N/A
Pilophorus nigricaulis	No	No	No Impact	N/A	N/A
Pseudocyphellaria rainierensis	**Yes**	No	No Impact	N/A	N/A
Ramalina pollinaria	No	No	No Impact	N/A	N/A
Stereocaulon spathuliferum	**Yes**	No	MIIH	N/A	N/A
Tholurna dissimilis	**Yes**	No	No Impact	N/A	N/A
Usnea longissima	No	No	No Impact	N/A	N/A
Fungi					
Alpova alexsmithii	**Yes**	Assumed Presence	MIIH	N/A	N/A
Bridgeoporus nobilissmus	**Yes**	No	No Impact	N/A	N/A
Choiromyces venosus	**Yes**	Assumed Presence	MIIH	N/A	N/A
Chroogomphus loculatus	**Yes**	Assumed Presence	MIIH	N/A	N/A
Cortinarius barlowensis	**Yes**	Assumed Presence	MIIH	N/A	N/A
Cudonia monticola	**Yes**	Assumed Presence	MIIH	N/A	N/A
Cystangium idahoensis	**Yes**	Assumed Presence	MIIH	N/A	N/A
Gastroboletus imbellus	**Yes**	Assumed Presence	MIIH	N/A	N/A
Gomphus kauffmanii	**Yes**	Assumed Presence	MIIH	N/A	N/A
Helvella crassitunicata	**Yes**	Assumed Presence	MIIH	N/A	N/A
Hygrophorus caeruleus	**Yes**	Assumed Presence	MIIH	N/A	N/A
Leucogaster citrinus	**Yes**	Assumed Presence	MIIH	N/A	N/A
Macowanites mollis	**Yes**	Assumed Presence	MIIH	N/A	N/A
Mythicomyces corneipes	**Yes**	Assumed Presence	MIIH	N/A	N/A
Octaviania macrospora	**Yes**	Assumed Presence	MIIH	N/A	N/A
Otidea smithii	**Yes**	Assumed	MIIH	N/A	N/A

		Presence			
Phaeocollybia attenuata	**Yes**	Assumed Presence	MIIH	N/A	N/A
Phaeocollybia californica	**Yes**	Assumed Presence	MIIH	N/A	N/A
Phaeocollybia olivacea	**Yes**	Assumed Presence	MIIH	N/A	N/A
Phaeocollybia oregonensis	**Yes**	Assumed Presence	MIIH	N/A	N/A
Phaeocollybia piceae	**Yes**	Assumed Presence	MIIH	N/A	N/A
Phaeocollybia pseudofestiva	**Yes**	Assumed Presence	MIIH	N/A	N/A
Phaeocollybia scatesiae	**Yes**	Assumed Presence	MIIH	N/A	N/A
Pseudorhizina (=Gyromitra) californica)	**Yes**	Assumed Presence	MIIH	N/A	N/A
Ramaria amyloidea	**Yes**	Assumed Presence	MIIH	N/A	N/A
Ramaria araiospora	**Yes**	**Yes**	MIIH	**Yes**	No
Ramaria aurantisiccescens	**Yes**	**Yes**	MIIH	**Yes**	No
Ramaria gelatiniaurantia	**Yes**	Assumed Presence	MIIH	N/A	N/A
Ramaria spinulosa var. *diminutiva*	**Yes**	Assumed Presence	MIIH	N/A	N/A
Rhizopogon exiguus	**Yes**	Assumed Presence	MIIH	N/A	N/A
Rhizopogon inquinatus	**Yes**	Assumed Presence	MIIH	N/A	N/A
Sowerbyella rhenana	**Yes**	Assumed Presence	MIIH	N/A	N/A
Stagnicola perplexa	**Yes**	Assumed Presence	MIIH	N/A	N/A

No Impact = A project or activity will have *no* environmental impacts on habitat, individuals, a population, or a species because the habitats where these species occur are closed to special forest products use/harvest. MIIH = May impact individuals or habitat, but will ***not*** likely contribute to a trend towards federal listing or loss of viability to the population or species.

Discussion

I do not expect the construction of roughly 17.2 miles of proposed downhill mountain bike trails to threaten *Rhizomnium nudum* populations in the riparian/wetland complex near and above the Jeff Flood ski chairlift terminal so long as trails are kept out of the riparian/wetland complex where *R. nudum* populations occur, mountain bike riders stay on designated trails and do not create informal (unauthorized) trails through the riparian/wetland complex where *R. nudum* occurs, mountain bike trails are patrolled frequently by park staff to keep all riders on designated trails, and sediment generation or other disturbance resulting from mountain bike traffic along trails does not impact *R. nudum* populations. Some populations of this moss occur along the toeslope of incised streambanks, streams that funnel water and sediment from above on the mountain, where downhill mountain bike trails are proposed for construction, downstream.

Two years of fall and spring surveys, at a minimum, are needed for a reasonable likelihood of detecting special-status fungi within proposed trails because fruiting body production can vary widely from year to year with some fungi not fruiting annually or for several years at a time (Vogt et al. 1992).

The construction of mountain bike trails, as currently laid out, would impact *Ramaria araiospora* and *R. aurantiisiccescens*, two Region 6 Sensitive fungi. There are 78 known sites in the Pacific Northwest for *R. araiospora*, but only nine for *R. aurantiisiccescens*, half of those within the proposed mountain bike trails (NRIS 2010). Construction of trails would destroy the sites where the mushrooms for these two species were found during the fall of 2010 and cut through their belowground mycelia, destroying some of the mycelia. Mycological research indicates that the mycelia of mycorrhizal fungi can form an extensive underground web (a "wood-wide web") linking them to the fine roots of trees (Beiler et al. 2009, Zhou et al. 2001, Simard & Durall 2004). Trail widths are narrow and therefore small in terms of the areal extent of their impact on soils, mycelia networks, and suitable habitat for fungi. Both *R. araiospora* and *R. aurantiisiccesens* are mycorrhizal fungi, but how far laterally their belowground mycelial mats extend is unknown (E. Cazares, pers. comm., 2011).

My recommendation is to err on the side of caution and avoid impacting the sites where the fruiting bodies of these two fungi were found by moving the proposed trails 5-10 ft. away (uphill, downhill, or sidehill) from where the fruiting bodies were found. The fruiting bodies are no longer present, having decomposed last fall, but their locations were recorded using a GPS receiver and flagged. Both species are also Survey & Manage Category B fungi. The standards and guidelines for Category B fungi are to manage all known sites (ROD 2001, Standards and Guidelines, p. 7).

The construction of mountain bike trails may impact individuals or the habitat of other special-status fungi that I did not detect during my 2010 fall field surveys, particularly hypogeous fungi (truffles and false truffles) that produce belowground fruiting bodies. Construction of trails would cut through belowground mycelia networks, destroying mycelia and their fruiting bodies, including those of undetected special-status fungi. However, trail widths are narrow and therefore small in terms of the areal extent of their impact on soils and mycelia. Mycological research indicates that the mycelia of mycorrhizal fungi can form an extensive underground web (a "wood-wide web") linking them to the fine roots of trees (Beiler et al. 2009, Zhou et al. 2001, Simard & Durall 2004).

The mycelia of fungi that would be destroyed by trail construction, including those of undetected special-status species, probably extend beyond the narrow width of trails. Undisturbed mycelia outside trails would likely survive the disturbance of trail construction and continue to persist and produce fruiting bodies.

Excessive trail widening or the formation of informal (unauthorized) trails or shortcuts between designated trails would increase the risk of harm to mycelia of any detected or undetected special-status fungi or, worse, the extirpation of the species at the site because a greater proportion of the mycelium or all of it might be destroyed. For this and other ecological reasons, it is important that designated trails be confined in width during their lifetime of use and that trail widening and formation of informal trails and shortcuts be prevented from occurring when mountain bikers use the trail system. If trail widening does occur, widened areas should be revegetated and monitored.

Finally, although not a special-status species, whitebark pine (*Pinus albicaulis*) is a tree species in decline because of the impacts of white pine blister rust (*Cronartium ribicola* J.C. Fisch) and mountain pine beetle (*Dendroctonus ponderosae* Hopkins) and, therefore, a species of concern. No whitebark pine should be cut for trail construction in the proposed mountain bike park.

Conclusion

The proposed action to construct a downhill mountain bike park in the vicinity of Timberline Lodge **may impact** some special-status vascular plant, bryophyte, lichen, or fungal species **or** their habitat, but will ***not*** likely contribute to a trend towards Federal listing or loss of viability to the population or species.

_____ No Impact

__X__ May Impact Individuals or Habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species.

_____ Will Impact Individuals or Habitat with a consequence that the action may contribute to a trend towards Federal listing or cause a loss of viability to the population or species.

The Biological Evaluation is complete.

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Appendix A.

Habitat and Identification Period for Special-Status Species Documented or Suspected To Occur on the Mt. Hood National Forest				
Vascular Plants				
Species	**Common Name**	**General Habitat**	**Identification Period**	**Potential Habitat in Project Area?**
Agoseris elata	tall agoseris	moist-dry meadow/prairie (*Pinus contorta*, *Picea englemannii*, *Abies grandis*)	June-Aug	No
Arabis sparsiflora var. *atrorubens*	sicklepod rockcress	dry meadow, shrub-steppe (oak/pine or transition oak-steppe habitat),, mostly of sagebrush & ponderosa pine country; also rocky areas (Columbia Gorge)	April-June	No
Astragalus tyghensis	Tygh Valley milkvetch	shrub-steppe grassland	May-Aug	No
Botrychium lunaria	common moonwort	meadows and open, mesic habitats at middle elevations in the mountains	May-Sept	**Yes**
Botrychium minganense	Mingan moonwort	forested wetlands	June-Sept	No

Botrychium montanum	mountain grape fern	forested wetlands	June-Sept	No
Calamagrostis breweri	Brewer's reedgrass	subalpine, moist to dry meadows	June- Sept	**Yes**
Carex abrupta	abrupt-beak sedge	moist meadows and streambanks at moderate to high elevations	June-Sept	**Yes**
Carex capitata	capitate sedge	wet or seasonally wet meadows; often alpine but also at lower elevations	May-Sept	No
Carex diandra	lesser panicled sedge	bogs, fens, lakeshores, springs, seeps	May-Sept	No
Carex livida	pale sedge	open bogs & fens, wet-dry meadows with high water table	June-Sept	No
Carex retrorsa	retrorse sedge	floodplain forests, edges between lakes & forests, swamps, streamsides, wet thickets & wet meadows	May-Sept	No
Carex vernacula	native sedge	alpine & subalpine wet meadows, rocky slopes that receive snowmelt, edges of headwater streams, lakeshores,	May-Sept	**Yes**
Castilleja thompsonii	Thompson's paintbrush	rock outcrops east of the Cascade Range crest	July-Aug	No
Cimicifuga elata var. *elata*	tall bugbane	mesic mixed hardwood/ conifer forest	June-Sept	**Yes**
Coptis trifolia	3-leaflet goldthread	edge of forested fens	June-July	No
Corydalis aquae-gelidae	cold water corydalis	forested seeps, streamsides, riverbanks	June-Sept	No
Delphinium nuttallii	Nuttall's larkspur	rocky outcrops, rocky meadows	May-June	No
Diphasiastrum (=Lycopodium) complanatum	ground cedar	open conifer forest	Apr-Nov	**Yes**
Elatine brachysperma	short-seeded waterwort	wetlands, riparian areas	April-Sept	No
Erigeron howellii	Howell's daisy	moist-dry cliffs, talus, rocky slopes	June-Sept	No
Eucephalus gormanii	Gorman's aster	dry cliffs, talus, rock slopes above 3,500 ft.	June-Sept	**Yes**
Fritillaria camschatcensis	Indian rice	moist-dry meadow	June-Aug	No
Howellia aquatilis var *howellia*	howellia	low-elevation lakes and ponds	June- Sept	No
Lewisia columbiana var. *columbiana*	Columbia lewisia	dry cliffs, talus, rocky slopes	June-Sept	No
Lomatium watsonii	Watson's desert parsley	open hillsides with sagebrush	May-Sept	No

Luzula arcuata ssp. *unalaschcensis*	Alaska curved woodrush	rocky or gravelly soil, generally on glacial moraines or above timberline	June-Sept	No
Lycopodiella inundata	bog club-moss	wet meadows and bogs	July-Sept	No
Ophioglossum pusillum	adder's tongue	wet-moist meadow	June-Sept	No
Phlox hendersonii	Henderson's phlox	sub-alpine, dry, rocky, scree	July-Sept	**Yes**
Potentilla villosa	villous cinquefoil	sub-alpine, dry, rocky, scree	July-Sept	**Yes**
Ranunculus triternatus (=R. reconditus)	Dallas Mt. buttercup, obscure buttercup	sagebrush slopes	June-Sept	No
Romanzoffia thompsonii	mistmaiden	vernally wet cliffs	April-June	No
Rorippa columbiae	Columbia cress	moist, generally sandy soil (riversides, streamsides, lakeshores, wet meadows, ditches)	April-Oct	No
Rotala ramosior	lowland toothcup	damp areas in fine silt/sand (swamps, lake & pond margins, riversides)	June-Aug	No
Scheuchzeria palustris var. *americana*	scheuchzeria	wet meadow, bog, fen	June-Sept	No
Sisyrinchium sarmentosum	pale blue-eyed grass	moist-dry meadow	June-Aug	**Yes**
Streptopus streptopoides	kruhsea, small twistedstalk	dense, damp, montane coniferous forest	June-Aug	**Yes**
Suksdorfia violacea	violet suksdorfia	moist cliffs, talus, rocky slopes	May-July	No
Sullivantia oregana	Oregon sullivantia, Oregon coolwort	moist cliffs, especially near waterfalls (low elevations)	May-Aug	No
Taushia stricklandii	Strickland's taushia	wet-dry meadows and moist slopes, bogs, alpine meadows	June-Sept	**Yes**
Utricularia minor	lesser bladderwort	affixed rather than free-floating in standing or slowly moving water (wetlands, bogs, lake margins)	June-Aug	No
Utricularia ochroleuca	northern bladderwort	standing or slowly moving water (wetlands, bogs, lake margins)	June-Aug	No
Wolffia borealis	dotted water-meal	pond, lake, gently flowing water	May-Sept	No
Wolffia_columbiana	water-meal	pond, lake, gently flowing water	May-Sept	No

Bryophytes				
Barbilophozia lycopodioides	giant fourpoint, maple liverwort	damp ledges of rock outcrops and cliffs at higher elevations (3,400-7,500 ft. elevation)	Year-round	No
Brachydontium olympicum	Olympic brachydontium moss	boulders or soil in rock crevices (boulder fields, moraines, ledges of cliffs) at subalpine to alpine elevations	Year-round	**Yes**
Bryum calobryoides	beautiful bryum	rocks and soil in shaded to exposed boulder fields, montane to alpine meadows, cliffs, & outcrops (3,000-7,000 ft.)	Year-round	**Yes**
Calypogeia sphagnicola	bog pouchwort	nutrient-poor fens containing sphagnum moss	Year-round	No
Chiloscyphus gemmiparus	alpine waterwort	rocks in beds of cold montane streams	Year-round	**Yes**
Conostomum tetragonum	ribbed mountain moss, helmet moss	soil in rock crevices in boulder fields, glacial moraines, and ledges of cliffs (subalpine to alpine elevations)	Year-round	**Yes**
Encalypta brevicollis	extinguisher moss	soil in open montane and alpine habitats (Mt. Rainier and Siskiyou Mts.)	Year-round	No
Encalypta brevipes	candle snuffer moss, stubby extinguisher moss	soil on ledges and in crevices on cliffs	Year-round	No
Gymnomitrion concinnatum	braided frostwort, pointy whiteworm	soil on cliffs and rock outcrops (subalpine parkland areas with mountain hemlock and subalpine fir)	Year-round	**Yes**
Helodium blandowii	Blandow's feather moss	montane fens (edges of fens too & streamlets of fens)	Year-round	No
Herbertus aduncus	common scissorleaf	exposed, dry, montane, windswept sites in moist, protected microsites on rock outcrops, in crevices, and on ledges, wedged among stones or roots	Year-round	**Yes**
Lophozia laxa	bog palewort	on hummocks of *Sphagnum* in fens and bogs (sea level to 5,000 ft.)	Year-round	No
Polytrichum sphaerothecium	dwarf rock haircap	on igneous rocks in subalpine parkland to	Year-round	**Yes**

		alpine krummholz (with mountain heath)		
Rhizomnium nudum	moss	moist mineral soil in shallow depressions on forest floor, 3000 to 5000 ft. elevation	Year-round	**Yes**
Rhytidium rugosum	crumpled leaf moss, pipecleaner moss	exposed rocks or soil on sloping sides and tops of bluffs and cliffs at middle to higher elevations	Year-round	**Yes**
Schistostega pennata	green goblin moss	moist mineral soil on rootwads	Year-round	**Yes**
Scouleria marginata	margined streamside moss	bedrock material or boulders along rivers & streams	Year-round	**Yes**
Splachnum ampullaceum	purple-vased stink moss, small capsule dung moss	old dung of herbivores or on soil enriched by dung in peatlands or wetlands	Year-round	No
Tayloria serrata	broad-leaved stink moss, serrate dung moss	old dung, rotten wood, soil enriched by dung on roadsides & trails in dry to moist conifer forest or wetlands	Year-round	**Yes**
Tetraphis geniculata	fourtooth bent-knee moss	large decaying logs in old-growth forest	Year-round	No
Tetraplodon mnioides	black-fruited stink moss, entireleaf nitrogen moss	on old carnivore dung or soil & rock enriched by dung on roadsides, trails, & in dry to moist conifer forest (also in wetlands)	Year-round	**Yes**
Tomenthypnum nitens	tomenthypnum moss, fuzzy hypnum moss	bogs and wet places	Year-round	No
Trematodon boasii (=*T. asanoi*)	Asano's trematodon moss	soil along the edges of trails, streams, & ponds in subalpine areas	Year-round	**Yes**
Tritomaria exsectiformis	little brownwort	seeps, springs, low-gradient streams on east side of Cascade Range	Year-round	No
Lichens				
Chaenotheca subroscida	pin lichen	boles of live trees and snags in moist forest	Year-round	**Yes**
Dermatocarpon meiophyllizum (= D. luridum)	brook lichen	rock submerged in streams	Year-round	No
Hypogymnia duplicata	ticker-tape lichen	conifer boles where > 90" inches of precipitation	Year-round	**Yes**
Leptogium burnetiae var. *hirsutum*	jellyskin lichen	bark of deciduous trees, decaying logs and moss on rock	Year-round	**Yes**
Leptogium cyanescens	blue jellyskin lichen	moss and bark of deciduous trees	Year-round	**Yes**
Lobaria linita	cabbage lungwort	lower bole of conifers, often mossy boulders	Year-round	**Yes**

Nephroma occultum	cryptic kidney lichen	tree boles and branches in older forest habitat	Year-round	**Yes**
Pannaria rubiginosa	brown-eyed shingle lichen	conifer/deciduous tree bark in moist forest habitat	Year-round	**Yes**
Peltigera pacifica	fringed pelt lichen	on moss in moist forest habitats	Year-round	**Yes**
Pilophorus nigricaulis	matchstick lichen	rock on cool, north-facing slopes	Year-round	No
Pseudocyphellaria rainierensis	specklebelly lichen	boles of hardwoods and conifers in older forests	Year-round	**Yes**
Ramalina pollinaria	chalky ramalina	bark in moist, low-elevation habitats	Year-round	No
Stereocaulon spathuliferum	chalk foam, snow lichen	crustose lichen on basalt blocks of talus slopes (3,000-5,000 ft. elevation)	Year-round	**Yes**
Tholurna dissimilis	urn lichen	branches of krummholz at moderate to high elevation	Year-round	**Yes**
Usnea longissima	Methuselah's beard lichen	branches of conifers and hardwoods in moist forest	Year-round	No
Fungi				
Alpova alexsmithii		sequestrate; associated with western and mountain hemlock (1,200-3,200 meters elevation)	Aug-Dec	**Yes**
Bridgeoporus nobilissimus	noble polypore	large true fir stumps, snags, & live trees	May-Nov	**Yes**
Choiromyces venosus		sequestrate; associated with western and mountain hemlock at low elevation	Oct	**Yes**
Chroogompus loculatus		sequestrate; associated with various Pinaceae spp., esp. mountain hemlock	Oct	**Yes**
Cortinarius barlowensis		on soil in montane coniferous forest to 4,000 ft. elevation	autumn	**Yes**
Cudonia monticola	earthtongue	spruce needles and coniferous debris	late summer and autumn	**Yes**
Cystangium idahoensis		epigeous under conifers	autumn	**Yes**
Gastroboletus imbellus		sequestrate; with *Abies grandis*, *A. lasiocarpa*, *T. mertensiana* (1,650 meters elevation)	Oct	**Yes**
Gomphus kauffmanii		epigeous in deep humus under pine and true fir	autumn	**Yes**
Helvella crassitunicata		on soil, esp. along trails, in montane regions with *Abies* spp.	Aug-Oct	**Yes**
Hygrophorus caeruleus		in soil with roots of	May-July	**Yes**

		Pinaceae spp. near melting snowbanks	(possibly autumn too)	
Leucogaster citrinus		sequestrate; with the roots of conifers up to 6,600 feet elevation	Aug-Nov	**Yes**
Macowanites mollis		sequestrate; under conifers	autumn	**Yes**
Mythicomyces corneipes		epigeous along margins of bogs or on wet soil under conifers	autumn	**Yes**
Octaviania macrospora		sequestrate; with roots of western hemlock	Aug	**Yes**
Otidea smithii	cup fungus	under cottonwood, Douglas-fir, and western hemlock	Aug-Dec	**Yes**
Phaeocollybia attenuata		epigeous in conifer forest	Oct-Nov	**Yes**
Phaeocollybia californica		epigeous with silver fir, Douglas-fir, and w. hemlock	March, May, Oct-Nov	**Yes**
Phaeocollybia olivacea		epigeous in low-elevation conifer forest	Oct-Nov	**Yes**
Phaeocollybia oregonensis		epigeous with Douglas-fir, silver fir, w. hemlock	Oct-Nov	**Yes**
Phaeocollybia piceae		epigeous with true fir, Douglas-fir, and w. hemlock	Oct-Nov	**Yes**
Phaeocollybia pseudofestiva		epigeous under mixed conifers and hardwoods	Oct-Dec	**Yes**

Phaeocollybia scatesiae		epigeous with true fir and *Vaccinium* spp.	March, May, Oct-Nov	**Yes**
Pseudorhizina (=*Gyromitra*) *californica*		on or adjacent to well-rotted stumps or logs of coniferous trees or on soil rich in brown rotted wood	June	**Yes**
Ramaria amaloidea	coral mushroom	epigeous with true firs, Douglas-fir, w. hemlock	Sept-Oct	**Yes**
Ramaria araiospora	coral mushroom	Epigeous with coniferous forests	Oct	**Yes**
Ramaria aurantiisiccescens	coral mushroom	epigeous with true firs, Douglas-fir, w. hemlock	Oct	**Yes**
Ramaria gelatiniaurantia	coral mushroom	epigeous with true firs, Douglas-fir, w. hemlock	Oct	**Yes**
Ramaria spinulosa var. *diminutiva*	coral mushroom	epigeous with Pinaceae spp.	Oct-Nov	**Yes**
Rhizopogon exiguus		sequestrate; under Douglas-fir & w. hemlock	March, Aug, Sept, Nov	**Yes**
Rhizopogon inquinatus		sequestrate; under Douglas-fir & w. hemlock (500-1,400 meters elevation)	Sept-Oct	**Yes**
Sowerbyella rhenana	cup fungus	in moist, undisturbed, older conifer forests	Oct-Dec	**Yes**
Stagnicola perplexa		on rotten wood, sometimes buried deeply enough to appear "rooting" in wet or recently dried-up depressions in conifer forest	autumn	**Yes**

SURVEY AND MANAGE REPORT

Proposed Timberline Mountain Bike Park

Zigzag Ranger District
Mt. Hood National Forest
December 2010

BACKGROUND

In addition to effects on TES species, all Forest Service projects, programs, and activities are reviewed for possible effects on Survey and Manage (S&M) species. The agencies' current direction is to apply the January 2001 *Record of Decision (ROD) and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures, Standards and Guidelines* (2001 ROD) for the Northwest Forest Plan without modifications made through the 2001, 2002, and 2003 Annual Species Review process.

The 2001 ROD includes direction to conduct "equivalent-effort" fungi surveys in old-growth forest for all habitat-disturbing projects with decisions in 2011 and beyond. Old-growth forest is defined as "at least 180-220 years old with moderate-to-high canopy closure; a multi-layered, multi-species canopy dominated by large overstory trees; high incidence of large trees; some with broken tops and other indications of old and decaying wood (decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground" (pp. 29-30, Standards and Guidelines, 2001 ROD). Based on surveys conducted in 2010 it was determined that much of the proposed project area (roughly ¾ of it) qualifies as old-growth mountain hemlock (*Tsuga mertensiana*) forest using a definition for old-growth hemlock developed by research ecologist David Peter of the Pacific Northwest Research Station in Olympia, WA.

Habitat-disturbing activities are defined as "those disturbances likely to have a significant negative impact on the species' habitat, its life cycle, microclimate, or life support requirements." The 2001 ROD also states, "'Habitat disturbing' is not necessarily the same as 'ground disturbing'; helicopter logging or logging over snow-pack, for example, may not disturb the ground but might clearly affect microclimate or life cycle habitat factors. Conversely, an activity having soil-disturbing effects might not have a large enough scope to trigger a need to survey" (2001 ROD, Standards and Guidelines, p. 22).

In determining a need for surveys, the 2001 ROD directs line officers to "consider the probablility of the species being present on the project site, as well as the probability that the project would cause a significant negative effect on the species habitat or the persistence of the species at the site" (2001 ROD, Standards and Guidelines, p. 22).

The Bureau of Land Management and U.S. Forest Service plan to jointly issue a new protocol for S&M fungi surveys soon. The protocol, created under both agencies' special status/sensitive species programs, includes two spring and two fall surveys for at least two years, replacing the older protocol of three spring and three fall surveys for one year. It is unknown what the final protocol for "equivalent- effort" surveys for fungi may require, but for now the new protocol is recommended for S&M surveys.

Below (Table 1-1) is the list of S&M fungi, lichens, bryophytes, and vascular plants from the 2001 ROD. Species highlighted in blue font are those documented or suspected to occur on the Mt. Hood National Forest. For species for which strategic surveys have been completed (indicated in red font), pre-disturbance surveys are not required.

Category A, B, & E species require management of all known sites. Category C & D species require management of only high-priority sites. Determining what constitutes a high-priority site is left to the decision/discretion of the local botanist. There are no management requirements for Category F species. Pre-disturbance surveys are required for Category A & C species. Pre-disturbance surveys are ***not*** required for Category B, D, E, & F species. See pp. 6-14 in the *Standards and Guidelines* in the 2001 ROD for a summary of the S&M species categories.

DISCUSSION

During the summer of 2010, I collected data on tree diameters, ages (counting rings on the stumps of recently cut trees determined to be hazardous along the Westleg Road that runs through the proposed mountain bike park), and densities as well as data on snag densities, diameters, and heights. Based on these data, I determined that much of the proposed project area (roughly ¾ of it) qualifies as old-growth mountain hemlock (*Tsuga mertensiana*) forest using a definition for old-growth hemlock developed by research ecologist David Peter of the Pacific Northwest Research Station in Olympia, WA (Peter 1992). I also e-mailed stand data results and photos of forest stands in the proposed project area to David Peter who, after reviewing them, agreed with my determination of the stands as old-growth mountain hemlock (Peter, D., pers. comm., 2010). Large-diameter mountain hemlock trees, of which there are many in the proposed project area, range from 180 to 320+ years in age. Equivalent-effort surveys for S&M fungi are required for habitat-disturbing projects in old-growth forest.

Some S&M species or their habitat may be affected by the proposed action. Trail construction may damage or destroy a S&M mushroom (fungus) or disturb its habitat.

The fruiting bodies of most fungi (e.g., mushrooms, conks, truffles, false truffles) are ephemeral, mostly fruiting either in the fall or the spring for a short time, adding to the challenge of their being detected during surveys. Moreover, mushrooms do not fruit in the same spot each year nor do they fruit each year. Variability (unpredictability) characterizes sporocarp (fruiting body) production (Vogt et al. 1992). Many S&M bryophyte and lichen species are cryptic (small and easily overlooked), making them too a challenge to find.

SURVEYS

I hiked the proposed mountain bike trails three times for a month-long period from September 21 through October 18, 2010, surveying for S&M fungi as well as fungi on the Regional Forester's Sensitive Species list. This period of time coincided well with the 2010 fall mushroom season at high elevations (4,600 to 6,000 ft.), including within the proposed project area. Mushroom production was relatively good with a number of species found despite low rainfall. Daytime temperatures were warm to chilly with the majority of days sunny or partially cloudy. Snow on Mt. Hood and in the proposed project area on October 19 effectively brought the fall mushroom season in the proposed project area to a close. More mushroom production at higher elevations in subalpine and high montane habitats in the proposed project area would probably have occurred following fall rains if snow had not intervened first.

RESULTS

The hypogeous fungus *Gymnomyces abietis* was found at Phlox Point in the vicinity of the proposed mountain bike park by Dr. James Trappe (Castellano et al. 1999). Its exact (GPS) location is unknown to me, but I don't expect any of the proposed mountain bike trails to have an effect on this species because the proposed trails do not go through Phlox Point and I assume there are probably other locations for this species in the Phlox Point area.

Two Survey & Manage Category B fungi, *Ramaria araiospora* and *Ramaria aurantiisiccescens*, were found in the proposed trail corridors for the mountain bike park. The standards and guidelines for Category B fungi are to manage all known sites (ROD 2001, Standards and Guidelines, p. 7). Fungi in the genus *Ramaria* are called coral fungi or coral mushrooms because of their resemblance to coral (marine organisms). Both *R. araiospora* and *R. aurantiisiccescens* are also Region 6 Sensitive species.

Only two S&M species were found during field surveys for S&M and special-status fungi in the fall of 2010, but there is the possibility that other special-status or S&M fungi exist within the proposed project area. This is due to suitable habitat being present and the difficulty of locating certain fungi during surveys, particularly hypogeous (belowground fruiting) species, commonly known as truffles and false truffles. The proposed project, however, would not have a significant adverse effect on any S&M or special-status fungi because the mycelia of fungi that could be destroyed by trail construction would likely extend beyond the narrow width of trails. Trail widths are narrow and therefore small in terms of the areal extent of their impact on soils, mycelia networks, and suitable habitat for fungi. Mycological research indicates that the mycelia of mycorrhizal fungi can form an extensive underground web (a "wood-wide web") linking them to the fine roots of trees (Beiler et al. 2009, Zhou et al. 2001, Simard & Durall 2004). Both *R. araiospora* and *R. aurantiisiccesens* are mycorrhizal fungi, but how far laterally their belowground mycelial mats extend is unknown (E. Cazares, pers. comm., 2011).

My recommendation is to err on the side of caution and avoid impacting the sites where the fruiting bodies of these two fungi were found by moving the proposed trails 5-10 ft. away (uphill, downhill, or sidehill) from where the fruiting bodies were found. The fruiting bodies are no longer present, having decomposed last fall, but their locations were recorded using a GPS receiver and flagged. Only nine known sites are documented for *R. aurantiisiccescens* in the Pacific Northwest, half of them in the proposed mountain bike park trails; 78 known sites are documented for *R. araiospora* (NRIS database, 2011).

The construction of mountain bike trails may impact individuals or the habitat of other special-status fungi that I did not detect during my 2010 fall field surveys, particularly hypogeous fungi (truffles and false truffles) that produce belowground fruiting bodies. Construction of trails would cut through belowground mycelia networks, destroying mycelia and their fruiting bodies, including those of undetected special-status fungi. However, trail widths are narrow and therefore small in terms of the areal extent of their impact on soils, mycelia networks, and suitable habitat for fungi. Mycological research indicates that the mycelia of mycorrhizal fungi can form an extensive underground web (a "wood-wide web") linking them to the fine roots of trees (Beiler et al. 2009, Zhou et al. 2001, Simard & Durall 2004). The mycelia of detected or undetected S&M and special-status fungi that would be destroyed by trail construction probably extend beyond the narrow width of trails. Undisturbed mycelia outside trails would in all likelihood survive the disturbance of trail construction and continue to persist and produce fruiting bodies.

Excessive trail widening or the formation of informal (unauthorized) trails or shortcuts between designated trails would increase the risk of harm to mycelia of any detected or undetected S&M and special-status fungi or, worse, the extirpation of the species at the site because a greater proportion of the mycelium or all of it might be destroyed. For this and other ecological reasons, it is important that designated trails be confined in width during their lifetime of use and that trail widening and formation of informal trails and shortcuts be prevented from occurring when mountain bikers use the trail system. If trail widening does occur, widened areas should be revegetated and monitored to ensure that restoration succeeds.

The proposed project, if implemented, would not have a significant adverse effect on the two detected S&M species because conifer trees, the hosts for these mycorrhizal fungi, would not be cut or removed. The mycelia of detected or undetected S&M and special-status fungi that would be destroyed by trail construction probably extend beyond the narrow width of trails. Undisturbed mycelia outside trails would in all likelihood survive the disturbance of trail construction and continue to persist and produce fruiting bodies.

See the attached botanical species list (p. 94) for a list of all the species of fungi that I found during fall 2010 field surveys.

Populations of the Survey & Manage moss *Rhizomnium nudum*, also a Region 6 Sensitive moss species, were found in the wetland complex adjacent to and above (north of) the Jeff Flood chairlift terminal in the proposed project area. Mountain bike trails would not be constructed in these areas.

/s/ David Lebo ______________________   ___Feb. 25, 2011__

David Lebo, Westside Zone Botanist   Date

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Table 1-1. Species in Record of Decision and Standards for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (January 2001). (Species highlighted in blue font are documented on the Mt. Hood National Forest. A brief habitat description is provided for some highlighted species.)

TAXA GROUP *Species*	*Note*: Where taxon has more than one name indicated, first name is current accepted name, second one (in parentheses) is name used in NFP (Table C-3).	Category
FUNGI		
Acanthophysium farlowii (*Aleurodiscus farlowii*)		B
Albatrellus avellaneus		B
Albatrellus caeruleoporus		B
Albatrellus ellisii		B
Albatrellus flettii		B
Alpova alexsmithii		B
Alpova olivaceotinctus		B
Arcangeliella camphorata (*Arcangeliella* sp. nov. #Trappe 12382; *Arcangeliella* sp. nov. #Trappe 12359)		B
Arcangeliella crassa		B
Arcangeliella lactarioides		B
Asterophora lycoperdoides		B
Asterophora parasitica		B
Baeospora myriadophylla		B
Balsamia nigrens (*Balsamia nigra*)		B
Boletus haematinus		B
Boletus pulcherrimus		B
Bondarzewia mesenterica (*Bondarzewia montana*)		B
Bridgeoporus nobilissimus (*Oxyporus nobilissimus*) (on noble and Pacific silver fir stumps, snags, and occasionally live trees; found on Zigzag and Clackamas River Ranger Districts)		A
Cantharellus subalbidus, In Washington and California		D
Catathelasma ventricosa		B
Chalciporus piperatus (*Boletus piperatus*)		D
Chamonixia caespitosa (*Chamonixia pacifica* sp. nov. #Trappe #12768)		B
Choiromyces alveolatus		B
Choiromyces venosus		B
Chromosera cyanophylla		B
Chroogomphus loculatus		B
Chrysomphalina grossula		B
Clavariadelphus ligula		B
Clavariadelphus occidentalis (*Clavariadelphus pistillaris*)		B
Clavariadelphus sachalinensis		B
Clavariadelphus subfastigiatus		B
Clavariadelphus truncatus (syn. *Clavariadelphus borealis*)		D
Clavulina castanopes var. *lignicola* (*Clavulina ornatipes*)		B
Clitocybe senilis		B
Clitocybe subditopoda		B
Collybia bakerensis		F
Collybia racemosa		B
Cordyceps ophioglossoides		B
Cortinarius barlowensis (syn. *Cortinarius azureus*)		B
Cortinarius boulderensis		B
Cortinarius cyanides		B
Cortinarius depauperatus (*Cortinarius spilomeus*)		B
Cortinarius magnivelatus		B
Cortinarius olympianus		B

Cortinarius speciosissimus (*Cortinarius rainierensis*)	B
Cortinarius tabularis	B
Cortinarius umidicola (*Cortinarius canabarba*)	B
Cortinarius valgus	B
Cortinarius variipes	B
Cortinarius verrucisporus	B
Cortinarius wiebeae	B
Craterellus tubaeformis (syn. *Cantharellus tubaeformis*)	D
Cudonia monticola	B
Cyphellostereum leave	B
Dermocybe humboldtensis	B
Destuntzia fusca	B
Destuntzia rubra	B
Dichostereum boreale (*Dichostereum granulosum*)	B
Elaphomyces anthracinus	B
Elaphomyces subviscidus	B
Endogone acrogena	B
Endogone oregonensis	B
Entoloma nitidum (*Rhodocybe nitida*)	B
Fayodia bisphaerigera (*Fayodia gracilipes*)	B
Fevansia aurantiaca (*Alpova* sp. nov. # Trappe 1966) (*Alpova aurantiaca*)	B
Galerina atkinsoniana	B
Galerina cerina	B
Galerina heterocystis	E
Galerina sphagnicola	E
Galerina vittaeformis	B
Gastroboletus imbellus	B
Gastroboletus ruber	B
Gastroboletus subalpinus	B
Gastroboletus turbinatus	B
Gastroboletus vividus (*Gastroboletus* sp. nov. #Trappe 2897; *Gastroboletus* sp. nov. #Trappe 7515)	B
Gastrosuillus amaranthii (*Gastrosuillus* sp. nov. #Trappe 9608)	E
Gastrosuillus umbrinus (*Gastroboletus* sp. nov. #Trappe 7516)	B
Gautieria magnicellaris	B
Gautieria otthii	B
Gelatinodiscus flavidus	B
Glomus radiates	B
Gomphus bonarii	B
Gomphus clavatus	F
Gomphus floccosus, In California	F
Gomphus kauffmanii	E
Gymnomyces abietis (*Gymnomyces* sp. nov. #Trappe 1690, 1706, 1710; *Gymnomyces* sp. nov. #Trappe 4703, 5576; *Gymnomyces* sp. nov. #Trappe 5052; *Gymnomyces* sp. nov. #Trappe 7545; *Martellia* sp. nov. #Trappe 1700; *Martellia* sp. nov. #Trappe 311; *Martellia* sp. nov. #Trappe 5903)	B
Gymnomyces nondistincta (*Martellia* sp. nov. #Trappe 649)	B
Gymnopilus punctifolius	B
Gyromitra californica	B
Gyromitra esculenta	F
Gyromitra infula	B
Gyromitra melaleucoides	B
Gyromitra montana (=*Gyromitra gigas*)	F
Hebeloma olympianum (*Hebeloma olympiana*)	B
Helvella crassitunicata	B

Helvella elastica	B
Hydnotrya inordinata (*Hydnotrya* sp. nov. #Trappe 787, 792)	B
Hydnotrya subnix (*Hydnotrya subnix* sp. nov. #Trappe 1861)	B
Hydropus marginellus (*Mycena marginella*)	B
Hygrophorus caeruleus	B
Hygrophorus karstenii	B
Hygrophorus vernalis	B
Hypomyces luteovirens	B
Leucogaster citrinus	B
Leucogaster microsporus	B
Macowanites chlorinosmus	B
Macowanites lymanensis	B
Macowanites mollis	B
Marasmius applanatipes	B
Martellia fragrans	B
Martellia idahoensis	B
Mycena hudsoniana	B
Mycena monticola	B
Mycena overholtsii	D
Mycena quinaultensis	B
Mycena tenax	B
Mythicomyces corneipes	B
Neolentinus adhaerens	B
Neolentinus kauffmanii	B
Neolurna pouchettii	B
Nivatogastrium nubigenum	B
Octavianina cyanescens (*Octavianina* sp. nov. #Trappe 7502)	B
Octavianina macrospora	B
Octavianina papyracea	B
Otidea leporina	D
Otidea onotica	F
Otidea smithii	B
Phaeocollybia attenuata	D
Phaeocollybia californica	B
Phaeocollybia dissiliens	B
Phaeocollybia fallax	D
Phaeocollybia gregaria	B
Phaeocollybia kauffmanii	D
Phaeocollybia olivacea	B
Phaeocollybia oregonensis (syn. *Phaeocollybia carmanahensis*)	B
Phaeocollybia piceae	B
Phaeocollybia pseudofestiva	B
Phaeocollybia scatesiae	B
Phaeocollybia sipei	B
Phaeocollybia spadicea	B
Phellodon atratus (*Phellodon atratum*)	B
Pholiota albivelata	B
Pithya vulgaris	D
Plectania melastoma	F
Plectania milleri	B
Podostroma alutaceum	B
Polyozellus multiplex	B
Pseudaleuria quinaultiana	B

Ramaria abietina	B
Ramaria amyloidea	B
Ramaria araiospora	B
Ramaria aurantiisiccescens	B
Ramaria botryis var. *aurantiiramosa*	B
Ramaria celerivirescens	B
Ramaria claviramulata	B
Ramaria concolor f. marrii	B
Ramaria concolor f. tsugina	B
Ramaria conjunctipes var. *sparsiramosa* (*Ramaria fasciculata* var. *sparsiramosa*)	B
Ramaria coulterae	B
Ramaria cyaneigranosa	B
Ramaria gelatiniaurantia	B
Ramaria gracilis	B
Ramaria hilaris var. *olympiana*	B
Ramaria largentii	B
Ramaria lorithamnus	B
Ramaria maculatipes	B
Ramaria rainierensis	B
Ramaria rubella var. *blanda*	B
Ramaria rubribrunnescens	B
Ramaria rubrievanescens	B
Ramaria rubripermanens	B
Ramaria spinulosa var. *diminutiva* (*Ramaria spinulosa*)	B
Ramaria stuntzii	B
Ramaria suecica	B
Ramaria thiersii	B
Ramaria verlotensis	B
Rhizopogon abietis	B
Rhizopogon atroviolaceus	B
Rhizopogon brunneiniger	B
Rhizopogon chamaleontinus (*Rhizopogon* sp. nov. #Trappe 9432)	B
Rhizopogon ellipsosporus (*Alpova* sp. nov. # Trappe 9730)	B
Rhizopogon evadens var. *subalpinus*	B
Rhizopogon exiguus	B
Rhizopogon flavofibrillosus	B
Rhizopogon inquinatus	B
Rhizopogon truncatus	D
Rhodocybe speciosa	B
Rickenella swartzii (*Rickenella setipes*)	B
Russula mustelina	B
Sarcodon fuscoindicus	B
Sarcodon imbricatus	B
Sarcodon latahense (*Plectania latahensis*)	B
Sarcosoma mexicanum, WA, CA, and Curry and Josephine Counties, OR	F
Sarcosphaera coronaria (*Sarcosphaera eximia*)	B
Sedecula pulvinata	B
Sowerbyella rhenana (*Aleuria rhenana*)	B
Sparassis crispa	D
Spathularia flavida	B
Stagnicola perplexa	B
Thaxterogaster pavelekii (*Thaxterogaster* sp. nov. #Trappe 4867, 6242, 7427, 7962, 8520)	B
Tremiscus helvelloides	D

Tricholoma venenatum	B
Tricholomopsis fulvescens	B
Tuber asa (*Tuber* sp. nov. #Trappe 2302)	B
Tuber pacificum (*Tuber* sp. nov. #Trappe 12493)	B
Tylopilus porphyrosporus (*Tylopilus pseudoscaber*)	D
LICHENS	
Bryoria pseudocapillaris (strictly oceanic/coastal; not occurring on Mt. Hood NF)	B
Bryoria spiralifera (strictly oceanic/coastal; not occurring on Mt. Hood NF)	B
Bryoria subcana (syn. *Alectoria subcana)* (pale white thallus; primarily coastal but with documented sites on Gifford Pinchot and Willamette NFs; could occur on Mt. Hood NF)	B
Bryoria tortuosa, WA Olympic Peninsula, WA Western Lowlands, WA Western Cascades, OR Western Cascades, OR Coast Range, OR Willamette Valley, and CA Coast Range Physiographic Provinces (on tree branches or boles)	A
Bryoria tortuosa, WA Eastern Cascades, OR Eastern Cascades, OR Klamath, CA, Klamath, and CA Cascades Physiographic Provinces (on tree branches or boles)	D[1]
Buellia oidalea	E
Calicium abietinum (pin lichen on snags and trees with furrowed bark) Strategic Surveys Completed	B
Calicium adspersum (pin lichen on snags and trees with furrowed bark)	E
Calicium glaucellum	F
Calicium viride (pin lichen on snags and trees with furrowed bark)	F
Cetrelia cetrarioides	E
Chaenotheca chrysocephala (pin lichen on snags and trees with furrowed bark) Strategic Surveys Completed	B
Chaenotheca ferruginea (pin lichen on snags and trees with furrowed bark) Strategic Surveys Completed	B
Chaenotheca furfuracea	F
Chaenotheca subroscida (pin lichen on snags and trees with furrowed bark)	E
Chaenothecopsis pusilla (syn. *Chaenotheca subpusilla, Calicium asikkalense, Calicium floerkei, Calicium pusillum, Calicium subpusillum*) (pin lichen on snags and trees with furrowed bark)	E
Collema nigrescens, In WA and OR, except in OR Klamath Physiographic Province	F
Dendriscocaulon intricatulum (on tree branches)	B
Dermatocarpon luridum (in coldwater streams)	B
Heterodermia sitchensis	E
Hypogymnia duplicata (syn. *Hypogymnia elongata*) (on tree boles and branches; old-growth forest associate)	A
Hypogymnia oceanica (on tree branches)	F
Hypogymnia vittata (*Hygomnia vittiata*)	E
Hypotrachyna revoluta (syn. *Parmelia revoluta*)	E
Leptogium burnetiae var. hirsutum (on moss-covered hardwoods such as vine maple, alder, cottonwood)	A
Leptogium cyanescens (on moss-covered hardwoods such as vine maple, alder, cottonwood)	A
Leptogium rivale	B
Leptogium teretiusculum	E
Lobaria linita (on tree boles and branches)	A
Lobaria oregana, In California	A
Microcalicium arenarium (pin lichen on snags and trees with furrowed bark) Strategic Surveys Completed	B
Nephroma bellum (on trees, shrubs, and mossy rocks)	F
Nephroma isidiosum	E
Nephroma occultum **(**found at Old Maid Flats on Zigzag RD)	B
Niebla cephalota (oceanic/coastal species; not occurring on Mt. Hood NF)	A
Pannaria rubiginosa **(**found on Clackamas River and Hood River RDs by Mark Boyll)	E
Pannaria saubinetii	F

Peltigera pacifica (found in summer home tracts on Mt. Hood NF along Hwy 26)	E
Platismatia lacunosa (rare with only few sites on Mt. Hood NF)	C
Pseudocyphellaria sp. 1 (syn. *Pseudocyphellaria mougeotiana, Pseudocyphellaria perpetua*) (oceanic/coastal species not occurring on Mt. Hood NF)	B
Pseudocyphellaria rainierensis (old-growth forest associate found at Old Maid Flats, in Bull Run watershed, along Collawash River, near Bagby Hot Springs, and known from a few other locations on the Mt. Hood NF)	A
Pyrrospora quernea (syn. *Lecidea quernea, Protoblastenia quernea*)	E
Ramalina pollinaria	E
Ramalina thrausta (on tree branches on western edge of Mt. Hood NF)	A
Stenocybe clavata (small pin-like lichen found in Still Creek Campground by Hwy 26)	E
Teloschistes flavicans	A
Tholurna dissimilis, south of Columbia River (high-elevation alpine-arctic lichen found along Timberline trail on Mt. Hood)	B
Usnea hesperina	B
Usnea longissima, In California and in Curry, Josephine, and Jackson Counties, Oregon	A
Usnea longissima, In Oregon, except in Curry, Josephine, and Jackson Counties and in Washington (Although assigned as a category F species, *U. longissima* remains an uncommon lichen found scattered across the Zigzag and Clackamas River RDs and in the Bull Run watershed.)	F
BRYOPHYTES	
Brotherella roellii	E
Buxbaumia viridis	D
Diplophyllum albicans (on downed logs; known sites in Bull Run watershed)	D
Diplophyllum plicatum Strategic Surveys Completed	B
Encalypta brevicolla. v. crumiana (only 2 known sites: Mt. Rainier NP and Siskiyou Mts.)	B
Herbertus aduncus	B
Iwatsukiella leucotricha (only 1 known site: Saddle Mt. in OR Coast Range) Strategic Surveys Completed	B
Kurzia makinoana Strategic Surveys Completed	B
Marsupella emarginata v. aquatica (on rocks in streams) Strategic Surveys Completed	B
Orthodontium gracile (only known in coastal redwood forests) Strategic Surveys Completed	B
Ptilidium californicum, In California	A
Racomitrium aquaticum (a misnomer since it's actually found in upland forest habitat)	B
Rhizomnium nudum, In Oregon (shallow depressions on forest floor; found in Bull Run watershed and on Barlow Ranger District) Strategic Surveys Completed	B
Schistostega pennata (soil on underside of rootwads; several known sites just east of Government Camp)	A
Tetraphis geniculata (bent seta; on cut logs; 2 known sites on Salmon River Trail south of Welches)	A
Tritomaria exsectiformis (possibly on Barlow RD along seeps, springs, and low-gradient streams)	B
Tritomaria quinquedentata (possibly on Barlow RD along seeps, springs, and low-gradient streams) Strategic Surveys Completed	B
VASCULAR PLANTS	
Arceuthobium tsugense mertensianae (Washington only)	F
Bensoniella oregana (California only)	A
Botrychium minganense, In Oregon and California (in forest wetlands on east side of Mt. Hood NF)	A
Botrychium montanum (in forest wetlands on east side of Mt. Hood NF)	A
Coptis asplenifolia	A
Coptis trifolia (along edge of meadow within grazing allotment on east side of Mt. Hood NF)	A
Corydalis aquae-gelidae (along coldwater streams; known sites along Oak Grove Fork, Stone Creek, Peavine Creek, and upper Clackamas River)	C
Cypripedium fasciculatum (entire range) (on east side of Mt. Hood NF)	C
Cypripedium montanum (entire range) (on west side of Mt. Hood NF)	C

Eucephalus vialis (syn. *Aster vialis*)	A
Galium kamtschaticum, Olympic Peninsula, WA Eastern Cascades, OR & WA Western Cascades Physiographic Provinces, south of Snoqualmie Pass (appears to be restricted to NW Washington)	A
Platanthera orbiculata var. *orbiculata* (syn. *Habenaria orbiculata*) (appears to be restricted to NW Washington; possibly in Bull Run watershed)	C

[1] Although Pre-Disturbance Surveys are deemed practical for these species, continuing pre-disturbance surveys is not necessary in order to meet management objectives.
[2] For these species, until Management Recommendations are written, the following language will be considered part of the Management Recommendation: "Known and newly discovered sites of these species will be protected from grazing by all practical steps to ensure that the local population of the species will not be impacted."
[3] For these species, until Management Recommendations are written, the language "known and newly discovered sites of these species will be protected from grazing by all practical steps to ensure that the local population of the species will not be impacted" is the Management Recommendation and no other recommendations are imposed at this time.
[4] Based upon direction contained in the ROD, equivalent-effort pre-disturbance surveys are required for these eight mollusk species.
5 Based upon direction contained in the ROD, these two mollusk species require management of sites known as of 9/30/99.

PLANT PROPAGATION & RESTORATION

Revegetation of disturbed areas is essential to successfully managing a downhill mountain bike park and repairing the environmental damage that mountain biking causes. Ground disturbance and trampling of vegetation can be expected to occur during the construction, use, and maintenance of a mountain bike park. For example, construction of trails would remove vegetation not only within trails but along their sides where excavated soil would be sidecast. If disturbed trailsides are not repaired (revegetated), mountain bikers will ride on them, widening trails. Trails will also more than likely widen with routine use with trampled shoulders requiring revegetation. Local rock materials pried out of the ground to line (armor) the surface of trails would expose bare ground that could be colonized by invasive non-native plants if not revegetated with native plants. Informal (unauthorized) trails, whether created by "rogue" mountain bike riders who illegally venture off trails or by workers performing routine maintenance on trails and trail infrastructure (e.g., bridges, boardwalks, culverts), would trample vegetation and create further ground disturbance. Additionally, sparsely vegetated areas in the Timberline Express ski runs, presently covered , for the most part, with wood strand (wood fiber mulch), require further revegetation work as required in the Timberline Express Draft EIS (2005) (Vol. 2: Appendices, p. 79).

Revegetation Methods

Plant propagation is often necessary to provide an adequate supply of locally collected native plant materials for revegetating disturbed sites. "Locally collected" means using seed, transplants, divisions, and/or cuttings from native plants growing in the proposed project area, ensuring that plants used for restoration are environmentally and genetically well-adapted to the sites requiring revegetation. Collection of plants or seed from similar environmental conditions (slope, elevation, aspect) will increase survival, but it is best to to collect materials within a very short distance from the revegetation site (Rochefort et al. 2006). Many high-elevation species are perennial, and seed production may not occur on an annual basis. High levels of variation within and between populations and the presence of ecotypes are evidence that sexual reproduction is an important process in mountain plant communities (Billings 1973, Linhart & Wise 1997, Rochefort & Peterson 2001, Linhart & Gehring 2003, Rochefort et al. 2006). Linhart and Wise (1997) found that genetic differentiation in herbs can be significant, in complex terrain, over distances of less than 100 meters (cited in Rochefort et al. 2006). Although movement of tree seeds to sites 2-3 kilometers away may be reasonable, movement of herbaceous plants may need to be more conservative, perhaps on the order of hundreds of meters (Rochefort et al. 2006).

Revegetation methods include seeding, natural seed rain from adjacent areas, greenhouse propagation and outplanting, transplants, and layering (Rochefort et al. 2006). The following methods can be used to restore vegetation in disturbed areas in the mountain bike park and in the nearby Timberline Express ski runs:

(a) salvage (transplants) of whole plants within trail corridors that would be destroyed during construction of mountain bike trails

(b) direct seeding

(c) outplanting of nursery-raised seedlings propagated from seeds collected in the special-use permit area

(d) clonal propagation in a nursery using divisions or vegetative propagules of plants collected in the special-use permit area

Forbs, graminoids, shrubs, and trees can all be salvaged and transplanted. Seed can be collected from plants in the special-use permit area, propagated in a nursery, and then emergents/seedlings outplanted later. For some species, seed collected from local plants can be sown directly in disturbed areas. Divisions or vegetative propagules (e.g., offset plants from runners, stem offshoots from parent plants, pieces of root crowns, rosettes with attached rhizome, rhizomes, bulbs, or cuttings) from plants that would be destroyed during trail construction can be salvaged and transplanted directly or grown in a nursery and then the seedlings outplanted at some later time.

Transplants

Plant propagation in a nursery or greenhouse and direct seeding (especially of grasses) are probably the methods most frequently employed in restoration projects because transplants are not always available or transplanting whole plants may not be appropriate (vegetation is removed and soil disturbed at the donor site) and outplanting of nursery-grown seedlings is more successful than direct (on-site) seeding for many forb and shrub species. Kruckeberg (1996) sums up the prevailing conservation ethic regarding transplanting: "transplanting whole plants from the wild *should not be done* except when the disturbance is recurrent or about to eradicate a colony of plants" because "this method repairs damage at one site by inflicting damage upon another" (p. 22). But when disturbance threatens to wipe out a colony of plants, "the natives dug are natives saved" (p. 22). Rose et al. (1998) also support the salvage of plants from sites designated for construction or some other disturbance that will destroy the existing vegetation. They offer the following general recommendations: "Carefully dig up the plants and transport to the nursery or outplanting site. It is crucial to keep the roots moist during this process. Cool, cloudy days with very little wind are ideal for this procedure. If possible, it is best to keep the original soil around the root system intact in order to minimize water loss and damage to the root system. Plants should be planted as soon as possible after salvage from a site" (p. 21). Transplants collected from sites adjacent to a disturbed locality have been used directly for arctic and alpine restoration too (May et al. 1982, Tishkov 1997, Shirazi et al. 1998). Finally, salvage transplants have been used with much success in subalpine and alpine areas at Mt. Rainier National Park (Rochefort & Gibbons 1992, Rochefort et al. 2006).

The goal in plant restoration is to revegetate disturbed sites with the plant community that would have been present if the site had not been disturbed (Rochefort & Gibbons 1992). Since the snow-free, summer season is very short at timberline (e.g., 30-60 days at Paradise Park on Mt. Rainier and perhaps 75-115 days at Timberline Lodge on Mt. Hood), natural revegetation is slow. Whenever possible at Mt. Rainier, restored sites are both planted and seeded (Rochefort & Gibbons 1992). Since maintenance of the genetic integrity of the area's plant communities is a goal at Mt. Rainier National Park, plants are propagated in a greenhouse from stock collected adjacent to the site or, less frequently, transplanted from undamaged areas near the site (Rochefort & Gibbons 1992). Salvage transplants from areas where bike trails are to be constructed in the proposed Timberline mountain bike park are an excellent way to revegetate disturbed areas (Rochefort, personal communication, 2010). Seed for direct seeding or nursery propagation should be collected as close to the revegetation site as possible to minimize any influence on the genetic composition of existing plant communities (Rochefort & Gibbons 1992). Workers at Mt. Rainier National Park seed and plant in September, just before the winter snows, to minimize the need for watering (Rochefort & Gibbons 1992). The last step of the season is to cover the site with an excelsior mulch (aspen shavings) to moderate surface temperatures, conserve moisture, and reduce surface erosion (Rochefort & Gibbons 1992).

Restoration at Mt. Rainier National Park

Although some native plant species that would be destroyed during trail construction in the proposed Timberline mountain bike park may transplant less well than others, transplanting, on the whole, can be highly successful for many species. For example, Mt. Rainier National Park has successfully salvaged whole plants for a number of restoration projects at Paradise Park on the south flank of Mt. Rainier (Whiteaker, pers. communication, 2010). Both woody and herbaceous plants were salvaged during the destruction of the old visitor center for the construction of a new visitor center at Paradise. Plants were salvaged in the fall of 2005 and stored in constructed beds until they were planted in the fall of 2008. The beds were laid on asphalt with bark on the bottom and manufactured topsoil as the substrate. The beds were 24 ft. x 12 ft. in size and used 2 inch x 12 inch lumber, making them about 11.5 inches deep. An irrigation system was set up so that the beds could be watered during the dry part of the year (August-September). There was an 80% survival rate for the woody species and the herbaceous species actually increased in the beds to about 130% to 140% before outplanting in 2008. The planting included both salvaged material and greenhouse-grown plants developed from locally collected seed. Mt. Rainier National Park uses a total of 45-50 species for subalpine restoration (Whiteaker, pers. communication, 2010).

Photo of salvage beds at Mt. Rainier National Park in 2006 (courtesy L. Whiteaker).

At Mt. Rainier National Park, plants were also salvaged for restoration work in the campground at Sunrise in 1997 (Whiteaker, pers. communication, 2010). Salvaged material included clumps of both woody and herbaceous vegetation. Herbaceous plants were stored on burlap and stacked in layers to limit the area of vegetation impacted by having the plants stored on top of it. The site was recontoured using large machinery from the National Guard, and the salvaged plants were transplanted in the fall of that year. Success rate overall was about 80%; the success rate for small trees was slightly less at about 50% or a little higher.

Planting of both salvage and greenhouse-raised plants at Paradise in Mt. Rainier National Park in 2008 (courtesy L. Whiteaker).

Erosion mats such as excelsior (aspen shavings), straw, or coconut fiber (coir) can be used to modify soil temperatures and moisture levels and to help keep people off restored sites (Rochefort et al. 2006). Seedling emergence at sites seeded with partridge foot and black sedge increased when covered with an exselsior blanket and clear plastic and watered regularly in the Enchantment Lakes of Washington (Juelson 2001).

At Mt. Rainier National Park, there is an established standard of planting eight plants per square foot in subalpine meadows (Rochefort et al. 2006). The natural density in undisturbed meadows is about eighty plants per square foot on average. Cost estimates for subalpine meadow restoration are based on a minimum plant density of eight plants per square foot. If meeting this minimum standard exceeds available funding, new planting density objectives are developed (Rochefort et al. 2006).

Species propagated successfully at Mt. Rainier National Park and the techniques used to propagate them are listed in Table 1 (Rochefort & Gibbons 1992):

Table 1. Summary of Greenhouse-Propagated Species		
Species	Vegetation Zone	Propagation Technique
Anaphalis margaritacea	S	s
Anemone occidentalis	S	s
Antennaria alpina	A	s
Antennaria lanata	S	s
Arctostaphylos uva-ursi	F	c
Aster alpigenus	A, S	s
Aster [=Eucephalus]ledophyllus	S, F	s, r
Berberis nervosa	F	c, s
Carex illota	S	s, d
Carex nigricans	A, S	s, d
Carex phaeocephala	A	s
Carex spectabilis	A, S	s
Cassiope mertensiana	A, S	c
Chimaphila umbellata	F	r
Cirsium edule	S	s
Deschampsia atropurpurea	S	s, d
Empetrum nigrum	A, S	c
Erigeron peregrinus	S	s
Festuca viridula	S	s, d
Gaultheria ovatifolia	F, S	s
Gaultheria shallon	F	c, s
Juncus spp.	S	d
Juniperus communis	S	c
Linnaea borealis	F	c
Luetkea pectinata	A, S	c
Lupinus latifolius	S	s
Luzula sp.	S	s
Menziesia ferruginea	F	c
Mimulus sp.	S	s
Pachistima myrsinites	F	c
Petasites frigidus	S, F	s
Phleum alpinum	A, S	s, d
Phlox diffusa	A, S	c
Phyllodoce empetriformis	A, S, F	c
Phyllodoce glanduliflora	A, S	c
Potentilla flabellifolia	S	s
Rhododendron albiflorum	F, S	c
Rubus laciococcus	F	c
Rubus spectabilis	F, S	c
Salix sp.	F	c
Sibbaldia procumbens	A	s
Sitanion hystrix	S	s
Sorbus sitchensis	S	c
Spiraea densiflora	S	c, s
Spiraea douglasii	F	c
Trisetum spicatum	S	s
Vaccinium deliciosum	S	c
Vaccinium parvifolium	F	c
Valeriana sitchensis	S	s

A = alpine, S = subalpine, F = forest, c = cuttings, s = seed, d = divisions

Survival rates of greenhouse plants in revegetation plants established in 1985 averaged 94% for forb species, and rates of spread averaged 230% (Rochefort & Gibbons 1992). Species such as *Luetkea pectinata*, *Phlox diffusa*, and *Lupinus latifolius* spread more quickly than sedges such as *Carex spectabilis* and *Carex nigricans*. Seeding with *Aster ledophyllus, Lupinus latifolius*, *Erythronium* spp., *Phleum alpinum*, and *Carex* spp. were successful on several sites, but generally slower than the spread of forb species. Heather plants exhibited an 85% survival rate after one year (Rochefort & Gibbons 1992).

Other Restoration Experiences with Transplants

In a 10-year-long restoration study conducted in subalpine forest in the Eagle Cap Wilderness in eastern Oregon, transplant success ranged from 43 percent to 100 percent (Cole & Spildie 2007). Transplanted graminoids (grasses, sedges, and rushes) survived most frequently (87%), forbs (herbaceous plants) survived less frequently (72%), and shrubs had poor survivorship (45%). Survivorship was notably high (100%) for Parry's rush and Ross' sedge. It was notably low for shrubs (e.g., 45% for grouse huckleberry and 50% for mountain heather). Hitchcock's smooth woodrush did well over time after transplanting despite initial low survivorship. Parry's rush also established well when seeded. Interestingly, wild yarrow (*Achillea millefolium*), a common and widespread species in many habitats, including subalpine areas, had poor survivorship. For the species that transplanted successfully, plants survived and grew well whether soils were amended with organic matter, compost, and mycorrhizal inoculum, or not. In the case of both Parry's rush and Ross' sedge, growth rates were significantly greater on plots amended with either organics or organics and compost, in comparison to unamended plots. Transplanting involved (1) digging up plants ensuring their entire root systems were included, (2) digging holes and placing transplants in the holes, along with Vita-start (vitamin B-1) to reduce transplant shock, and (3) watering each transplant. Mycorrhiza inoculation may improve transplant success. Cole & Spildie (2007) offer the following planting recommendations:

1. Amend soils with at least a 2.5 cm (1 inch) layer of locally collected, well-decomposed organic matter. Add an equivalent amount of compost. Alternatively, mix in a smaller amount of bioorganic fertilizer. For example, a bioorganic fertilizer with 6 or 7 percent nitrogen could be applied at a rate of about 18 kg per 100 m^2.
2. If possible, water plants during long, dry spells. This is most important in the first few growing seasons. However, we had transplants, which had been growing well, die 4 years or more after transplanting.
3. Transplant shrubs (if appropriate to the site) at densities at least as high as their densities on undisturbed sites. Consider growing these shrubs in nurseries, from seed collected close to the site.

4. Collect seed from a wide variety of species growing in the vicinity, preferably a year before restoration. Match the species sown to site conditions.
5. The benefits of using a mulch blanket are unclear. It is not harmful, however, and can have benefits such as keeping people off the site.

Lessons Learned from Restoration in Alpine Environments

Methods used to restore alpine disturbances have included seeding, individual tiller transplanting (tillers are shoots that sprout from the base of a grass), and turf transplanting (Chambers, 1997, Conlin & Ebersole 2001). Seeding has been successful on moderate alpine sites (Chambers, 1997). Seeding methods must consider episodic seed production during collection periods as well as high seedling mortality on more severe sites (Conlin & Ebersole 2001). On machine-graded ski runs in the Swiss Alps, direct transplanting of tillers has not been successful while indirect tiller transplants (those grown in greenhouses from harvested tillers) have worked very well (Urbanska et al. 1988, Urbanska, 1994,1997). May et al. (1982) found that root form was the most important determinant for transplant success in a study of directly transplanted, entire, mature individuals of six different species in alpine habitat in Colorado. The plants with highest transplanting success had deep taproots, fleshy roots, well-developed secondary roots, and/or dense, fibrous roots without rhizomes. Plants with shallow, fibrous roots, on the other hand, did not transplant well. Marr et al. (1974) reported use of turf transplants for restoration of a alpine disturbance in moist sites dominated by *Deschampsia cespitosa* and *Sibbaldia procumbens* in Colorado. Eighteen years later, Buckner and Marr (1988) reported high success of these transplants.

Seeding, transplanting, or both have been used successfully for revegetation of alpine sites in the Swiss Alps (Urbanska 1995). Transplantation is a promising restoration technique since the vulnerable stages of germination and recruitment are largely circumvented, transplant survival is generally good, and reproduction may occur soon after reintroduction of plants (Urbanska 1995). Transplant material is obtained either by direct transfer from the donor population to the restoration site or by cultivation of the native material in a nursery prior to transplanting. The latter method is recommended so that more plants can be propagated and outplanted. Urbanska (1995) reports that transplanting may be done in three different ways: (a) plants can be grown in the greenhouse from seeds taken from a donor population; (b) whole plants taken from the donor site can be cloned and then the clones can be grown in the greenhouse; or (c) divisions of grown plants can be collected from the donor population. Method “b” can result in the removal of some established genotypes from donor populations; the result is that these genotypes are introduced into the restoration site but the donor populations become genetically depleted (Urbanska 1995).

Previously tested methods for revegetating alpine disturbances include seeding and transplanting of both single species and pieces of turf (Chambers 1997 cited in Ebersole et al. 2004). Seeding of native species proved successful at high elevations in some situations (Bayfield 1980, Guillaume et al. 1986, Chambers 1997), and collecting seed is less damaging to donor populations than transplanting. However, seeds and seedlings are more susceptible to environmental hazards (Urbanska 1997), so seeding can take longer to revegetate areas than transplanting. Indirect single species transplants, in which whole plants are removed, split into single rootstocks, and propagated in a greenhouse before transplanting were successful on ski runs in Switzerland while directly transplanting these plant parts without rooting in the greenhouse was not successful (Urbanska et al. 1987, Urbanska 1994).

Turf Transplants

Transplanting turf pieces has worked well in the Rocky Mountains (Buckner and Marr 1988, Ebersole et al. 2004, Bay & Ebersole 2006) and is especially appropriate when turf is available from construction and not obtained by damaging previously undisturbed vegetation. Benefits of turf transplants include reduced shock to individuals, greater mix of transplanted species, immediate diaspore production, and potential safe sites for seedlings and vegetative expansion (Urbanska 1997a, 1997b cited in Ebersole et al. 2004). Direct transplanting of plant parts (without rooting in the greenhouse) has not worked well (Urbanska et al. 1988; Urbanska 1994, 1997a, 1997b). The use of turf-transplants taken from a newly cut trail may be more successful than seeding and individual transplanting due to reduced shock to individuals during the transplant process and avoidance of the susceptible germination and seedling stages (Urbanska, 1997a, 1997b). Additional benefits of this method may include a more complete mix of native species, production and entrapment of diaspores, potential for vegetative expansion from the transplant into surrounding areas, and presence of an intact mycorrhizal mat (Urbanska, 1994, 1997a, 1997b).

Ebensole et al. (2004) report that turf transplants have been very successful for revegetating *social* alpine trails (informal trails created by climbers) on 14,000-foot peaks in Colorado and would presumably survive even better in moister sites. They maintain high species richness and, in some cases, enhance natural seedling colonization near them. Whenever a new trail is cut, crews should carefully excavate to maximize the amount of turf available for transplant to areas with very similar original vegetation. Immediate transplanting is best although turf blocks can survive for a limited time with watering before transplanting (Buckner and Marr 1988 cited in Ebersole et al. 2004). Edges of turf blocks need to be flush with the surrounding surface as blocks placed on the surface or whose edges are partially exposed have poor survival. Even if disturbances cannot be completely covered with turf transplants, turf blocks can serve as sources of seeds and "safe sites" for other colonizers. In favorable sites, turf blocks can be placed

30 cm (12 inches) apart and still strongly enhance colonization of natural seedlings. Seeding areas between turf blocks is also likely to be effective. Loose soil from newly cut trails contains a valuable seed bank and important organic matter and nutrients. It should be spread on stabilized areas needing restoration and covered with erosion matting. When turf blocks are not available, seeding seems to be the most time-efficient, logistically reasonable, and effective approach for restoring social trails (Ebersole et al. 2004).

Erosion matting increases seedling density dramatically, and seeding is unlikely to be successful without it (Ebersole et al. 2004). Matting should be used whenever permitted and logistically feasible. The authors report that the short-term aesthetic trade-off of using matting is offset completely by the enormously better revegetation. Seed can be collected on site when it matures in late summer to early fall and immediately seeded into disturbed sites with similar moisture regimes and duration of snow cover. This eliminates transporting it to and from the site, cleaning, and storage. Disadvantages include time constraints of collecting sufficient seed and poor seed production and viability in some years (Chambers 1989). Many species have germinated from seed collected on site so that maintaining species richness using this technique seems likely. Ebersole et al. (2004) report seeding success not only with graminoids (grasses, rushes, sedges) but with dicots too and recommend that seed collected on site be grown out and increased in a native plant center. They also report that harvesting plant parts, rooting them, and then planting them into bare areas has effectively produced good cover and high species richness in other sites, but that poor stabilization, subsequent erosion and deposition, and problems with erosion matting have complicated interpreting the results of this technique.

Species Not Transplanting Well

Some plant species in the proposed project area may not transplant well. One on-line source reports that mature plants of big huckleberry seldom survive transplanting (http://berrygrape.org/information-on-huckleberry-plants/). The Wind River Nursery in Carson, Washington provides suggestions for successful propagation of big huckleberry in the nursery (http://www.fs.fed.us/database/feis/plants/shrub/vacmem/all.html). Initial planting of big huckleberry is recommended in flats with subsequent transplanting of germinants to individual pots. Flats should be covered with glass or plexiglass to reduce soil moisture loss and placed in a cool location (large refrigerator or unheated greenhouse) to provide cool moist stratification. After stratification, flats should be transferred directly to heated greenhouse for germination. Seedlings should be hand transplanted to pots. Lupines do not tolerate transplanting well; instead, nursery plugs are recommended (http://courses.washington.edu/esrm412/protocols/LULE2.pdf). Nursery seedlings are also recommended for diffuse phlox. Newberry's fleeceflower is a plant with a large storage taproot reaching >80 cm depth in adults and so would be a challenge digging up for transplanting (Chapin and Bliss 1989).

Direct Seeding and Nursery-Grown Plants

Some plant species growing in the proposed project area may be directly seeded in disturbed areas. For example, workers at Mt. Rainier National Park had good success with direct seeding of Cascade aster (*Eucephalus ledophyllus*) (Rochefort, pers. comm., 2010). Cascade aster is abundant in the proposed project area, especially in meadows. Seed could be collected from Cascade aster in the summer of 2011 and sown the same summer or in subsequent years. Other plant species may have to be grown from seed, offset plants, stem offshoots, rhizomes, cuttings, or bulbs in a nursery first and then outplanted as containerized seedlings (as plugs or in pots). Seed can be collected from alpine aster, alpine hawkweed, broadleaf lupine, Cascade aster, diffuse phlox, grasses, Hitchcock's smooth woodrush, Jacob's ladder, Mt. Hood pussypaws, mountain arnica, mountain mariposa lily, Newberry's fleeceflower, Pacific (dwarf) lupine, and sedges and then propagated in a nursery. Containerized seedlings could then be outplanted later in areas needing restoration in the proposed mountain bike park. Some species can be regenerated vegetatively by dividing a plant: using pieces from the root crown (e.g., Cascade aster), using offset plants produced by runners (e.g., wild strawberries), using detached rosettes with rhizome (e.g., partridge foot), by rooting pieces carefully detached from parent plants (e.g., twinflower), by rooting small rosette or stem offshoots from a parent plant (e.g., diffuse phlox), using pieces of the root crown or rosettes (e.g., *Penstemon*), or using young offset clumps (e.g., beargrass). See propagation table in appendix. Further inquiry in the literature on restoration ecology may provide more information on successful propagation methods for particular species.

Growing plants from locally collected seed (from the special-use permit area) is preferable because genetic diversity is maintained and promoted in this way. Propagation of plants asexually (vegetatively) from offset plants, offshoots, rhizomes, cuttings, or bulbs produces genetically identical daughter plants. Genetic diversity increases the chances of individuals or populations adapting to climate change, drought, disease, insect attack, and other environmental challenges.

In addition to transplant shock, plants transplanted during the summer may be subject to prolonged drought periods, while plants transplanted in early fall (late September/early October) may be subject to early frost or even snow. But there appears to be consensus that transplanting in late summer-early fall (mid-September to early October) in high elevation areas works best because plants are then not subject to periods of summer drought.

Revegetation: Getting Ready

Successful revegetation of disturbed areas would certainly require planning beforehand, careful coordination, and a team of workers to carry it out. The best way to ensure that native vegetation is successfully restored in areas disturbed by trail construction and mountain bike traffic is for RLK & Company to prepare and organize a restoration plan well before trail construction begins and to put together a team of workers to implement it. For example, restoration workers would precede trail construction, digging up whole plants and turf blocks for salvage transplanting and, in cases when whole plants cannot be salvage transplanted, collecting seed, divisions, cuttings, and vegetative propagules for propagation in a nursery. Following Mt. Rainier National Park's lead, salvaged plants would be stored and tended (watered) in beds constructed nearby (e.g., Wy'East Lodge parking lot) for planting the same season or taken to a nearby nursery for planting the following year or in subsequent years. Following transplanting, some species may need regular watering if transplanted during prolonged periods of summer drought instead of in late summer or early fall before the fall rains arrive.

Divisions, cuttings, or vegetative propagules, too, would be propagated in a nursery for outplanting. All of these native plant materials would then be available for outplanting later in disturbed areas in the mountain bike park (e.g., along trails where excavated soil was sidecast, the sides or shoulders of trails that have been widened, trampled areas). The advantage of propagating plant materials in a nearby permanent nursery facility is that a supply of seedlings could then be produced from locally collected seed, divisions, cuttings, or vegetative propagules for outplanting in successive years, ensuring a stock of native plant materials to draw upon to revegetate disturbed areas. Any divisions or vegetative propagules (offset plants, stem offshoots from parent plants, rosettes with rhizomes, rooted pieces, root crown pieces) collected/in the field would be clonally propagated in a nursery and then the clones outplanted in successive years when needed.

Nurseries

The collection of seed, divisions, cuttings, or other vegetative propagules from native plants within the special-use permit area is the best way to build and maintain a supply of native plant restoration materials for the mountain bike park. Below are nursery growers that could propagate plants.

Benson Farms (Moses Lake, WA)
http://www.nativeseednetwork.org/viewuser?id=10047

Bureau of Land Management's Horning Seed Orchard (Colton, OR – near Estacada)
http://www.cascadepacific.org/Horning_facility.pdf

NRCS Corvallis Plant Materials Center (Corvallis, OR) - contact person: Amy Bartow http://plant-materials.nrcs.usda.gov/orpmc/

Northwest Native Plants, Inc. (Oregon City), Scholls Valley Native Nursery, LCC (Tigard), and Heritage Seedlings, Inc. (Salem) are a few nearby native plant nurseries where plants might also be propagated for outplanting later.

Table 2. Propagation methods for native plant species growing in the proposed project area.

Scientific Name	**Common Name**	**Propagation Method**	**Notes**
Achillea millefolium	wild yarrow	Regenerates naturally via rhizomes. Plant rhizome fragments. Can also be propagated by division (cutting the cluster of basal rosettes) and then replanting the cuttings .	Cole & Spildie (2007) reported low success with transplanting wild yarrow in subalpine forest in eastern Oregon.
Arnica latifolia	mountain arnica	Can be propagated from rhizomes or seed	
Calochortus subalpinus	mountain mariposa lily	Grown from seed. Bulbs can be dug up and transplanted but	Not a single species of mariposa lily has been successfully cultivated/propagated
Carex mertensii	Merten's sedge		
Carex pachystachya	thick-headed sedge		
Carex rossii	Ross' sedge	Whole plants can be transplanted from the wild or plants can be grown from seed.	
Castilleja miniata	scarlet paintbrush	Best left alone	Difficult to propagate; partially parasitic on other herbs
Chimaphila umbellata	pipsissewa	Best left alone	Attempts to cultivate it mostly fail
Cistanthe umbellata var. *caudicifera*	Mt. Hood pussypaws	Grown from seed	Adapted to dry soils; does not endure irrigation
Eriogonum umbellatum	sulphur buckwheat	Grown from seed; outplant seedlings that are well-established in pots	Transplant seedlings into 3-inch pots and allow them to grow until they are large enough to outplant.
Eucephalus (=*Aster*) *ledophyllus*	Cascade aster	Easy to start from seeds or from pieces of the root crown	Mt. Rainier NP reports good success with salvage transplants.
Fragaria vesca, *F. virginiana*	wild strawberry, broadpetal s.	Can be grown from offset plants produced by the many runners or from seed	Easy to cultivate. Cut newly rooted runners from the parent plant and transplant in late summer or early fall.
Heracleum lanatum	cow parsnip	Grown from seeds or from carefully collected	

		seedlings	
Hieracium albiflorum, H. gracile	white hawkweed, alpine h.	Grown from seed	
Juncus parryi	Parry's rush	Whole plants can be transplanted from the wild or plants can be grown from seed	
Linnaea borealis	twinflower	Easy to propagate from rooted pieces carefully detached from parent plants occurring in disturbed sites; no information about starting it from seed	Easily introduced from the wild
Luetkea pectinata	partridge foot	Grown from seed or easy to multiply from detached rosettes with rhizome	Forms many rosettes from creeping rhizomes and stolons; thrives in full sun but needs moisture
Lupinus latifolius	broadleaf lupine	Grown from seed	
Lupinus lepidus	prairie lupine, dwarf lupine	Grown from seed	Favors gritty, sandy soils in dryish openings
Luzula hitchcockii	Hitchcock's smooth woodrush	Whole plants can be transplanted from the wild or plants can be grown from seed	Cole & Spildie (2006) report low success rate with this species, but in another paper (2007) report high success rate with this species.
Polygonum newberryi	Newberry's fleeceflower	Untried and difficult to propagate	Difficult to dig up and transplant. Grows from a deep taproot (up to 80 cm deep in soil)
Pedicularis racemosa	lousewort	Grown from seed	Partially parasitic on other seed plants
Penstemon spp.	beardtongues	Grown from seed, cuttings, or pieces of the root crown; also attached rosettes of leaves root well	Propagation/cultivation is easy
Phlox diffusa	diffuse phlox	Grown by rooting small rosette or stem offshoots from a parent plant	
Phyllodoce empetriformis	mountain heather	Difficult to transplant whole plants. Cole & Spilkie (2007) report only a 43% success rate.	Cole & Spildie (2006 & 2007) report low success with transplanted shrubs in subalpine forest in eastern OR.
Polemonium pulcherrimum	Jacob's ladder, sky pilot	Grown from seed or by dividing nursery-grown plants	Cole & Spildie (2006) report good success with transplants of this species.
Pyrola picta	wintergreen	Very difficult to propagate; best left alone	Mycoheterotrophic (obtains carbon and nutrients from

			mycorrhizal fungi and their tree hosts)
Rhododendron macrophyllum	Pacific rhododendron	Grown from seeds, cuttings, or by layering. Propagate seed and cuttings in a nursery before outplanting.	
Rubus lasiococcus	dwarf bramble	Easily planted from rooted runners. Transplant cuttings taken from runners to potting soil and grow in a greenhouse before outplanting.	Excellent trailing plants
Senecio triangularis	arrowleaf groundsel	Grown from seed or collected plants	
Sorbus sitchensis	mountain ash	Grown from seed. Seeds sown from berries have a slower and less successful germination rate. Two-year-old nursery stock is preferred for outplanting.	Difficult to propagate from cuttings
Vaccinium membranaceum	big huckleberry, black h., thinleaf h.	Grown from seeds, cuttings, and rooted suckers or offshoots	Time between seedling and nursery-sized plant can be 2-3 years
Veratrum viride	green false hellebore	Grown from seeds or from divisions of the rootstock	Difficult to propagate but worth the try
Xerophyllum tenax	beargrass	Young offset clumps (formed after the flower stalk dies) can be used for propagation	Seeds are a much slower source of new plants

Sources: Cole & Spildie (2006), Cole & Spildie (2007), Kruckeberg (1996), Rose et al. (1998)

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Noxious Weed Risk Assessment
and
Recommendations to Minimize the Introduction
and Spread of Invasive Plants

Proposed Timberline Mountain Bike Park

Zigzag Ranger District
Mt. Hood National Forest
December 2010

What Are Invasive Plants?

Invasive plants are any plant species not native to a particular ecosystem that are likely to cause environmental harm or harm to human health. They include, but are not limited to, species on the Oregon Department of Agriculture (ODA) Noxious Weed list. Invasive plants may disrupt natural ecosystems by displacing native species and reducing natural diversity through the replacement of native communities with invasive monotypic weed stands. They reduce productivity of forest ecosystems by outcompeting and displacing desirable native species and monopolizing valuable resources (Oregon Weed Control Program 2002). Please refer to the tables below that list both ODA Noxious Weeds (Table A) and the Supplemental List of Invasive Plants for the Clackamas River and Zigzag Ranger Districts (Table B).

In addition to the above-mentioned lists, it should be noted that new invasive plant species are continually being introduced and are spreading to new areas. These new invaders may not always be included on the present lists. However, if they are not native to Pacific Northwest ecosystems and are likely to harm the environment or human health, they should be added to the supplemental list and evaluated for this report.

Table A. ODA Noxious Weed List

Rating*	**Common Name**	**Scientific Name**
B	velvetleaf	*Abutilon theophrasti*
B	bidy-bidy	*Acaena novae-zelandiae*
B	Russian knapweed	*Acroptilon repens*
B	jointed goatgrass	*Aegiops cylindrica*
A	ovate goatgrass	*Aegilops ovata*
A	barbed goatgrass	*Aegilops triuncialis*
B	quackgrass	*Agropyron repens*
A	camelthorn	*Alhagi pseudalhagi*
B	ragweed	*Ambrosia artemisiifolia*
A	skeletonleaf bursage	*Ambrosia tomentosa*

B	common bugloss	*Anchusa officinalis*
B	false brome	*Brachypodium sylvaticum*
B	lens podded white top	*Cardaria chalapensis*
B	white top (hoary cress)	*Cardaria draba*
B	hairy white top	*Cardaria pubescens*
B	musk thistle	*Carduus nutans*
A	plumeless thistle	*Carduus alanthoides*
B	Italian thistle	*Carduus phycnocephalus*
B	slender flowered thistle	*Carduus tenuiflorus*
A	smooth distaff thistle	*Carthamus baeticus*
A,T	wooly distaff thistle	*Carthamus lanatus*
A,T	purple starthistle	*Centaurea calcitrapa*
B	diffuse knapweed	*Centaurea diffusa*
A,T	Iberian starthistle	*Centaurea iberica*
B,T	spotted knapweed	*Centaurea stoebe (C. maculosa)*
B	short fringed knapweed	*Centaurea nigrescens*
B	meadow knapweed	*Centaurea pratensis*
B,T	yellow starthistle	*Centaurea solstitialis*
A,T	squarrose knapweed	*Centaurea virgata*
B,T	rush skeletonweed	*Chondrilla juncea*
A	western water hemlock	*Cicuta douglasii*
B	Canada thistle	*Circium arvense*
B	bull thistle	*Circium vulgare*
B	traveler’s joy	*Clematis vitalba*
B	poison hemlock	*Conium maculatum*
B	field bindweed	*Convolvulus arvensis*
B	common crupina	*Crupina vulgaris*
B	houndstongue	*Cynoglossum officinale*
B	yellow nutsedge	*Cyperus esulentus*
A	purple nutsedge	*Cyperus rotundus*
B	French broom	*Cytisus monspessulanas*
B	Scotch broom	*Cytisus scoparius*
B	Portugese broom	*Cytisus striatus*
B	cutleaf teasel	*Dipsacus laciniatus*
B	South American waterweed (elodea)	*Elodea (=Egeria) densa*
B	giant horsetail	*Equisetum telmateia*
B,T	leafy spurge	*Euphorbia esula*
B	Japanese knotweed	*Fallopia japonica*
B	Himalayan knotweed	*Fallopia polystachyum*
B	giant knotweed	*Fallopia sachalinensis*
B	shiny leaf geranium	*Geranium lucidum*
B	herb Robert	*Geranium robertianum*
B	halogeton	*Halogeton glomeratus*
B	English ivy	*Hedera helix*
A	Texas blueweed	*Helianthus ciliaris*

B	spikeweed	*Hemizonia pungens*
A,T	giant hogweed	*Heracleum mantegazzianum*
A	orange hawkweed	*Hieracium aurantiacum*
A,T	yellow hawkweed	*Hieracium floribundum*
A	mouse ear hawkweed	*Hieracium pilosella*
A	king devil hawkweed	*Hieracium piloselloides*
A	meadow hawkweed	*Hieracium pratense*
A	hydrilla	*Hydrilla verticillata*
B	St. John’s-wort (Klamath weed)	*Hypericum perforatum*
B	policeman’s helmet	*Impatiens glandulifera*
B	yellow flag iris	*Iris pseudacorus*
B	dyers woad	*Isatis tinctoria*
B	kochia	*Kochia scoparia*
B	perennial pepperweed	*Lepidium latifolium*
B	dalmatian toadflax	*Linaria dalmatica*
B	yellow toadflax	*Linaria vulgaris*
B,T	purple loosestrife	*Lythrum salicaria*
B	Eurasian watermilfoil	*Myriophyllum spicatum*
A	matgrass	*Nardus stricta*
B	Scotch thistle	*Onopordum acanthium*
B	small broomrape	*Orobanche minor*
B	wild proso millet	*Panicum miliaceum*
A	African rue	*Peganum harmala*
B	sulfur cinquefoil	*Potentilla recta*
A,T	kudzu	*Pueraria lobata*
B	creeping yellow cress	*Rorippa sylvestris*
B	Armenian (Himalayan) blackberry	*Rubus armeniacus*
B	Mediterranean sage	*Salvia aethiopis*
B,T	tansy ragwort	*Senecio jacobaea*
B	milk thistle	*Silyburn marianum*
A	silverleaf nightshade	*Solanum elaegnifolium*
B	buffaloburr	*Solanum rostratum*
B	Johnsongrass	*Sorghum halepense*
A	smooth cordgrass	*Spartina alterniflora*
A	spartina	*Spartina anglica*
A	spartina	*Spartina densiflora*
B	spartina	*Spartina patens*
B	Spanish broom	*Spartium junceum*
B	Austrian peaweed	*Sphaerophysa salsula*
B	dodder	*Suscuta spp.*
B	medusahead rye	*Taeniatherum canput-medusae*
B	tamarix	*Tamarix ramossissima*
B	puncturevine	*Tribulus terrestris*
A	coltsfoot	*Tussilago farara*
B,T	gorse	*Ulex europaeus*

B	spiny cocklebur	*Xanthium spinosum*
A	Syrian bean caper	*Zygophyllum fabago*

***Noxious Weed Control Rating System**

Noxious weeds, for the purpose of this system, shall be designated “A,” “B,” and/or “T,” according to the ODA Noxious Weed Rating System:

1. **“A” Designated weed** – a weed of known economic importance that occurs in the state in small enough infestations to make eradication /containment possible; or is not known to occur, but its presence in neighboring states make future occurrence in Oregon seem imminent. Recommended action: Infestations are subject to intensive control when and where found.
2. **“B” designated weed -** a weed of economic importance that is regionally abundant but may have limited distribution in some counties. Where implementation of a fully integrated statewide management plan is infeasible, biological control shall be the main control approach.
3. **“T” designated weed** – a priority noxious weed designated by the State Weed Board as a target weed species for which ODA will implement a statewide management plan.

Table B. Supplemental List of Invasive Plants for the Clackamas River and Zigzag Ranger Districts

Common Name	**Scientific Name**
Norway maple	*Acer platanoides*
tree-of-heaven	*Ailanthus altissima*
European beachgrass	*Ammophila arenaria*
false brome	*Brachypodium sylvaticum*
fountain butterfly bush	*Buddleia alternifolia*
butterfly bush	*Buddleia davidii*
cotoneaster	*Cotoneaster* spp.
pampas grass	*Cortaderia jubata*
pampas grass	*Cortaderia selloana*
English hawthorn	*Crataegus monogyna*
spurge laurel	*Daphne laureola*
foxglove	*Digitalis purpurea*
water hyacinth	*Eichhornia crassipes*
broom	*Genista monspessulana*
shining crane’s-bill	*Geranium lucidum*
herb Robert	*Geranium robertianum*
English holly	*Ilex aquifolium*
policeman’s helmet	*Impatiens glandulifera*
yellow flag iris	*Iris pseudacorus*

eastern redcedar	*Juniperus virginiana*
perennial peavine	*Lathyrus latifolius*
privet	*Ligustrum spp.*
birdsfoot trefoil	*Lotus corniculatus*
lemon balm	*Melissa officinalis*
common forget-me-not	*Myosotis scorpioides*
water lily	*Nymphaea polysepela*
fountain grass	*Pennisetum spp.*
reed canarygrass	*Phalaris aquatica*
reed canarygrass	*Phalaris arundinacea*
English laurel	*Prunus laurocerasus*
Portugal laurel	*Prunus lusitanica*
sweet cherry	*Prunus avium*
thundercloud cherry	*Prunus cerasifera*
firethorn	*Pyracantha spp.*
creeping buttercup	*Ranunculus repens*
black locust	*Robinia pseudoacacia*
sweet-briar	*Rosa eglanteria*
multiflowered rose	*Rosa multiflora*
European mountain ash	*Sorbus aucuparia*
bigleaf periwinkle; vinca	*Vinca major*
common periwinkle; vinca	*Vinca minor*

S**upporting Direction**

Development of weed prevention practices is supported by U.S. Forest Service noxious weed policy and strategy. Forest Service policy is to prevent the introduction and establishment of noxious weed infestations. This policy directs the Forest Service to (1) determine the factors that favor establishment and spread of noxious weeds, (2) analyze weed risks in resource management projects, and (3) design management practices to reduce these risks. The Forest Service Noxious Weed Strategy identifies development of practices for prevention and mitigation during ground-disturbing activities as a long-term emphasis item. Region 6 completed a Final Environmental Impact Statement (FEIS) for *Preventing and Managing Invasive Plants* in April 2005. In 2008, the Mt. Hood National Forest and Columbia River Gorge National Scenic Area completed a FEIS for *Site-Specific Invasive Plant Treatments* that would authorize herbicide use and an early detection/rapid response program. Executive Order 13112 on Invasive Species (February 1999) requires federal agencies to use relevant programs and authorities to prevent the introduction of invasive species and not authorize or carry out actions that are likely to cause the introduction or spread of invasive species unless the agency has determined--and made public--documentation that shows that the benefits of such actions clearly outweigh the potential harm. All feasible and prudent measures to minimize risk of harm will need to be taken in conjunction with the actions. An additional authority for coordinated efforts to prevent and control the spread of Invasive Plants in Region 6 is the 1988 *Final EIS for Managing Competing and Unwanted Vegetation.*

As part of the NEPA process, the Forest Service must analyze and discuss the need for measures to prevent the establishment or spread of invasive plants based upon a survey of project areas proposed for ground disturbance. These may include locations of proposed temporary roads and new specified roads, reconstruction of existing roads, and likely transportation routes to establish the presence or absence of invasive plants and to identify equipment cleaning and other potential requirements. Weed risks must be analyzed in the planning stage to identify the likelihood of weeds spreading to the project area and determining the consequence of weed establishment in the project area. A finding of risk is the basis for identifying the appropriate weed-prevention practices from the *Guide*, which are likely to be effective in a particular project situation.

The excerpts from the Forest Service *Guide to Noxious Weed Prevention Practices, USDA July 2001 (GUIDE)* below provide a comprehensive directory of weed prevention practices for use in planning and wildland resource management activities and operations. The *Guide* supports implementation of Executive Order 13112. Federal agencies are expected to follow the direction in this order. In addition, Best Management Practices, or other credible methods, may be used in establishing equipment cleaning needs and requirements.

Risk Ranking

The **Factors** and **Vectors** considered in determining the risk level for the introduction or spread of noxious weeds are as follows:

Factors

A. Known noxious weeds in close proximity to project area that may foreseeably invade project
B. Project operation within noxious weed population
C. Any of vectors 1-8 in project area

Vectors

1. Heavy equipment (implied ground disturbance including compaction or loss of soil “A” horizon.)
2. Importing soil/cinders/gravel/straw or hay mulch.
3. ORVs (off-road vehicles) or ATVs (all-terrain vehicles)
4. Grazing
5. Pack animals (short-term disturbance)
6. Plant restoration
7. Recreationists (hikers, mountain bikers, etc.)

8. Forest Service or other project vehicles

High-, moderate-, or low-risk rankings are possible. For the high ranking, the project must contain a combination of either factors A+C or B+C above. The moderate ranking contains any of vectors #1-5 in the project area. The low ranking contains any of vectors #6-8 in the project area or known weeds within or adjacent to the project area, without vector presence.

Weed Risk Ranking Results

Project	Factors	Vectors	Risk Ranking
Timberline mountain bike park	A & C	1, 2, 6, & 7	Moderate-High

Weed Risk Ranking Results

Species Name	Common Name
Alliaria petiolata	garlic mustard
Brachypodium sylvaticum	false brome
Centaurea stoebe (=C. maculosa)	spotted knapweed
Centaurea diffusa	diffuse knapweed
Cirsium arvense	Canada thistle
Cirsium vulgare	bull thistle
Cytisus scoparius	Scotch broom
Hieracium aurantiacum	orange hawkweed
Hieracium pratense	meadow hawkweed
Hypericum perforatum	St. John's-wort
Senecio jacobea	tansy ragwort

DISCUSSION

Populations of the 11 noxious weed species listed above are located near the proposed project area and listed on the Oregon Department of Agriculture's (ODA) "A" or "B" List. Some of these species are widely established regionally and management objectives are to control infestations on a case-by-case basis (e.g., Canada thistle, bull thistle, Scotch broom, St. John's-wort, tansy ragwort). Garlic mustard, false brome, orange hawkweed, meadow hawkweed, spotted knapweed, and diffuse knapweed are not widely established and early detection followed by rapid response is recommended to check the spread of these species. These plants can be considered "ecosystem-altering" species because of their ability to quickly overrun and alter natural habitats.

Bull thistle is a biennial weed with a short, fleshy taproot. It is not uncommon in areas with previous soil disturbance, including roadsides, forest plantations, and manipulated forage openings. Present control efforts are limited to handpulling associated with specific site objectives or project areas.

Threats: This plant is a threat to agricultural lands and to native forest biodiversity.

Mode of Establishment: Spreads by wind, animals, and vehicles.

Canada thistle is a perennial weed distributed on the west side of the Cascade Range crest in areas where previous soil disturbance has occurred (e.g., roadsides, timber harvest areas, forest plantations, forest openings, and meadows). It can also colonize areas with little or no disturbance such as dry or wet meadows. Canada thistle is difficult to eradicate because of its deep rhizomes (root system) and new plants can sprout from rhizomes even if all all of the aboveground plants have been removed.

Threats: This plant is a threat to agricultural lands and to native forest biodiversity.

Mode of Establishment: Spreads asexually via rhizomes (underground stems) or by wind, animals, and vehicles.

False brome is a highly invasive "ecosystem-altering" grass, capable of invading and overrunning roadsides, trailsides, openings, and forest interiors. This non-native grass is a species of particular concern in the Willamette Valley where it has invaded thousands of acres on the Willamette National Forest and Eugene BLM District. Populations of false brome have now spread along roads and trails in the Columbia River Gorge. The Nature Conservancy and East Multnomah County Soil and Water Conservation District are treating populations in the Columbia River Gorge with herbicide on an annual basis.

Threats: This plant is a serious threat to forests and meadows on the west side of the Cascade Range and can spread rapidly (like wildfire). It could easily be transported by mountain bikers from infested areas (upper Willamette Valley, Columbia River Gorge) to the proposed Timberline mountain bike park.

Mode of Establishment: Spreads via seed or vegetatively by stem and root fragments.

Garlic mustard is another highly invasive "ecosystem-altering" plant species, capable of invading and overrunning roadsides, trailsides, openings, and forest interiors. This non-native herb has invaded thousands of acres of forest in the northeastern and midwestern United States (e.g., New England, Wisconsin, Minnesota). It is now present along trails in the Columbia River Gorge and in Forest Park in downtown Portland. Populations in the Columbia River Gorge were probably spread from what is thought to be the source population in the nearby town of Corbett. Garlic mustard exudes a chemical into the soil that disrupts beneficial mycorrhizal associations between native plants, especially trees, and fungi.

Threats: This plant is a serious threat to forests and meadows on the west side of the Cascade Range and can spread rapidly (like wildfire). It could easily be transported by mountain bikers from infested areas (Columbia River Gorge) to the proposed Timberline mountain bike park. This plant is very difficult to eradicate or control.

Mode of Establishment: Spreads by seed or vegetatively by stem and root fragments.

Meadow and orange hawkweed have already invaded over 1,000 acres in the Bonneville Powerline Corridor along Lolo Pass Road (just west of Mt. Hood). Populations of orange hawkweed can also be found along the Pacific Crest Trail at Lolo Pass and there is one population occupying about 3-4 acres in a meadow complex just off of the Burn Mountain Trail in the Mt. Hood Wilderness Area (about 5 miles WNW of Timberline Lodge). Populations are very difficult to eradicate. Control requires annual treatment with herbicide. The Oregon Department of Agriculture (ODA) has been treating meadow and orange hawkweed along Lolo Pass for over 15 years now. ODA has been treating the orange hawkweed population in the wilderness area for three years now.

Threats: These two species can be considered "ecosystem-altering" invasive plants because of their ability to overrun (displace) native species in montane meadows and openings.

Mode of Establishment: Reproduce and spread by seed dispersed by wind, animals, people, or vehicles or vegetatively by stolons, root fragments, and rhizomes.

Scotch broom establishes in open areas with little tree cover and along roadways at low and moderate elevations, mostly west of the Cascade Range crest. Management priorities on the Forest are two-fold: east of the crest, control populations to keep them from expanding, with the long-term goal of eradication; west of the crest, where the species is well-established, active management is considered on a site-by-site basis where there are overriding resource concerns. Bio-control insects are established west of the crest and are relied on to depress Scotch broom infestations where resource concerns are not critical.

Threats: Where broom establishes, it can form a monoculture, outcompeting and displacing native trees, shrubs, forbs, and grasses; delaying forest development; and altering ecologic functioning. The hard, long-lived seed can persist in the soil for up to 75 years.

Mode of Establishment: Scotch broom establishes from seed that may be transported by vehicles carrying soil or plant parts.

Spotted and diffuse knapweed populations are located along Highway 26 and Highway 35. The tap-rooted plants displace native vegetation and can form dense populations. Population distributions are spotty on the west side of the Cascade Range crest (e.g., scattered along Highway 26), but on the east side they can form dense populations that exclude native shrubs, forbs, and grasses. A number of areas and Forest Service roads on the nearby Hood River Ranger District are infested with spotted, diffuse, and meadow knapweed.

Threats: Displaces native vegetation.

Mode of Establishment: Spreads by seed. Dispersal distances for the seed are short: seeds generally fall within a 3-12 dm radius of the parent plant. Movement over greater distances requires transport by rodents, livestock, vehicles, or hay or commercial seed.

St. John's-wort is distributed across the Forest along road shoulders, in rock storage areas, in quarries, and in other areas of soil disturbance. Similar to Scotch broom, active management to control or eradicate an infestation occurs when there are overriding resource concerns. Bio-control insects are well established and are the primary means of control on the Forest.

Threats: While infestations don't result in a great deal of economic harm in forestry settings, St. John's-wort displaces native vegetation and can alter ecological functioning.

Mode of Establishment: St. John's-wort establishes from seed that may be transported by vehicles carrying soil or plant parts.

Tansy ragwort distribution on the Forest is similar to that of Scotch broom. West of the Cascade Range crest, control efforts on the Forest are mostly limited to bio-control insects. East of the crest, bio-control insects have not established, due to the colder winters. Management priority in this area is to control and eradicate infestations by manual, mechanical, or chemical treatment methods.

Threats: Tansy ragwort is poisonous to livestock, particularly horses. At sites where it becomes dominant, it can displace native vegetation and alter ecologic functioning.

Mode of Establishment: The light seed is dispersed by wind and can be transported in soil on vehicles.

RECOMMENDED PROJECT DESIGN CRITERIA

With the exception of the "ecosystem'altering" invasive species listed above, the other invasive plant species are common along roadsides and trailsides, in old landings, in clearcuts, and in other areas with a history of ground disturbance throughout much of the Clackamas River and Zigzag Ranger Districts. Vehicles and heavy equipment are a major vector for the spread of invasive plants along roads and from roads into forest, forest openings, and meadows.

Standard Procedures to Reduce the Risk of Spreading Noxious Weeds

Management Objectives	Management Practice
Reduce the risk of spreading existing weed populations.	1. Clean all equipment (using pressurized water) that will be used to construct trails before entering the project area. It is recommended that a weed- cleaning station be located near the project area. These management practices can be

	stipulated in the contract specifications to ensure they are mandatory and not discretionary. 2. Stage equipment in designated areas that are pre-determined to be weed-free. 3. To all practical extent, limit soil disturbance consistent with project objectives in order to avoid creating growing space opportunities for invasive plants to colonize. 4. Provide a cleaning station to clean mountain bikes using the mountain bike park. Seriously consider making cleaning mandatory for all mountain bikes before riders use the skills park or trails. 5. Educate mountain bikers about invasive plants and the risk of their transport and spread on mountain bikes, shoes, and clothing from infested areas (elsewhere in the region, in North America, or abroad) to the mountain bike park. Prevention is the most effective and least costly management tool. "An ounce of prevention is worth a pound of cure" is no understatement.
Reduce the risk of noxious weed species being introduced into the project area.	1. More than inspecting off-road equipment prior to start of work to ensure it is free of all soil, seeds, vegetative matter, and other debris that could hold or contain seeds (WO-CT6.36), clean all vehicles with pressurized water using a weed-cleaning station. 2. Ensure that rock and other materials imported to the project area originate from a weed-free source. 3. Erosion control materials (seed, straw, hay) must be certified free of weed seed and weed plant parts. In place of straw, consider using "wood strands," a weed-free straw analog made from wood fiber. 4. Follow management practices 3, 4, and 5 listed above.

<u>Design Criterion 1</u>. Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.

- <u>Practice</u>: Clean all project equipment (e.g., excavators, shovels, rakes, hoes) before entering national forest lands. Remove mud, dirt, and plant parts; clean wheels, tires, undercarriage, and radiator of vehicles and any other equipment parts that may harbor weed seed or seed carriers before moving it into a project area. This practice does not apply to service vehicles traveling frequently in and out of the project area that will remain on the roadway.

<u>Design Criterion 2</u>. Prevent the introduction and spread of weeds caused by moving infested sand, gravel, borrow, and fill material in Forest Service, contractor, and cooperator operations.

- Practice: Inspect material sources on site, and ensure that they are weed-free before use and transport. Treat weed-infested sources for eradication, and strip and stockpile contaminated material before any use of pit material.

- Practice: Inspect and document the area, where material from treated weed-infested sources is used, annually for at least three years after project completion to ensure that any weeds transported to the site are promptly detected and controlled.

- Practice: Maintain stockpiled, un-infested material in a weed-free condition.

Design Criterion 3. In those vegetation types with relatively closed canopies, retain shade to the extent possible to suppress weeds and prevent their establishment and growth.

- Practice: Retain native vegetation in and around project activity to the maximum extent possible consistent with project objectives.

Design Criterion 4. Avoid creating soil conditions that promote weed germination and establishment.

- Practice: Minimize soil disturbance to the extent practical, consistent with project objectives.

Design Criterion 5. Where project disturbance creates bare ground consistent with project objectives, re-establish vegetation to prevent conditions for the colonization of weeds.

- Practice: Revegetate disturbed soil (except travelways on surfaced projects) in a manner that optimizes plant establishment for that specific site.

- Practice: Revegetation may include topsoil replacement, transplanting, planting, seeding, fertilization, liming, and weed-free mulching as necessary. Use native plant material from seed or stock originating from or near the project area. Use certified wood strand (wood fiber) mulch or certified weed-free straw. Where practical, stockpile weed/seed-free topsoil and replace it on disturbed areas.

- Practice: See project design criteria and section on “Plant Propagation & Restoration” for more information on restoring vegetation in disturbed sites.

Design Criterion 6. Educate the contractor in simple techniques to avoid spreading weeds.

- Practice: Give the flyer, *Simple Things You Can Do to Help Stop the Spread ofWeeds*, to the contractor/operator who will implement the project.

The essentials of invasive plant prevention can be summarized as follows:

1. Clean all vehicles and heavy equipment associated with the project thoroughly with pressurized water before entering the Mt. Hood National Forest.

2. Minimize soil disturbance to the extent practical.

3. Revegetate disturbed ground/soil by seeding, mulching, and transplanting and planting native forbs, graminoids, low-lying shrubs, and tree seedlings to prevent growing space from being colonized by invasive nonnative plants.

OTHER RECOMMENDATIONS

Native plant species should be used to meet erosion control needs and other management objectives such as wildlife habitat enhancement. Appropriate plant and seed transfer guidelines would be observed. Non-native species may be used if native species would not meet site-specific requirements or management objectives. Non-native species would be gradually phased out as cost, availability, and technical knowledge barriers are overcome. Undesirable or invasive plants would not be used.

Native plant materials (e.g., *Elymus glaucus* [blue wildrye], lupine [*Lupinus latifolius*]) are the first choice in re-vegetation of bare soils, but non-native, non-invasive, non-persistent plant species (e.g., *Lolium perenne* ssp. *multiflorum* [annual ryegrass], Madsen sterile wheat] may be used if native plant materials are not available or as an interim measure designed to aid in the reestablishment of native plants. In general, however, native plants are preferred and non-native plants, even if non-persistent, are discouraged for re-vegetating sites. Orchard grass (*Dactylis glomerata*) has been used in the past for re-vegetation, but use of this non-native grass is discouraged in Region 6 because it is not native and persists at sites. **Iinvasive non-native plant species should never be used for re-vegetation.**

Grass seed must be certified by the states of Oregon or Washington or grown under government-supervised contracts to assure it is weed-free. In certain cases, non-certified seed may be used if it is deemed to be free of noxious weeds listed by the State of Oregon.

If **straw** is used, it would originate from the state of Oregon or Washington fields which grow state certified seed, or grown under government-supervised contracts to assure noxious weed-free status, or originate in annual ryegrass fields in the Willamette Valley.

In certain cases, straw or hay from non-certified grass seed fields may be used if is deemed to be free of noxious weeds listed by the State of Oregon.

If **mulch** is used, it too should be certified weed-free.

Invasive non-native species: All off-road equipment is required to be free of soil, seeds, vegetative matter, or other debris that could contain or hold seeds prior to coming onto national forest lands. Timber sale contracts and service contracts include provisions to minimize the introduction and spread of invasive plants. These provisions contain specific requirements for the cleaning of off-road equipment. Ensure that these provisions are included in the contract for the project.

The Weed Risk Analysis Report is complete.

__/s/ David Lebo__________________ __Feb. 25, 2011__

David Lebo, Westside Zone Botanist Date

BOTANICAL SPECIES
Proposed Timberline Mountain Bike Park

TREES

Common name	Scientific name
Pacific silver fir	*Abies amabilis*
subalpine fir	*Abies lasiocarpa*
whitebark pine	*Pinus albicaulis*
lodgepole pine	*Pinus contorta*
Scouler's willow	*Salix scouleriana*
western hemlock	*Tsuga heterophylla*
mountain hemlock	*Tsuga mertensiana*

SHRUBS

Common name	Scientific name
baneberry	*Actaea rubra*
ground juniper	*Juniperus communis*
false huckleberry	*Menziesia ferruginea*
red mountain heather	*Phyllodoce empetriformis*
prickly currant	*Ribes lacustre*
dwarf bramble	*Rubus lasiococcus*
salmonberry	*Rubus spectabilis*
red elderberry	*Sambucus racemosa*
Sitka mountain ash	*Sorbus sitchensis* var. *grayi*
subalpine spiraea	*Spiraea densiflora* var. *densiflora*
Alaska huckleberry	*Vaccinium alaskaense*
big huckleberry	*Vaccinium membranaceum*
oval-leaf huckleberry	*Vaccinium ovalifolium*

HERBS

Common name	Scientific name
wild yarrow	*Achillea millefolium*
orange agoseris	*Agoseris aurantiaca*
pearly everlasting	*Anaphalis margaritacea*
threeleaf windflower	*Anemone deltoidea*
little mountain thimbleweed	*Anemone lyallii*
umber pussy toes	*Antennaria umbrinella*
bigleaf sandwort	*Arenaria macrophylla*
mountain arnica	*Arnica latifolia* var. *gracilis*
alpine aster	*Aster alpinus*

mountain mariposa lily	*Calochortus subalpinus*
Scouler's harebell	*Campanula scouleri*
scarlet paintbrush	*Castilleja miniata*
magenta paintbrush	*Castilleja parviflora* var. *oreopola*
little prince's pine	*Chimaphila menziesii*
enchanter's nightshade	*Circaea alpine*
Mt. Hood pussypaws	*Cistanthe umbellata* var. *caudicifera* (= *Calyptridium umbellatum*)
queen's cup, bead lily	*Clintonia uniflora*
coral-root	*Corallorhiza mertensiana*
fairy-bell	*Disporum hookeri*
alpine willow herb	*Epilobium alpinum* v. *lactiflorum*
fireweed	*Epilobium angustifolium*
subalpine daisy	*Erigeron perigrinus* ssp. *callianthus* var. *angustifolius*
Cascade aster	*Eucephalus* (= *Aster*) *ledophyllus* var. *ledophyllus*
wild strawberry	*Fragaria vesca*
sulfur buckwheat	*Eriogonum umbellatum* var. *umbellatum*
Oregon bedstraw	*Galium oreganum*
rattlesnake plantain	*Goodyera oblongifolia*
cone plant	*Hemitomes congestum*
white hawkweed	*Hieracium albiflorum*
alpine hawkweed	*Hieracium gracile*
oxeye-daisy	*Leucanthemum vulgare*
Gray's lovage	*Ligusticum grayi*
twayblade	*Listera* sp.
Martindale's lomatium	*Lomatium martindalei* var. *martindalei*
bird's-foot trefoil	*Lotus corniculatus*
partridgefoot	*Luetkea pectinata*
broadleaf lupine	*Lupinus latifolius* var. *latifolius*
low mountain lupine	*Lupinus lepidus* var. *lobii*
false Solomon's seal	*Maianthemum* (=*Smilacina*) *racemosum*
starry Solomon's seal	*Maianthemum* (=*Smilacina*) *stellatum*
yellow monkey-flower	*Mimulus guttatus*
Lewis' monkeyflower	*Mimulus lewisii*
mitrewort	*Mitella* sp.
pinesap	*Monotropa hypopithys*
candyflower, western springbeauty	*Montia sibirica*
beard-tongue	*Nothochelone nemorosa*
alpine aster, tundra aster	*Oreostemma* (= *Aster*) *alpigenus* var. *alpigenus*
sidebells wintergreen	*Orthilia* (= *Pyrola*) *secunda*
sweet cicely	*Osmorhiza chilensis*
sickletop lousewort	*Pedicularis racemosa* var. *racemosa*
Davidson's penstemon	*Penstemon davidsonii* var. *davidsonii*

small flowered penstemon	*Penstemon procerus* var. *brachyanthus*
spreading phlox	*Phlox diffusa*
whiteleaf phacelia	*Phacelia hastata* var. *compacta*
American bistort	*Polygonum bistortoides*
skunk-leaved polemonium	*Polemonium pulcherrimum* var. *calycinum*
prostrate knotweed	*Polygonum aviculare*
Newberry's fleeceflower or knotweed	*Polygonum newberryi* var. *newberryi*
three-leaved bramble	*Rubus lasiococcus*
wood saxifrage, Merten's saxifrage	*Saxifraga mertensiana*
alpine saxifrage	*Saxifraga tolmiei* var. *tolmiei*
arrowleaf groundsel	*Senecio triangularis*
goldenrod	*Solidago canadensis*
twisted stalk	*Streptopus amplexifolius*
fringecup	*Tellima grandiflora*
coolwort, foamflower	*Tiarella trifoliata* var. *unifoliata*
white clover	*Trifolium repens*
trillium	*Trillium ovatum*
Sitka valerian	*Valeriana sitchensis*
green false hellebore	*Veratrum viride*
stream violet, pioneer violet	*Viola glabella*
evergreen violet	*Viola sempervirens*
beargrass	*Xerophyllum tenax*

GRASSES

Common name	**Scientific name**
Brewer's reedgrass	*Calamagrostis breweri*
alpine fescue	*Festuca ovina* var. *brevifolia*
green fescue	*Festuca viridula*
Cusick's bluegrass	*Poa cusickii* var. purpurescens
Gray's bluegrass	*Poa grayana*
bottlebrush squirreltail	*Elymus elymoides* (= *Sitanion hystrix* var. *brevifolium*)
spike trisetum	*Trisetum spicatum*
western needlegrass	*Achnatherum occidentalis* (= *Stipa occidentalis* var. *occidentalis)*

SEDGES

Common name	**Scientific name**
Brewer's sedge	*Carex breweri* var. *breweri*
Merten's sedge	*Carex mertensii*
black alpine sedge	*Carex nigricans*
thick-headed sedge	*Carex pachystachya*

Presl's sedge	*Carex preslii*
Ross' sedge	*Carex rossii*
showy sedge	*Carex spectabilis*

RUSHES

Common name	Scientific name
Drummond's rush	*Juncus drummondii* var. *subtriflorus*
Parry's rush	*Juncus parryi*
Hitchcock's smooth woodrush	*Luzula glabrata* var. *hitchcockii*

FERNS AND FERN ALLIES

Common name	Scientific name
lady fern	*Athyrium filix-femina*
bladder-fern	*Cystopteris fragilis*
sword fern	*Polystichum munitum*

BRYOPHYTES (Mosses and Liverworts)

Common name	Scientific name
moss	*Atrichum selwynii*
coldwater moss	*Brachythecium frigidum*
seep moss	*Philonotis fontana*
hairy cap moss	*Polytrichum commune*
rhizomnium moss	*Rhizomnium nudum*
thalloid liverworts	*Lunularia* sp., *Marchantia* sp.

LICHENS

Common name	Scientific name
old man's beard	*Alectoria sarmentosa*
horsehair lichen	*Bryoria fremontii* and other *Bryoria* spp.
tublular lichens	*Hypogymnia inactiva, Hypogymnia enteromorpha*
wolf lichen	*Letharia vulpina*
dog pelt lichen	*Peltigera membranacea*
leaf lichen	*Platismatia glauca*

FUNGI

Common name	Scientific name
orange peel fungus	*Aleuria aurantia*
gemmed amanita	*Amanita gemmata*?
fly agaric	*Amanita muscaria*
panther mushroom	*Amanita pantherina*?
honey mushroom	*Armillaria ostoyae*
bitter bolete	*Boletus calopus*? or *B. rubripes*?
cracked-cap bolete	*Boletus chrysenteron*
king bolete	*Boletus edulis*
admirable bolete	*Boletus mirabilis*
Zeller's bolete	*Boletus zelleri*
chrysomphalina	*Chrysomphalina aurantiica*
collybia	*Collybia* sp.
cortinarius	*Cortinarius percomis*? or *C. cinnamomea* group?
cortinarius	*Cortinarius vanduzerensis?*
cortinarius	*Cortinarius* sp.
red belt fungus	*Fomitopsis pinicola*
deadly galerina	*Galerina autumnalis* (= *G. marginalis*)
gomphidius	*Gomphidius subroseus*
poor man's gum drops	*Heterotextus* (= *Guepiniopsis*) *alpinus*
lion's mane, conifer coral	*Hericium abietis*
laccaria	*Laccaria bicolor*
lackluster laccaria	*Laccaria laccata*
delicious milk cap	*Lactarius deliciosus*
slimy milk cap	*Lactarius pseudomucidus*?
chicken of the woods	*Laetiporus conifericola*
parasol mushroom	*Lepiota clypeolaria*
puffball	*Lycoperdon* sp.
orange mycena	*Mycena aurantiidisca*
mycena	*Mycena galericulata*
mycena	*Mycena purpureofusca*
mycena	*Mycena strobilinoides*?
conifer tuft	*Naematoloma* (= *Hypholoma*) *capnoides*
sulfur tuft	*Naematoloma* (= *Hypholoma*) *fasciculare*
pholiota	*Pholiota alnicola*
pholiota	*Pholiota spumosa*?
deer mushroom	*Pluteus cervinus*
coral fungus	*Ramaria araiospora* var. *rubella*
coral fungus	*Ramaria aurantiisiccescens*
coral fungus	*Ramaria cystidiophora* var. *citronella*
coral fungus	*Ramaria flavigelatinosa*
coral fungus	*Ramaria leptoformosa*

coral fungus	*Ramaria longispora*
coral fungus	*Ramaria* sp.
blackening russula	*Russula albonigra*
short-stemmed russula	*Russula brevipes*
sickening russula	*Russula emetica*
russula	*Russula occidentalis*?
rosy russula	*Russula rosacea*
shrimp mushroom	*Russula xerampelina*
unknown Russula's	*Russula* spp.
questionable stropharia	*Stropharia ambigua*
short-stemmed slippery jack	*Suillus brevipes*
poor man's slippery jack	*Suillus tomentosus*
tricholoma	*Tricholoma caligata*?
tricholoma	*Tricholoma* sp.
marshmallow polypore	*Tyromyces leucospongia*
xeromphalina	*Xeromphalina campanella*

INVASIVE NON-NATIVE PLANTS

Common name	**Scientific name**
oxeye daisy	*Leucanthemum vulgare*
bird's-foot trefoil	*Lotus corniculatus*
prostrate knotweed	*Polygonum aviculare*
white clover	*Trifolium repens*

APPENDIX F

VISUAL ANALYSIS

On November 1, 2010, Steve Kruse of RLK and Company and Mike Teems of the US Forest Service conducted a field investigation to determine the visibility of the proposed Timberline Bike Park, including the Skills Park, from the historic Timberline Lodge.

Methodology: In order to simulate a mountain biker in the Skills Park, the team estimated the height of a rider on a bike using a 5' 9' person on a medium adult Mt bike. They measured from the ground to the highest point of the person in a standing position on the bike, which is a normal position when riding a bike in a skills park. This resulted in a height of 66" so they rounded up to 6' or 72". By design, no terrain feature in the Skills Park will be higher than 3 feet above the ground. As a result, a 6' mountain biker on a bike, on top of a 3' terrain feature makes a total of 9'. Again, they rounded up to 10' to ensure adequate coverage. A 10' piece of conduit with a length of survey flag at the top was used to simulate the maximum height of a rider in the Skills Park (Photo 1)

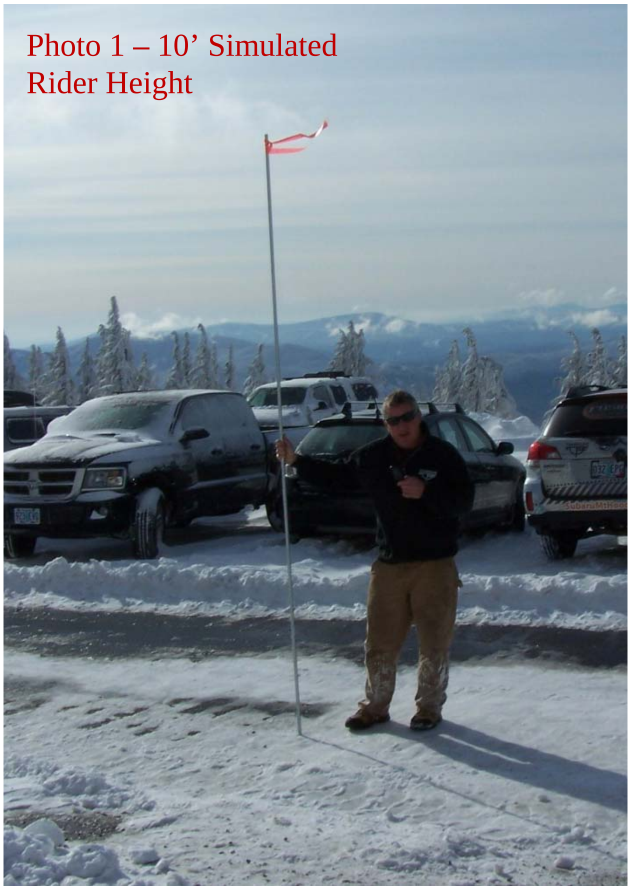


Photo 1 – 10' Simulated Rider Height

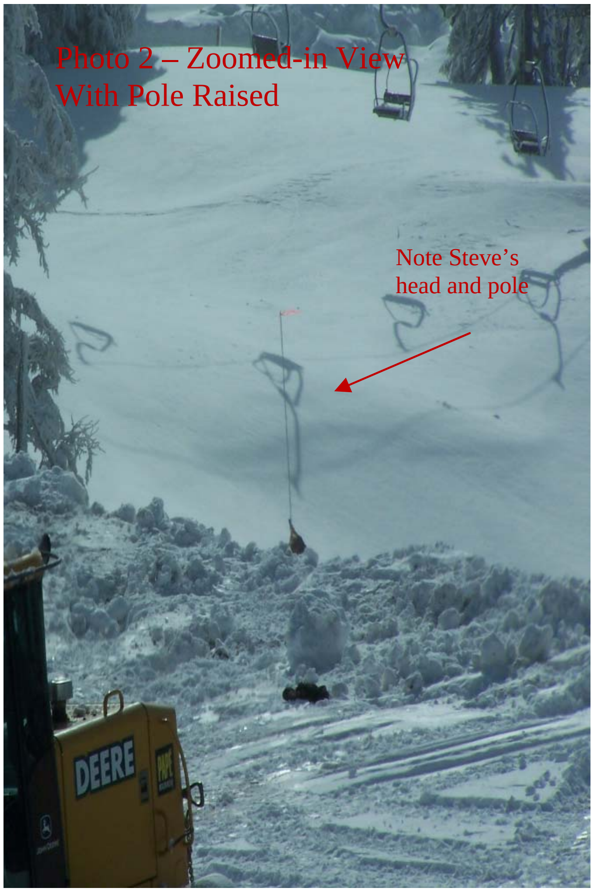
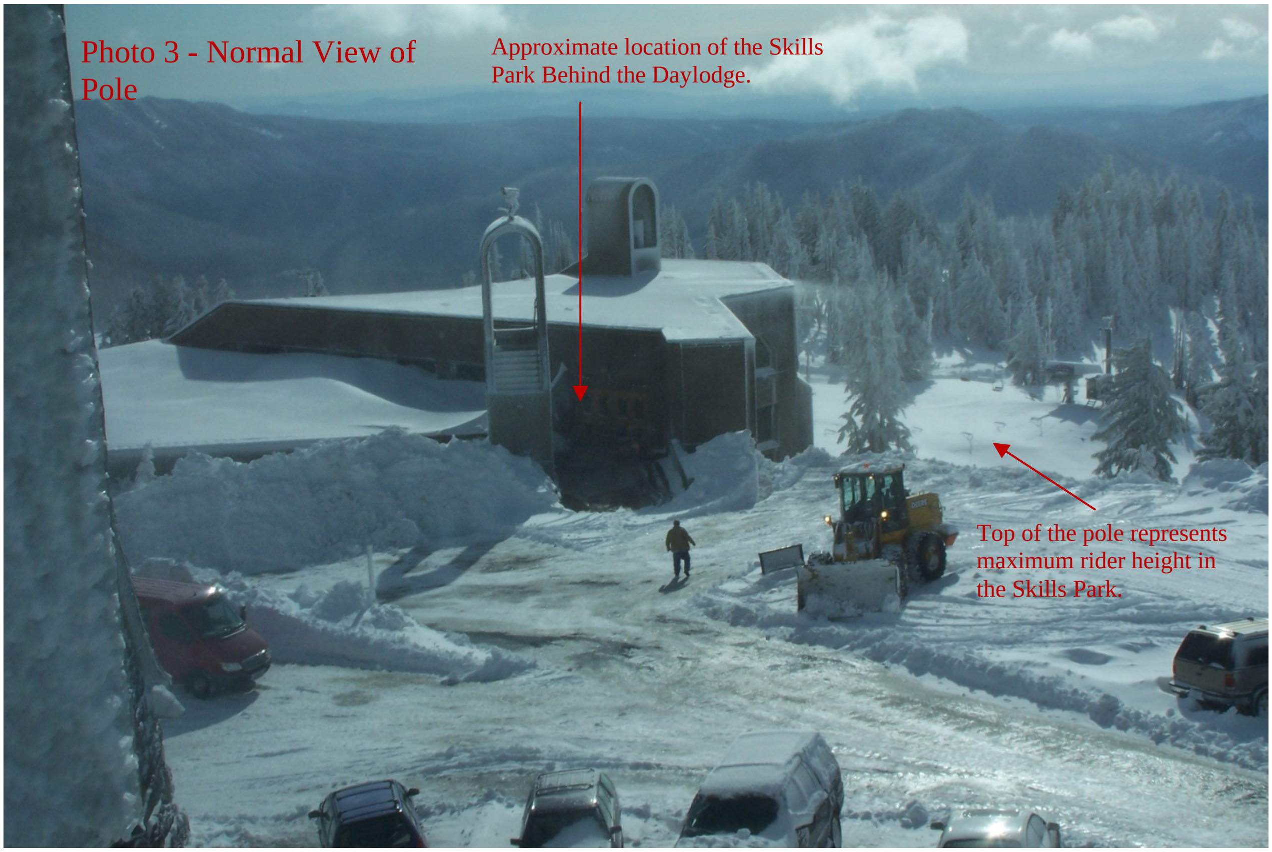


Photo 2 – Zoomed-in View With Pole Raised

Photos were taken from the south window in the Mezzanine level and the Roosevelt terrace to evaluate the visibility of the 10-foot pole and flagging from Timberline Lodge.

Photo 2 is a zoomed in photo of Steve holding the conduit as high as he could reach and in a location that is approximately 100 feet west of the westernmost edge of the skills park. This photo is provided as a control – a zoomed in image from the Mezzanine level.

Photo 3 is the same shot as Photo 2 using a normal vision lens and with the pole on the ground. This represents the actual height of a mountain biker on a terrain feature in the Skills Park. The Skills Park would be located to the left of this picture, behind the Wy'East Daylodge and under Bruno's chairlift, whose bottom terminal is visible in the photo. This image includes the edge of the southwest window, near the Ram' Head Bar on the Mezzanine level.



Given that the Mezzanine level represents the view from the upper-most floor of Timberline Lodge, these photos show that the Skill Park and its riders would not be visible from the lodge due to the topography of the site and the placement of the Skills Park behind the Wy'East Daylodge.

APPENDIX G

DRAFT AQUATICS BIOLOGICAL ASSESSMENT

Draft Fisheries Biological Assessment
Timberline Bike Park

Zigzag Ranger District, Mt. Hood National Forest

Fifth Field Watershed: Zigzag River, Salmon River

Table 1. List of Proposed, Endangered, Threatened, or Sensitive (PETS) Fish and Region 6 Sensitive Species found on the Mt. Hood National Forest and addressed under this Biological Assessment:

	Date of Listing & Critical Habitat	Critical Habitat Present	Species Present	Effects of Actions	
Endangered Species Act Listing by ESU/DPS ***Threatened***				**Construction**	**Operation**
Lower Columbia River steelhead & CH (*Oncorhynchus mykiss*)	1/06 9/05	Y	Y	NLAA	NLAA
Lower Columbia River Chinook & CH (*Oncorhynchus tshawytscha)*	6/05 9/05	N	N	NE	NE
Columbia River Bull Trout (*Salvelinus confluentus*)	6/98	N	N	NE	NE
Lower Columbia River coho *(Oncorhynchus kisutch)*	6/05	N/A	N	NE	NE
Southern DPS Smelt (*Th. Pacificus*)	3/10	N/A	N	NE	NE
Regional Forester's Special Status Species List					
Interior Redband Trout *(Oncorhynchus mykiss spp.)*	7/04	Y*	Y	MIIH	MIIH
Columbia duskysnail *(Colligyrus sp. nov. 1)*	1/08	Y*	Y	MIIH	MIIH
Barren Juga *(Juga hemphilli hemphilli)*	1/08	N	Unk	NI	NI
Purple-lipped Juga *(Juga hemphilli maupinensis)*****	1/08	N	Unk	NI	NI
Scott's Apatanian Caddisfly *(Allomyia scotti)*	1/08	Y*	Y	MIIH	MIIH
Essential Fish Habitat		N/A	N	NAA	NAA

*Suitable habitat exists within the Action Area for this species.

Endangered Species Act Abbreviations/ Acronyms:		**Essential Fish Habitat Abbreviations/ Acronyms:**	
NE	No Effect	NAA	Not Adversely Affected
NLAA	May Affect, Not Likely to Adversely Affect	AE	Adverse Effects
LAA	May Affect, Likely to Adversely Affect		
Regional Forester's Sensitive Species List Abbreviations/ Acronyms:			
Unk	presence unknown but suspected		
NI	No Impact		
MIIH	May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing loss of viability to the population or species		

/s/ Kathryn Arendt

KATHRYN ARENDT

Fisheries Biologist

Zigzag Ranger Districts

Table of Contents

I. Introduction

Forest management activities that may alter the aquatic habitat or affect individuals or populations of PETS (Proposed, Endangered, Threatened, and Sensitive) fish and aquatic species require a Biological Evaluation to be completed (FSM 267l.44 and FSM 2670.32) as part of the National Environmental Policy Act process and Endangered Species Act to determine their potential effects on sensitive, threatened or endangered species. The Biological Evaluation process (FSM 2672.43) is intended to conduct and document analyses necessary to ensure proposed management actions will not likely jeopardize the continued existence or cause adverse modification of habitat for:

A. Species listed or proposed to be listed as endangered (E) or threatened (T) by the USDI-Fish and Wildlife Service or USDC-NOAA Fisheries, and their listed or proposed listed critical habitat.

The Biological Evaluation process (FSM 2672.41) is also intended to conduct and document analyses to ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant or contribute to animal species or trends toward Federal listing of any species for:

A. Species listed as sensitive (S) by USDA-Forest Service Region 6.

This Biological Evaluation addresses all the project elements presented in the Timberline Downhill Bike Trail Environmental Assessment (hereafter referred to as the EA).

II. Description of Proposed Action (no alternative provided)

Included in this section is a description of the proposed action including interrelated and interdependent actions [50 CFR 402] in sufficient detail to analyze effects of the action on ESA listed species and associated critical habitat.

2.1 Proposed Action

The proposed action is to develop a managed, ski lift-assisted downhill-only mountain bike trails system and skills park within the southern portion of the Timberline Ski Area permit boundary. The proposal would consist of an approximate 17 mile trail network and a separate “skills park” that would encompass approximately 0.2 acre. The trail system would be designed to accommodate all skill levels with an emphasis on beginner and intermediate levels.

The proposed action also includes a watershed restoration activity to reduce sediment erosion that is occurring within the project area. The watershed restoration activity would involve road stabilization and decommissioning measures on approximately 2.1 miles of native surface roads within or adjacent to the project area.

2.1.1 Bike Park Trails

The trail network would be constructed in phases over a two year development period, in the area served by the Jeff Flood Express Chairlift (see Figure 3). The trail system would offer trails for all ability levels with a design emphasis on beginner and intermediate levels. Trails would include natural and human-created features and banked turns where appropriate, particularly on the intermediate and advanced trails. Human-created features would include structures such as ladder bridges. A summary of each of the proposed trails is provided in Table 1.

Three ability levels would be served by the mountain bike trail network. Similar to the ski terrain at Timberline, these include Beginner, Intermediate, and Advanced (Table 2).

Beginner (Green) – Easiest. Gentle climbs and descents with obstacles such as rocks, gravel, roots, bridges and pot holes. Rider must have ridden a bike before using these trails.

Intermediate (Blue) – More difficult than Green. Challenging riding with steep slopes and/or obstacles, including narrow trail or elevated skills park with poor traction. Riders must have off-road riding experience.

Advanced (Black) – Most difficult. Mixture of steep descents, loose trail surface, numerous trail and man-made obstacles including jumps, ramps, elevated features, berms, drops, and rocks.

The development plan proposes a construction schedule of two years to provide enough trails to allow an entertaining riding experience for a variety of ages, abilities and riding preferences during each year of construction. During construction, approximately three mini-excavators and/or mini-loaders and 5 - 10 person trail crew would be used to construct trails.

Three types of mountain bike trails would be constructed: Wide- excavated trails, narrow-excavated, and single-track trails.

Wide-Excavated Trails - Average tread width of 66 inches and a construction corridor that averages 99 inches in width. The tread is graded primarily using excavators, which are capable of working around individual trees or other sensitive areas. Excavated trail features such as berms, jumps, drops, rocks, and elevated ladders are located during construction.

Narrow-Excavated Trails - Average tread width of 42 inches and a construction corridor of approximately 63 inches. The tread is graded primarily using excavators, which are capable of working around individual trees or other sensitive areas. Excavated trail features such as berms, jumps, drops, rocks, and elevated ladders are located during construction.

Single-Track Trails - Average trail width of 16 inches and a construction corridor of 24 inches. The tread is constructed primarily by hand, with some use of machinery where necessary.

Table 2 provides details on the proposed Bike Park trails. Colors are added to the table to reflect Beginner (green), Intermediate (blue) and Advanced (Gray)

Trail No.	Phase	Total Vertical (ft)	Total Length (mi.)	Average Grade (%)	Average Tread (in)	Avg. Disturbed Width (in)	Total Area (ac)
1	1	1,135	3.25	4 - 7	66	99	3.2
2	1 and 2	1,010	3.11	6 - 7	16 - 42	24 - 63	1.8
3	1	653	1.74	7	16	24	0.4

4	1	1128	4.66	5	66	99	4.7
5	1	43	0.15	5	66	99	0.2
6	1	-16	0.29	-1	66	99	0.3
7	2	846	2.00	7 - 8	16	24	0.5
8	2	751	1.99	6 - 8	16 - 42	24 - 63	0.8
Skills Park	1			n/a	n/a	n/a	0.2
Total			**17.19**				12.1

All mountain bike trails have been designed with approximately 4% to 8% average grade over the length of the trail. In an effort to understand how best to approach trail design suitable to the soil and topography at Timberline, Gravity Logic spent a significant amount of time studying local trails (e.g., Highway 44, Sandy Ridge, Bridle Trail, Alpine, and Glade) to better understand what works on Mt. Hood's soil and what does not. Additionally, they visited offsite areas such as Northstar at Tahoe Bike Park, the sandy trails around South Lake Tahoe, and the trails around Mammoth Lakes, California. Based on this reconnaissance, Gravity Logic found that:

- Trails with a ***sustained*** grade over 8% are simply not suitable for downhill bike traffic. Trails 7% and less showed little or no soil movement and a very compact riding surface. Important to all trail design is the installation of numerous rolling dips and grade reversals to both moderate speed and shed water at regular intervals. Trails with short segments from 8%-20% can be sustainably incorporated providing the approach and exit are designed to manage speed, sightlines, and by avoiding abrupt turns and corners prior to steeper segments.
- Soils are typically well draining.
- Soils are not negatively affected by a moderate amount of moisture and/or rain, and in fact benefit from damp conditions. An important consideration, however, is to not allow water to follow the trail for sustained pitches. Grade reversals, bridges, and culverts would all manage water before it has a chance to gain enough velocity and volume to recruit sediment and/or cause damage to the trail surface.
- Corners /switchbacks have significant grade reversals prior to the turn to reduce or eliminate aggressive braking.
- Steep pitches on advanced trails would be successfully armored with wood and/or rock to protect the soil.

The average gradient (i.e., 6% - 8%) has been established in the field by not aligning trails along the fall line. Rather, the trails typically run across the fall line. The Timberline Bike Park trails have been designed to include numerous rolling dips and grade reversals to both moderate speed and shed water at regular intervals. These would be sited and designed in the field during construction. As a result of the grade reversals and rolling dips, very short trails segments (approximately 20 - 40 feet in length) ranging from 8%-20% may be present along the downward pitch of a rolling dip, for example. Depending upon the field conditions, these steeper pitches may be armored with wood and/or rock.

The Timberline Bike Trails would have an average gradient of 4% – 8%, as described above. However, grade reversals and rolling dips would be applied throughout the trail network.

An important operational consideration is the management of surface water along the trail system. Grade reversals, bridges, and culverts would all manage water before it has a chance to gain enough velocity and volume to rill or recruit significant sediment. The field design of the trail is intended to minimize sediment mobilization that would cause damage to the trail surface. Bike Park staff (RLK) would patrol the trails on a daily basis and sediment deposited in sediment basins or rolling/drain dips would routinely be cleaned out and replaced onto the surface of the trails to protect the trail surface and to prevent delivery of this sediment downslope.

Another important operational consideration is the management of biker velocity along the trails. Sharper turns such as corners and switchbacks have been designed with grade reversals prior to the turn to reduce or eliminate aggressive braking, thereby reducing damage to the trail surface.

Wooden features such as bridges, boardwalks, wall rides, ladders, wood tables, rollers, and doubles (examples provided in the attached documentation) are used to avoid sensitive areas such as puddles and tree roots. It is estimated that a total of 70-90 wooden features would be constructed in the Timberline Bike Park, providing a total protected trail length of approximately 2,400 linear feet, or 2% - 3% of the total trail length.

2.1.2 Skills Park

In addition to the individual trails, a Skills Park would be constructed on approximately 0.2 acre (80 feet by 100 feet) in the vicinity of the Brunos chairlift. The Skills Park would include temporary, removable wooden structures built by hand tools on site and removed prior to winter operations (see attached documentation). These structures would consist of elevated ladder systems, teeter totters, rock structures and other obstacles. The Skills Park offers practice areas for all skill levels.

The Skills Park would include entrance and exit gates and it would be encircled with native materials that would serve as a fence – this may include logs, rocks or actual fencing. This fencing would direct riders into and out of the Skills Park. The perimeter of the Skills Park would include drainage ditches that would convey surface water from the area to a sediment basin. Water leaving the sediment basin would be conveyed via a rock-lined channel to the existing sediment basin near the wastewater treatment plant (see attached Skills Park site plan).

2.1.3 Watershed Restoration

Based on comments received from the public during scoping and concerns raised by the ID Team doing the environmental analysis, watershed restoration activities are being included as part of the proposed action. Site specific project analysis affords the Forest Service the opportunity to identify existing problems in a project area and propose corrective measures. There are currently approximately two miles of native surface service roads in this area that are contributing sediment to downstream areas in both the Still Creek and West Fork Salmon River drainages (see Figure3).

The proposed action would include 5.9 acres (2.1 miles) of restoration projects in both the Still Creek and West Fork Salmon drainages. In the Still Creek drainage a total of approximately 1.4 miles (4.3 acres) of roads and disturbed areas would be treated. In the west Fork Salmon drainage approximately 0.7 miles (1.6 acres) would be treated. The watershed restoration projects include decommissioning of existing service roads, where the roadway surface would be graded to match natural topographic contours, topped with topsoil or amended local material, and seeded with native plant species or suitable stabilizing cover. The existing access road to the bottom terminal of the Stormin' Norman lift would be enhanced to provide improved surface water management, including re-grading of the road surface to divert surface flows to ditches and sediment basins, and the new road prism would be surfaced with inches of gravel. The areas surrounding several bottom terminals of the *Pucci* and *Stormin' Norman* lifts would be restored by better defining service vehicle access routes and parking areas for terminal maintenance. Road areas to remain would be re-graded to provide improved surface water management and surfaced with a 6 inch lift of gravel. Areas outside of the gravel would be scarified and seeded with native plant species. The mazing area at the bottom terminal of the Jeff Flood Express would be protected through the installation of a geo-grid, which will harden the loading area to protect the ground surface from mountain bikers loading the chairlift. The geo-grid would be framed with a hard curb or other similar structure to prevent bikers from leaving the geo-grid and trampling the restored bottom terminal area. Based on comments received from the public during scoping and concerns raised by the ID Team doing the environmental analysis, watershed restoration activities are being included as part of the proposed action. Site specific project analysis affords the Forest Service the opportunity to identify existing problems in a project area and propose corrective measures.

There are three project elements (and associated sub-elements) of the proposed action. The first element is the construction the Downhill Bike Park, the second is the long-term operation and maintenance of the Bike Park and the third element includes a suite of watershed restoration actions which have been designed to reduce or offset "adverse effects" to aquatic habitat which have resulted from the development and operation of the ski area. Each element is described in terms of the nature, timing and duration of the action and includes conservation measures/project design criteria (PDC's) which have been developed to reduce the potential of "adverse effects" to ESA listed species and critical habitat. A table of the complete list of PDC's is provided in Appendix A. Relevant PDC's are cited for each "sub-element" associated with the project elements. A detailed description of sensitive sites, relevant HUC boundaries, and land uses and allocations can be found in the *Hydrology Specialist Report*.

1) Element 1 - Construction of Downhill Bike Park

Construction timing: June/July through October 2011 and 2012, depending on snowmelt and soil moisture conditions. PDC's will not allow work to commence until site conditions are sufficiently dry (PDC, Soil-5, Soil-9, Soil-12, Soil-19). Work would be conducted during the daytime (8 – 10 hour days), up to 7 days per week. Relevant PDC's include; Veg-3, Veg-21, WS-4, WS-4, WS-16, WS-17).

Equipment used (for trails and bridges and boardwalks): Three mini-excavators will be used simultaneously to excavate trails and build approaches to bridges and boardwalks. Each excavator will be accompanied by a hand crew using hand tools. Relevant PDC's for equipment leaks, hauling routes, staging areas, sediment control include; Veg-1, Veg-2, Veg-8, Veg-9, Veg-10, Veg-11, Veg-21, Veg-24, Veg-27

Trail Construction Specifications: 1) **Wide-Excavated Trails-** Average tread width of 66 inches and a construction corridor that averages 99 inches in width. The tread is graded primarily using mini-excavators, which are capable of working around individual trees or other sensitive areas, subject to the Project Design Criteria. With each excavator, 3 – 5 people would be working with hand tools to fine grade and stabilize the trail behind the mini-excavator. Excavated trail features such as berms, jumps, drops, rocks, and elevated ladders are built during construction. 2) **Narrow-Excavated Trails -** Average tread width of 42 inches and a construction corridor of approximately 63 inches. The tread is graded primarily using mini-excavators, which are capable of working around individual trees or other sensitive areas, subject to the Project Design Criteria. With each excavator, 3 – 5 people would be working with hand tools to fine grade and stabilize the trail behind the mini-excavator. Excavated trail features such as berms, jumps, drops, rocks, and elevated ladders are built during construction. 3) **Single-Track Trails -** Average trail width of 16 inches and a construction corridor of 24 inches. The tread is constructed primarily by hand (crew of 3 – 5 people), subject to the Project Design Criteria. Relevant PDC's include: WS-9, WS-10, WS-11, WS-15,

Access and hauling routes and fueling stations: The fueling area would be in the Wy'East or Salmon parking lot, away from all riparian areas **(PDC, Soil 6; WS-1)**. Other staging areas (not fueling) would include existing disturbed areas such as top or bottom terminal sites (i.e., if an excavator is working on trails at the bottom of a chairlift, the excavator may be kept there overnight). Each day, mini excavators would mobilize along existing, paved roads (i.e., West Leg Road) or parking lots to access the construction sites (trails). Work crews would arrive via truck and walk to construction sites. The newly constructed trails would provide access to the upcoming work area for the day. For example, an excavator would start constructing a trail at West Leg Road and proceed ¼ mile down-slope on Day 1. On Day 2, the excavator would use "yesterday's" trail to access the next ¼ mille of trail. For single track, hand crews would follow the same basic idea. There would be no overland access for the mini-excavator or work crews.

The skills park would be "roughed in" during Year 1 construction and includes a permanent disturbance area of 0.2 acres, none of which are in riparian reserves or in any other sensitive areas. This would include excavating the perimeter drainage ditches and creation of soil-based features. In year 2, just before opening, they would install the wooden features, perimeter fencing, etc.

Stream Crossings: No culverts will be used in the project. Perennial and ephemeral channels will be crossed using either bridges or fords. At least 27 bridges have been identified, but the PDC calls out potentially more (PDC, WS-1).

Tree removal: No trees larger than 6" dbh will be removed from the project (PDC Veg-1, Veg-2). Trees (< 6" dbh) would be cut by hand (chainsaw) felled near the trail construction site, any that span the trail would be cut by hand such that the trail would pass through the cut and the rest of the downed tree remains in place.

Construction Source Material: All of the rock for the project will be readily available from the construction corridor – there will be no quarrying (PDC, Veg-5, Soil-1). Wood will be untreated, kiln-dried (likely 2X material) sourced from a local/regional lumber yard. It will be delivered to the staging area in the parking lot where it will be transported via approved travelways/existing roads or trails as they are constructed and then hand-carried to the actual construction site.

Surface Water Management: Relevant PDC's for surface water management including the prevention of equipment leaks and sediment delivery are described in; WS-1, WS-2, WS-5, WS-7, WS-8, WS-12, WS-13,WS-14, WS-15, WS-16, WS-17.

Proximity to listed species and critical habitat: Critical habitat for LCR winter steelhead exists at the lowermost part of the proposed project at the bottom terminal of the Jeff Flood lift (the chair- lift which will be providing access to the Bike Park). Thus, proximity ranges from 0 miles (< 50 feet) at the bottom of the project area to ~1.2 mile at the top of the project area. All trails are within 0-2 miles of listed ESA LCR winter steelhead and their designated critical habitat.

Riparian Reserves: There are approximately 13 acres of disturbance associated with trail construction and 6 acres of restoration with revegetation associated with watershed restoration actions. This would result in a net disturbance of 7 acres, some of which would occur within Riparian Reserves. By design, the project avoids impacts to "stands" – there is no "clearing" of trees. To meet Aquatic Conservation Objectives, the following PDC's have been developed for trail construction in Riparian Reserves (PDC's Veg-1, Veg-2, Veg-8, Veg-9, Veg-10, Veg-11, WS-1, WS-5, WS-7, WS-8, WS-14, WS-15, Soil-2, Soil-6).

Interrelated or interdependent activities: 1) Jeff Flood Lift Operation & Maintenance; Trucks traveling along West Leg Road to access the top and bottom terminals for maintenance activities. Maintenance crews MAY ride ATVs along parts of the lift corridor to access lift towers for sheave train maintenance. This would be a several-day activity along the 1+ mile lift corridor for Stormin Norman, Pucci, Molly's, Brunos and Jeff Flood). 2) Existing Summer Recreation uses; Hiking, biking/mountain biking along Glade and Alpine as well as West Leg Road. Occasionally people squat at user camp sites near the bottom terminal.

Element 2 – Annual Operation and Maintenance of the Downhill Bike Park

Annual maintenance and operation timing: The Bike Park operating season is expected to be from July through September depending on snowmelt and soil moisture conditions. The following PDC's describe the conditions in which the Bike Park will operate; Veg-21, Soil 12. The park will operate during daylight hours only (PDC, Wild-3) up to 7 days per week. Maintenance activity timing will follow the same guidelines as those described under the construction elements.

Annual maintenance and operation nature: At full build-out, the capacity of the bike park would be about 338 bikers at one time, with 110 – 115 bikers on the trails at any given time. It is important to note that capacity days will occur on weekends and events. It is much more likely that a weekday will see ~60 bikers. In addition, the Bike Park will host two or more race-day events which may increase both the number of riders and spectators and therefore requires race-day PDC's (Rec-5). Those events may focus activities on certain trails (or the skills park) or at certain terrain features along a portion of a trail.

Under typical operating conditions, the Bike Park would be designed to provide a balance between the uphill lift capacity and the downhill capacity. The winter operating capacity of the *Jeff Flood Express* lift is 1,800 people per hour (pph) and the lift has a total of 102, four-passenger carriers. During the summer, every other chair would be used as a bike carrier with no passengers, leaving 51 carriers for passengers and operating at 75% speed, resulting in a summer operating capacity of 720 pph (75% of 900 pph). With 6 trails operating in the Bike Park, if a mountain biker started down each trail every 30 seconds, 720 pph would descend the trails.

In the winter time, the *Jeff Flood Express* Comfortable Carrying Capacity (CCC) is 900. Operating half of the chairs as bike carriers and running the lift at 75% speed, the CCC would reduce to 338 (75% of 450). The CCC typically refers to the people that would be divided into three categories: 1/3 on the lift, 1/3 riding the trails, and 1/3 milling about or practicing in the Skills Park. Based on this calculation, there would be ~110-115 bikers at one time on the trail network.   The trails provide the potential for four to six laps per hour, suggesting that this biker-at one-time number matches the pph capacity of the lift (i.e., 115 people riding 4 times is 460pph and 6 times is 690 pph, or just under the lift capacity of 720 pph. Relevant PDC's: Mon-1, Rec-5, Soil-12, Soil-14, Soil-19, Veg-21, WS-3.

Equipment used for maintenance (for trails and bridges and boardwalks): Trail maintenance will be done on a daily basis using hand rakes and shovels. Wheel barrows may be used at times to transport materials such as mulch. Occasionally a gator may be used to transport heavy materials such as rock. Bridges and boardwalks would be maintained by hand using chainsaws. Inspection of park features would take place every day the Bike Park operates. Routine maintenance would be conducted as needed – duration would be minutes to a couple hours. Bridge maintenance (on streams) would occur once per season and would follow in-water work windows when appropriate. The following are the relevant PDC's associated with Bike Park trail and feature maintenance:

Established access and hauling routes and fueling stations: All Maintenance activities would be based out of the existing shop, located immediately south of the Skills Park. Fueling would be done at the maintenance shop. If gator access to trails is needed, access would originate along the West Leg Road or the parking lots.

Surface Water Management: Relevant PDC's for surface water management including the prevention of equipment leaks are described in; WS-1, WS-2, WS-5, WS-7, WS-8, WS-12, WS-13,WS-14, WS-15, WS-16, WS-17.

Sediment and Erosion Control: Relevant PDC's for surface water management including the prevention of equipment leaks and sediment delivery are described in; Soil-1 through 8, Soil 9, Soil-12, Soil-14, Veg-2, Veg-8, Veg-17, Veg-21, WS-3, WS-8, WS-9.

Proximity to listed species and critical habitat: Critical habitat for LCR winter steelhead exists at the lowermost part of the proposed project at the bottom terminal of the Jeff Flood lift (the chair- lift which will be providing access to the Bike Park). Thus, proximity ranges from 0 miles (< 50 feet) at the bottom of the project area to ~1.2 mile at the top of the project area. All trails are within 0-2 miles of LCR winter steelhead and their designated critical habitat.

Management of Riparian Reserves: Trees would be removed when they fall on the bike trails. A section of the log would be cut out to allow bikers to pass. Hazard tree removal will be minimized. To meet Aquatic Conservation Objectives, the following PDC's have been developed for trail maintenance in Riparian Reserves and spectator management (PDC's Rec 5,Veg-1, Veg-2, Veg-8, Veg-9, Veg-10, Veg-11, WS-1, WS-5, WS-7, WS-8, WS-14, WS-15, Soil-1, Soil-6).

Interrelated or interdependent activities: 1) Jeff Flood Lift Operation & Maintenance; Trucks traveling along West Leg Road to access the top and bottom terminals for maintenance activities. Maintenance crews MAY ride ATVs along parts of the lift corridor to access lift towers for sheave train maintenance. This would be a several-day activity along the 1+ mile lift corridor for Stormin Norman, Pucci, Molly's, Brunos and Jeff Flood). 2) Existing Summer Recreation uses; Hiking, biking/mountain biking along Glade and Alpine as well as West Leg Road. Occasionally people squat at user camp sites near the bottom terminal.

2) **Element 3 – Watershed Restoration Actions**

Nature and Duration of Watershed Restoration actions: There are currently several miles of native surface service roads within the action area that are contributing sediment to downstream areas in both the Still Creek and West Fork Salmon River drainages. The proposed restoration actions would include 5.9 acres of projects in those drainages. In the Still Creek drainage a total of 4.3 acres of roads and disturbed areas would be treated. In the West Fork Salmon drainage 1.6 acres would be treated. The watershed restoration projects include decommissioning of existing service roads[1], where the roadway surface would be graded to match natural topographic contours, topped with topsoil or amended local material, and seeded with native plant species or suitable stabilizing cover. The existing access road to the bottom terminal of the Stormin' Norman lift would be enhanced to provide improved surface water management, including re-grading of the road surface to divert surface flows to ditches and sediment basins, and the new road prism would be surfaced with 6" of gravel. The areas surrounding several bottom terminals of the *Pucci* and *Stormin' Norman* lifts would be restored by better defining service vehicle access routes and parking areas for terminal maintenance. Remaining roads would be re-graded to provide improved surface water management and surfaced with a 6" lift of gravel. Areas outside of the gravel would be scarified and seeded with native plant species. The mazing area (i.e., the area where bikers line up to get on the chairlift) at the bottom terminal of the *Jeff Flood Express* would

[1] The Glade Trail currently consists of a series of ill-defined user trails that have resulted in a road-like situation. This restoration action would decommission the majority of the disturbed area and convert it to a defined trail. This trail would not be constructed until after the Timberline to Town Trail is completed and the Glade Trail is closed to mountain biking.

be protected through the installation of a geo-grid, which will harden the loading area to protect the ground surface from mountain bikers loading the chairlift. The geo-grid would be framed with a hard curb or other similar structure to prevent bikers from leaving the geo-grid and trampling the restored bottom terminal area[2](**Table 3**).

The timing of restoration actions would be concurrent with the trail construction and share the same PDC's for when activities would start and stop as those described in Element 1. Watershed restoration projects would be phased to occur in areas where Bike Park trails are being constructed, in order to reduce the number of incursions into any one area. Consequently, the restoration effort will take place in two phases.

Table 3. Outlines the proposed restoration projects by Phase (year 1 and year 2) and by sub-basin.

Project Label	Phase	Road/Project	Action	Length (ft.)	Width (ft.)	Area (ac.)
		Still Creek Basin				
A	1	Glade Trail	Convert Road to Trail (Decommission Road)	2512 (0.48 mi.)	15	0.9
B	1	Alpine Trail	Surfacing and Surface Water Management	332(0.06 mi.)	12	0.1
C	1	Stormin Normal Access Road	6" lift of gravel, surface water control	686(0.13 mi)	18	0.3
D	1	Stormin' Norman Service Road	Decommission	3937 (0.75 mi)	12	1.1
E	1	Jeff Flood Bottom Terminal	Surface Water Management and Re-Vegetation	-	-	0.4
F	1	Kruser Run Landing	Surface Water Management and Re-Vegetation	-	-	0.2
G	1	Stormin' Norman Bottom Terminal	Surface Water Management and Re-Vegetation	-	-	0.8
H	1	Roundhouse - West Leg Road	Surface Water Management and Re-Vegetation	-	-	0.6
		Still Creek Subtotal				*4.3*
		WF Salmon				
I	2	Pucci Service Road	Decommission	3651 (0.69 mi.)	12	1.0
J	2	Pucci Bottom Terminal	Drainage Control and Re-vegetation	-	-	0.6
		WF Salmon Subtotal				1.6
		Total		2.11 mi		**5.9**

Equipment used for restoration (for roads, lift landings): Equipment will include mini-excavators and hand crews described in Element 1 & 2 as well as large excavators and back-hoes to

[2] The restoration of the bottom terminal of the *Jeff Flood Express* is a requirement of the ROD for the Timberline Express EIS. The action included in this proposal is the protection of the restored area from impacts due to the mountain biking activity at the bottom terminal.

prepare road surfaces for decommissioning (or drainage control and gravel placement). Relevant PDC's are Mon-1, Soil-14, WS-11, WS-16.

Established access and hauling routes and fueling stations: Access and haul routes would be the same as those described in Element 1 and will not occur in sensitive areas. Work on existing road networks will stay within the existing road prism. The fueling area would be in the Wy'East or Salmon parking lot, away from all riparian areas. Other staging areas (not fueling) would include existing disturbed areas such as top or bottom terminal sites (i.e., if an excavator is working on decommissioning or terminal stabilization at the bottom of a chairlift, the excavator may be kept there overnight). Each day, the excavator would mobilize along existing, paved roads (i.e., West Leg Road) or parking lots to access the de-commissioning sites . Work crews would arrive via truck/ATV/Gator. There would be no overland access for the mini-excavator or work crews.

Surface Water & Sediment Management: For road decommissioning, equipment would first obliterate the road surface and restore the natural grade, to the extent possible. Depending on the slope gradient and sustained length of roadway on the fall line, surface water control structures such as water bars or cross-drain logs would be installed to prevent high-velocity surface water drainage.

Upon establishment of the rough grade and surface water controls, site stabilization would be completed through application of topsoil and/or mulch and seed material as specified in the PDCs. The mulch crew would follow closely behind the grading crew to ensure that newly decommissioned road surfaces are stabilized. Similar to the bike park trail construction, temporary erosion and sediment control measures would be applied to decommissioned road segments at the end of each work day, if the areas have not been mulched and planted.

Roadway segments to be enhanced would follow a similar construction sequence as decommissioning, except that the roadway surface would be modified to reduce slope gradients or install drain dips to the extent possible, or to install other surface water drainage controls such as water bars, road-side ditches or culverts. Sediment basins would be installed below drainage ditches and culverts, and rock check-dams would be installed in the drainage ditches in accordance with Forest Service standards.

Bottom Terminal sites and the Roundhouse area of West Leg Road would be treated similar to road decommissioning projects, with a rough grade established to manage surface water, fine grading with topsoil and/or mulch and seeding planting.

Relevant PDC's for surface water management including the prevention of equipment leaks are described in; WS-1, WS-2, WS-5, WS-7, WS-8, WS-12, WS-13,WS-14, WS-15, WS-16, WS-17.

Proximity to listed species and critical habitat: Critical habitat for LCR winter steelhead exists at the lowermost part of the proposed project at the bottom terminal of the Jeff Flood lift (the chair- lift which will be providing access to the Bike Park). Thus, proximity ranges from 0 miles (< 50 feet) at the bottom of the project area to ~1.2 mile at the top of the project area. All trails are within 0-2 miles of LCR winter steelhead and their designated critical habitat.

Management of Riparian Reserves: No trees shall be removed as a result of restoration actions. PDC's have been developed to maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands including:

- Salvaging whole plants from proposed trails in advance of trail construction and transplant them in disturbed areas once construction is completed
- Propagate seedlings from vegetative propagules materials in a nursery for revegetating disturbed areas when whole plants cannot be removed for transplanting
- Collect seed from native plants in the special-use permit area and propagate seedlings from this seed in a nursery for restoration of disturbed areas in subsequent years and directly sow collected seed in disturbed areas for those species for which this method is effective

With the minimal amount of trail clearing and associated criteria to minimize disturbance the project is not anticipated to impact the diversity, and complexity of watershed and landscape-scale features.

Interrelated or interdependent activities: The timing of restoration actions would be concurrent with the trail construction and share the same PDC's for when activities would start and stop as those described in Element 1. Watershed restoration projects would be phased to occur in areas where Bike Park trails are being constructed, in order to reduce the number of incursions into any one area. Consequently, the restoration effort will take place in two phases.

III. Description of Action Area

The Action Area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action [50 CFR §402.02]. Therefore, the following aquatics summary, and resultant analysis of effects, is organized by multiple watershed scales. This is because the proposed project will have a range of observable effect, some of which will be measurable on the fifth field scale, others which will only be detectable at the 6th or smaller watershed scale.

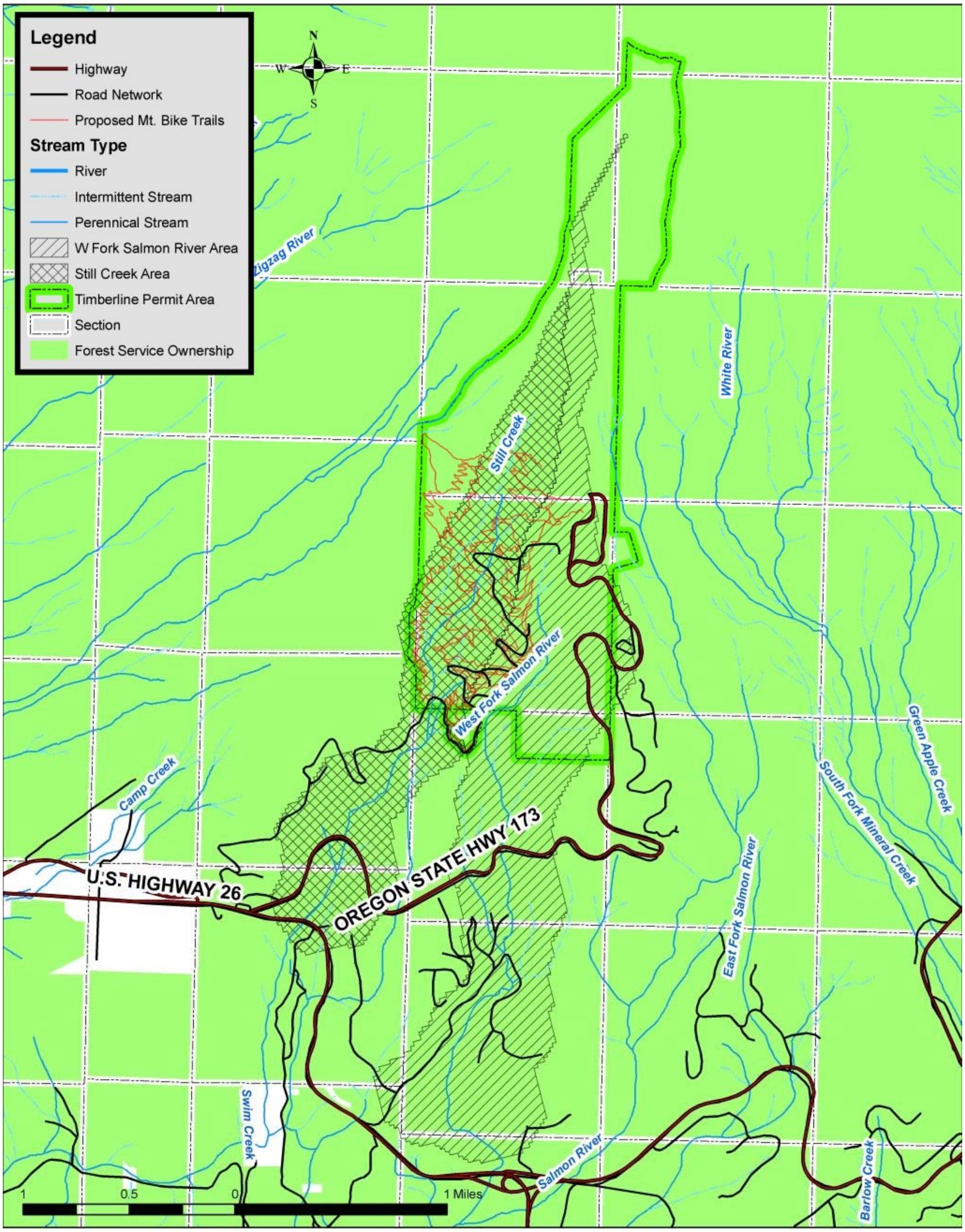
The analysis area for aquatic resource indirect and cumulative effects analysis includes the proposed downhill bike trails and skills park as well as existing road and trail network associated with ski area operations at Timberline. The Action Area includes portions of Hwy 26 where Still Creek and the West Fork Salmon intersect Highway 26 and riparian reserves along all streams (both perennial and ephemeral) (Figure 1.). For a discussion of the hydrologic planning areas and watershed resources identified for this project, please refer to the *Hydrology Specialist Report* within this EA.

Several aquatic habitat elements could be impacted by downhill mountain bike construction and use (discussed in detail below) but the primary elements are related to erosion that could lead to increased sedimentation into surface waters downstream of the proposed project; the extension of the stream drainage network; and long and short term impacts to riparian buffers.

Fine sediment routing and turbid conditions would extend downstream varying distances from the project depending on stream flow, stream size, gradient, and habitat complexity (the more complex the habitat the more likely sediment would be trapped behind logjams or other structures). For purposes of this analysis, it was assumed that in Still Creek fine sediment generated from the downhill bike park would be transported through the steep gradient below the project area and likely settle out in the first low-gradient section below Highway 26 (adjacent to Still Creek Campground), which is located approximately 1.2 miles below the project area. In the West Fork Salmon, this analysis assumes that sediment will likely be transported to the first low gradient area that exists above the Highway 26 and Highway 35 interchange (refer to map). Sediment generated in the Glade and Sand Canyon sub-watershed is not expected to extend beyond the ski area permit boundary. A detailed discussion of the sediment routing assumptions used in this BE can be found in the *Hydology Specialists Report* within this EA.

Wherever roads or, in this case, trails intersect stream networks, the stream drainage network increases. This analysis assumes the stream network will expand by 1.3% over the entire project area (*Hydrology Specialist Report in the EA*).

Figure 1. Map of the area that is likely to be directly or indirectly affected by the project as it relates to aquatic resources ("Action Area"). Cross-hatches delineate the Action Area in Still Creek and stripes delineate the Action Area in the West Fork Salmon River.



IV. Methodology and Analysis Points

This effects analysis utilizes research, relevant monitoring, field data, previous experience and professional judgment, as well as GIS information to provide the context, amount and duration of potential effects on aquatic resources from the proposed project. The physical scientist reports titled *Soils* and *Hydrology* provide the basis for the analysis for effects to aquatic habitat. One year was used for short-term effects and 10 years used for long-term effects.

The following is a summary of the primary sources of information and assumptions made.

- Data Sources
    - The downhill bike park trail locations were visited by all watershed specialists (fisheries, soils, and/or hydrology). Existing or proposed routes were reviewed in the field focusing on areas adjacent to streams or other water bodies and stream crossings.
    - GIS data runs were compiled using existing Forest data (NRIS and District data). Information summarized included road and trail density, number and location of stream crossings, miles of trail within 80 feet of streams, soil type, fish distribution, and miles of existing trail, new trail, and road to trail conversion.
    - Pertinent literature, including similar analyses from other national forests, was used to supplement field observations.
    - Stream habitat and fish passage survey information compiled over the last 20 years on the Forest.
    - Streamnet information was cross-checked against stream survey information to confirm species distribution (http://www.streamnet.org/).
    - Critical habitat information for Lower Columbia Steelhead was confirmed using USFWS's Critical Habitat Portal (http://criticalhabitat.fws.gov/).

- Effects Analysis
    - *Water Quality*: Much of the analysis in regards to water quality such as erosion and sedimentation potential is covered in detail in the *Soil and/or Hydrology Specialists' Reports.* This effects analysis on aquatic fauna and habitat relies extensively on the Soil Productivity and Water Quality effects analyses because the primary effects to aquatic fauna are related to fine sediment. For example, if hydrology and soils experts expect little to no sedimentation from the proposed project then that activity would have little to no effect on fish or aquatic macroinvertebrates from a sediment perspective. Other indicators incorporated in the effects analysis from a sediment perspective included the number of trail and road crossings over perennial and intermittent streams, and miles of road and trail within 80 feet of streams.
    - *Habitat Access*: Physical barrier information is based on a Forest Wide Culvert Asessment conducted in 2001 (Asbridge et al., 2001). Proposed stream crossings were evaluated to assess the effects on fish and other aquatic fauna connectivity
    - *Habitat Elements*: Physical parameters describing in-channel habitat quality are primarily found in Mt Hood National Forest Stream Surveys.

- *Flow/Hydrology:* Much of the analysis in regards to flow and hydrology conditions is covered in detail in the *Soil and/or Hydrology Specialists' Reports*.
- *Watershed Conditions*: same as habitat elements.
- *Species and Habitat*: Direct and indirect disturbance to aquatic fauna was assessed for each new trail focusing on stream crossings, particularly fords and an overall assessment of impacts to habitat and aquatic fauna is based on professional judgment and direct experience within the four sub-watersheds.

- Assumptions made in this analysis
  - The Bike Park construction and operation will occur during dry site conditions and will not operate when saturated soils exceed those described in the *Hydrology Specialist Report* and relevant PDC's.
  - Bike Park race events or other activities that involve "heavy" trail and spectator use would only occur during dry site conditions and would not operate when saturated soils exceed those described in the *Hydrology Specialist Report* and relevant PDC's.
  - Bike Park users would follow the rules of the trail park, coupled with effective trail park enforcement, to prevent unintended and unpredictable impacts.
  - Design features and best management practices described in the EA would be followed and be as effective as predicted.
  - Passive and active re-vegetation efforts would be effective.
  - The current proposal represents the total project and there are no current proposals to extend the bike park area.
  - Construction activities will follow PDC's described in this EA and detailed in the annual operating plan.
  - Operation/maintenance activities (including race days) will follow PDC's described in this EA and further detailed in the annual operating plan.

V. Status of Listed Fish Species/Critical Habitat and Presence of Region 6 Special Status Species

The Forest uses salmonids (salmon, trout and char) as management indicator species for aquatic habitats. Due to their value as game fish and their sensitivity to habitat changes and water quality degradation, salmonids are used to monitor trends within Forest streams and lakes. Although other fish species may be present (e.g., lamprey, sculpins and dace), their population status and trends are unknown. Since more information exists on salmonids, this group serves as a more optimal choice for monitoring aquatic environments.

The Sandy River supports several species of anadromous salmonids, including spring and fall Chinook, coho, and winter steelhead. These salmon and steelhead populations, which historically numbered in the tens of thousands (Taylor 1998), have experienced significant declines during the last century (SRBP, 2005). Within the last decade, the federal government and State of Oregon have listed all of these populations for protection under either the state or federal Endangered Species Act (ESA) (Table 4).

“The decline in abundance of Sandy River native salmon and steelhead over the last century can be attributed to multiple factors, such as hydroelectric and municipal water supply developments and operations, hatchery influences, and over-harvesting (SRBP, 2005).” The increase in human population and associated degradation of habitat are also major contributors to the decline (Murtaugh, 1997). Sandy River spring Chinook, fall Chinook, and coho stocks have been classified by several scientists studying west coast salmonids as at a **high risk** of extinction due to, among other factors, habitat loss and modification (Nehlsen et al., 1991, as found in SRBP, 2005). Restoration of abundant salmon and steelhead populations and the habitat that supports them is a high priority for federal, state, and local governments and agencies as those species play critical economic, cultural, and recreational roles (SRBP, 2005).

Salmonids listed under the ESA are grouped by distinct population segment (DPS) or evolutionary significant unit (ESU) - large geographic areas that are reproductively isolated from each other (i.e. different run and spawning timing). The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service have agreed the grouping name for Pacific salmon will be ESU and for steelhead DPS. More information may be found in Federal Register ESA listings.

Table 4. ESA listed, special status and other important aquatic species found in the Sandy River Basin. The date in the status column is the date of listing or most recent status review and subsequent Federal Register notice for ESA listed species and the date of the most recent sensitive species list and/or Northwest Forest Plan Record of Decision for special status species.

Species	DPS/ESU	Status	Fifth Field Watersheds Where Found
Bull trout (*Salvelinus confluentus*)	Columbia River DPS	Threatened 6/98	Lower Sandy River
Steelhead trout (*Oncorhynchus mykiss*)	Lower Columbia River DPS	Threatened 1/06	Middle Sandy River, Upper Sandy River, Zigzag River, Salmon River
Steelhead trout	Lower Columbia River DPS	Threatened 1/06	Middle Sandy River, Upper Sandy River, Zigzag River, Salmon River
Chinook salmon (*O. tshawytscha*)	Lower Columbia River ESU	Threatened 6/05	Middle Sandy River, Upper Sandy River, Zigzag River, Salmon River
Coho salmon (*O. kisutch*)	Lower Columbia River ESU	Threatened 6/05	Middle Sandy River, Upper Sandy River, Zigzag River, Salmon River
Smelt (Th. Pacificus)	Southern DPS	Threatened 3/10	Lower Sandy River
US Forest Service, Region 6 Regional Forester’s Special Status Species (R6 SS)			
Redband/ Inland Rainbow Trout (*O. mykiss*)	Not Applicable (N/A)	R6 SS – 1/08	Middle Sandy River, Bull Run River, Upper Sandy River, Zigzag River

Species	DPS/ESU	Status	Fifth Field Watersheds Where Found
Columbia duskysnail (*Colligyrus sp. nov. 1*)	N/A	R6 SS – 1/08, Rare & Uncommon – 1/01	Most 5th field watersheds within the Forest
Barren Juga *(Juga hemphilli hemphilli)*	N/A	R6 SS – 1/08	Unknown*
Purple-lipped Juga *(Juga hemphilli maupinensis)*	N/A	R6 SS – 1/08	Unknown*
Scott's Apatanian Caddisfly *(Allomyia scotti)*	N/A	R6 SS – 1/08	Salmon River and White River; may be present elsewhere but surveys not conducted*.
Basalt Juga (*Juga* (*Oreobasis*) n. sp. 2)	N/A	Rare & Uncommon – 1/01	Middle Columbia/Mill Creek**
Other Species Addressed in this Analysis			
Pacific lamprey (*Lampetra tridentata*)	N/A	Culturally and locally important	Middle Sandy River, Upper Sandy River, Zigzag River, Salmon River
Cutthroat Trout (*O. clarki*)	N/A	Forest Management Indicator Species	Middle Sandy River, Upper Sandy River, Zigzag River, Salmon River

*These three species were recently added to the Region 6 Regional Forester's Special Status Species list. Extensive surveys for these species have not been conducted. Recent surveys (Wissman, 2010) indicate they are present within the action area and are assumed to be requirements (see below) indicate they could be present at least in some areas and where habitat is suitable they are assumed to be present.

**The Basalt Juga was found for the first time during the 2008 field season in North Fork Mill Creek. It has not been found in any other streams surveyed in the Forest. Given that all other known locations are within the Columbia Gorge near The Dalles it is presumed this snail is localized in distribution and not present in most watersheds on the Forest.

Aquatic macroinvertebrates are important residents of streams, lakes, and ponds in the Forest. Presence, abundance, and status of invertebrate species that reside in area water bodies are not well understood. Most streams within the Forest have good water quality within their natural constraints (e.g., glacial streams are naturally turbid at times and carry a high sediment load) and habitat conditions are generally favorable. Macroinvertebrate populations appear robust and a range of species representing a wide variety of feeding groups (predators, grazers, leaf shredders) are usually present, but definitive studies to characterize diversity, richness, and biomass are lacking. Therefore, the following discussion, as well as the effects analysis, focus on the four snails and one caddisfly listed in Table 1.

Listed or sensitive species in Table 1 were federally listed or designated as special status species for a number of factors. Although there are different reasons for their current status, as indicated in Table 1, common issues throughout their range include impaired fish passage at dams and other obstructions, commercial and recreational fishing, habitat modification and/or loss, hatchery influences, and pollution. Hydropower, irrigation, domestic water supply, and flood control dams have disrupted migrations and eliminated historically available habitat. Commercial and recreational fishing have reduced numbers of wild fish in some populations. Habitat has been degraded, simplified, and fragmented due to a variety of land management activities both on and off the Forest. Hatchery programs have influenced populations, partly by masking declines in native fish abundance and dilution of native gene pools due to interbreeding. Reduced water quality from both point and non-point sources has had an impact at localized and even watershed scales in some areas. Impacts to aquatic macroinvertebrates have primarily been from habitat modification and water quality degradation.

Lower Columbia River Steelhead

Winter-run steelhead trout (*O. mykiss*) are indigenous to the Sandy River Basin, and historic returns may have once numbered 20,000 adults (ODFW, 2002, as found in SRBP, 2005). Today the average native run return is size is around 1,500 (Mobrand, 2004). In regards to habitat utilization, they occupy a greater range of habitat than any other salmon or trout species and their range in the Sandy River extends from the Timberline Ski Area Boundary to the Sandy River Delta. Steelhead are more of an opportunist anadromous species compared to salmon. As such, they are often more widespread and can utilize smaller streams more readily than many salmon species which is why steelhead are the only anadromous species known to reside in the action area.

Typically, winter-run steelhead enter the basin in significant numbers from February through May, with peak spawning occurring in mid-May. The majority of suitable spawning habitat is located upstream of the former Marmot Dam site in the Salmon River and its tributaries, and in Still Creek (PGE, 2002, SRBP, 2005). Spawning habitat is also present in Clear Creek, Clear Fork, Lost Creek, Horseshoe Creek, Zigzag River, Cheeney Creek, Henry Creek, Lady Creek, and Camp Creek (Bishop, pers. comm., 2010). Lower basin tributaries (below the Marmot Dam site) that may support additional winter steelhead production include the Bull Run River and Gordon, Trout, and Buck creeks. Natural production in the Bull Run is limited by a lack of fish passage into the upper reaches of the watershed. Since the Little Sandy Dam removal, adult and juvenile steelhead have been documented above the former dam site and appear to be recolonizing their range in the Little Sandy.

Steelhead are a “stream-type” salmonid with much of their lives spent in their natal stream. Following emergence, steelhead fry will often seek refuge from fast currents by inhabiting stream margins and pool backwater habitats (as found in SRBP, 2005). As they begin to mature and grow larger, juveniles will typically inhabit deeper water habitats of pools, riffles, and runs. Steelhead juveniles may rear 2 – 3 years in their natal stream before migrating as smolts to the ocean. As such, the quality of the habitat they inhabit during this time is critical to their survival. Smolt emigration takes place primarily from March through June during spring freshets (USFS, 2003).

LCR steelhead are present throughout most of the Still Creek sub-watershed and trout/steelhead have been documented in the lower gradient depositional reach below the project area at RM 13-14 (USFS 1980, 1984, 1995b, 1996, 2004). Their current distribution extends up to Still Creek

Campground which is within the Action Area (approximately 1.2 miles downstream of the proposed project). It is likely the Highway 26 road culvert currently acts as a fish barrier, although shortly thereafter, there are two potential waterfall barriers at RM 14.4 and RM 15.1 which may have acted as the historic upper limits for the anadromous form of rainbow trout, however, the resident form was historically present within the project area. Designated Critical Habitat for LCR steelhead extends upstream of Highway 26 to the bottom end of the proposed project (RM 15.2) and is therefore present within the Action Area.

In the Salmon River watershed there are several main-stem falls which prevent anadromous fish passage into the upper watershed. One of these occurs on the main-stem of the Salmon River at RM 14.3 (Final Falls) (USDA, 2001). On the West Fork, a natural waterfall barrier at RM 2.0 further prevents fish passage (SE Group 2004, Jones & Stokes 2004). Based on the presence of these barriers and the absence of sightings during 2003 and 2004 surveys the LCR steelhead is not expected to occur within the West Fork Salmon River.

LCR steelhead are also present in the Zigzag River Watershed up to where a natural barrier falls on the Little Zigzag River prevents fish passage into the upper watershed (~5 miles below the Action Area). As such, steelhead are not known to occur within either the Glade or Sand Canyon tributaries of the Zigzag River.

Still Creek, the Lower Salmon River and the Zigzag River are considered primary habitat for native winter steelhead in the basin. The NMFS Willamette/Lower Columbia Technical Recovery Team (NMFS WLC-TRT) classified the winter run as a "core" population in its recovery planning efforts. This designation means the population (1) historically was abundant and productive, and (2) it currently offers one of the most likely paths to recovery in the Lower Columbia Steelhead ESU (McElhany et al., 2003, as found in SRBP, 2005). The Lower Columbia Fish Recovery Board designates the priority for contribution of this stock to recovery goals in the ESU as "Primary." This classification means the Sandy River winter steelhead stock would be targeted for recovery in the Cascade "stratum" to achieve viable population levels with greater than 95 percent probability of persistence (negligible extinction risk) within 100 years (LCFRB, 2004; McElhany et al., 2003; McElhany et al., 2004, as found in SRBP, 2005).

Lower Columbia River Chinook Salmon

Lower Columbia River Chinook salmon are found throughout the Sandy River including several of its 5th field watersheds. This ESU is made up of both spring and fall run components. Both runs have been influenced by historic hatchery operations associated with the Willamette ESU but there is evidence that naturally reproducing spring Chinook in the upper Sandy River have retained at least "a low level of genetic differentiation from upper Willamette River stock propagated in the Clackamas Hatchery (Bentzen, 1998, as found in SRBP 2005)."

The fall Chinook population is comprised of two stocks: an earlier returning non-native "tule" stock and a later returning wild stock known as the "late bright" stock (Murtaugh et al. 1997, as found in SRBP 2007). The late bright fall Chinook population is one of only two remaining wild populations in the Lower Columbia Evolutionarily Significant Unit (ESU) (SRBP 2007).

Spring Chinook: Spring run Chinook salmon are indigenous to the Sandy River Basin, and historic returns may have once numbered 15,000 adults (City of Portland 2004). Today, the average native run size is around 2,000 (PGE, 2002). The majority of spring Chinook present in the basin today are of hatchery origin. Sandy River spring Chinook enter the Sandy River delta as early as February, but more commonly in April and May (SRBP 2005). Peak migration into the upper Basin (above the former Marmot Dam site) occurs in June, with a smaller peak occurring in September (SRBP 2005). Spawning occurs primarily in August through October, with peak spawning in September. Fry emergence typically occurs in middle to late winter, followed by a downstream migration to larger mainstem areas for rearing (SRBP 2005). Juvenile spring Chinook rearing distribution is not well documented in the lower Sandy River Basin (ODFW 1997, as found in SRBP 2005)." The majority of smolts migrate to the ocean in the spring of their second year (at age 1+ as stream type fish); however, a significant portion may out-migrate in the fall as sub-yearlings (SRBP 2005).

ODFW and USFS have conducted spring Chinook spawning surveys in the upper Sandy River basin since the early 1990s (Grimes et al. 1996, Lindsay et al. 1997, Schroeder et al. 1998, 1999, 2002, 2003, Schroeder and Kenaston 2004, 2005, 2006-2008, Arendt 2003, Hanna 2009, 2010), excluding run years 2000-01, and designed the surveys to document the geographic distribution, timing, and abundance of naturally spawning spring Chinook (SRBP 2005, Hanna 2009). Principal spawning areas are focused in the Salmon River with the highest redd densities occurring in the four mile reach below Final Falls (RM 10-14) (~ 20 miles below the Action Area) with the next highest densities occurring in Still Creek (from RM 0 to RM 3). The balance are unevenly distributed throughout the Zigzag River, mainstem Sandy River, Camp Creek, and Lost Creek (Schroeder et al 2008, Hanna 2009). Thus, the Salmon River and Still Creek provide the majority of critical spawning and juvenile rearing habitat for LCR spring Chinook, and consequently play a critical role in the recovery of that ESU (SRBP 2005, City of Portland 2004).

As previously described, there are several main-stem falls in the Salmon River which prevent anadromous fish passage into the upper watershed. Based on the presence of these barriers and the absence of sightings during surveys, LCR spring Chinook salmon are not expected to occur within the Action Area that includes the West Fork Salmon River (USDA 2004, Jones & Stokes 2004)

While there are no anadromous fish barriers in Still Creek, spring Chinook have only been observed in the lower 7 miles of the stream (~ 8 miles below the Action Area) (**Error! Reference source not found.**). Above RM 7.0, Still Creek becomes narrow and more entrenched with steep gradients and a series of pool drops which probably act as natural deterrents to spring Chinook migration and juvenile rearing. Potential habitat exists within the Action Area as well as downstream. However, surveys conducted in Still Creek within the study area and downstream did not find any presence of Chinook salmon (Jones & Stokes 2004, USDA 2004). Based on the lack of historic and current distribution of spring Chinook in upper Still

Creek, LCR Chinook salmon are not expected to occur within the Action Area that includes Still Creek.

LCR spring Chinook are also present in the Zigzag River Watershed up to Little Zigzag Falls which prevents anadromous fish passage into the upper watershed (~5 miles below the Action Area). As such, LCR spring Chinook are not known to occur within either the Glade or Sand Canyon tributaries of the Zigzag River and therefore are not present within the Action Area that includes those tributaries.

Fall Chinook: The fall Chinook population is comprised of two stocks: "an earlier returning non-native "tule" stock and a later returning wild stock known as the "late bright" stock (Murtaugh et al. 1997, as found in SRBP 2005)." The late bright fall Chinook population is one of only two remaining wild populations in the Lower Columbia ESU.

While historic population estimates of the native "late bright" stock (LRW) are not available, most agree that the stock is depressed (SRBP 2005). "The minimum average annual run estimate for returns to the Sandy River in 1984-1994 was 1,503 (ODFW 2002). Another estimate for 1984 to 2001, as determined by Cooney et al. (2003), was only 504 individuals. Spawning escapement in 2000 reached a record low of only 88 individuals (ODFW 2003a). More recently, Mobrand Biometrics (City of Portland, 2004) summarized Sandy LRW fall Chinook stocks estimates for 1990 to 2000 from several sources. "The winter subcomponent appears to be severely depressed based on declining spawner counts at index sites in Gordon and Trout creeks (ODFW 1997). In most years, only a handful of these fish are observed or caught by anglers in the Sandy River (as found in SRBP 2005)."

"Adult fall Chinook are present in the Sandy River Basin from August through February. Peak spawning occurs from October through December, and spawning distribution appears to be controlled by flow conditions in the basin (ODFW 1997, as found in SRBP 2005)." "Size, age, and run timing of adult fall Chinook vary by stock. The first, the early maturing tule, is also referred to as the Lower River Hatchery (LRH) stock. The second, the late maturing Lower River Wild (LRW) stock, shows run timing and genetic characteristics similar to the late wild stock in the Lewis River in Washington (Cooney et al., 2003, as found in SRBP 2005)." "The early maturing tule fall Chinook are believed to be a mix of: (1) naturally produced fish that originated from hatchery releases made in the Sandy River prior to 1977; (2) the progeny of successful spawning stray hatchery fall Chinook; and to a lesser extent (3) stray hatchery fall Chinook adults originating from hatcheries in both Washington and Oregon (ODFW 1997, as found in SRBP 2005)."

"Tule fall Chinook begin entering the Sandy River in August, and spawning occurs from late September through mid-October. The late maturing LRW stock is indigenous and typically enters the Sandy River in October, with spawning occurring late October through December. Though most spawning of fall Chinook now occurs in the main-stem and tributaries of the lower basin near Oxbow Park, historic spawning distribution occurred both in the Bull Run River and above Marmot Dam in the lower Salmon River and Sixes Creek (a Salmon River tributary stream) (ODFW 2002, as found in SRBP 2005)."

"The NMFS Fisheries Willamette and Lower Columbia Technical Recovery Team (WLC-TRT 2003a) has classified the late run Sandy River brights (LRW stock) as both a "core" and a "genetic integrity" population in their recovery planning efforts (as found in SRBP 2005)." "These designations mean (1) the population historically was abundant and productive, (2) the current population resembles the historic life histories and genetic types in the Sandy River Basin, and (3) it currently offers one of the most likely paths to recovery in the Lower Columbia Chinook ESU (McElhany et al. 2003, as found in SRBP 2005)."

The Lower Columbia Fish Recovery Board (LCFRB) also looked at this stock and designated it as "Primary" in regard to its priority for contribution to recovery goals in the ESU. This classification means the Sandy River late fall Chinook stock would be targeted for recovery to achieve viable population levels with a greater than 95 percent probability of persistence (i.e., negligible extinction risk) within 100 years (LCFRB 2004; McElhany et al. 2003; McElhany et al. 2004). The early fall run tule stock (LRH) did not receive a similar designation as either a "core" or "genetic integrity" population. The Lower Columbia Fish Recovery Board designated the priority for contribution of this stock to recovery goals as "stabilizing," which focuses on maintaining the current population structure of this stock (LCFRB 2004).

ODFW has conducted spawning surveys for fall Chinook in the Sandy River since 1952 (Fulop 2003). Since 1984, ODFW has conducted annual surveys of tule and late-bright wild stocks on a 10-mile index reach on the main-stem Sandy River between the confluence of Gordon Creek and Lewis and Clark State Park. ODFW has also surveyed the late bright fall Chinook stock along two 0.2-mile long index reaches on Trout and Gordon creeks irregularly from 1952 to 1997, and annually in run years 1989-2009.

Principal spawning areas are similar for both tule and late-bright Chinook and are generally located near Oxbow Park. "But due to their run timing, late-brights usually have more available tributary and side channel habitat. Gordon and Trout creeks are important lower basin tributaries used by fall Chinook when flows increase (ODFW, 2002, as found in SRBP 2005)." Based on both historic and current distribution of fall Chinook well below Mt. Hood National Forest boundaries, the LCR Chinook salmon does not occur within the Action Area.

Lower Columbia River Coho Salmon

The Lower Columbia River/Southwest Washington Coast ESU is sustained primarily by hatchery production. "The only two known self-sustaining populations are in the Sandy and Clackamas rivers in Oregon (Iwamoto et al., 2003, as found in SRBP 2005)." "Weitkamp et al. (1995) hypothesized that the only known remaining natural population of coho in the Lower Columbia River/ Southwest Washington Coast ESU is the Clackamas late-run stock. However, since 1999, only natural origin coho have been allowed to pass over Marmot Dam and a naturally spawning population appears to exist (as found in SRBP 2005)." "Currently, the Sandy River Basin supports both an early hatchery run of coho, with peak presence occurring in

September and October, and a late wild run generally peaking from September through November (ODFW, 1997, as found in SRBP 2005)."

"Historically, the late wild Sandy coho were thought to have been present in the basin primarily from October through February, with peak spawning occurring in November through February (ODFW 2002, as found in SRBP 2005)." "ODFW (1997) lists two possible factors for the possible shift in run timing of wild coho in the Sandy River Basin: (1) inconsistent flow regimes at Marmot Dam throughout the late summer and early fall from the early 1900s through the early 1970s; and (2) possible genetic introgression with early returning hatchery fish escaping to spawning grounds upstream of Marmot Dam (as found in SRBP 2005)." Peak spawning activity in the Sandy River Basin occurs in late October through November, with very few fish observed on the spawning grounds after December (ODFW 1997).

Fry emergence primarily occurs from February through April and peaks in March (PGE, 2002). Following emergence, juvenile coho typically seek stream margin habitats and backwater pools for initial rearing (ODFW 1997). As they continue to grow in size, juveniles seek low velocity pool and off-channel habitats for summer and winter rearing. Juvenile coho rely heavily on slack water habitats with complex large woody debris for protection from winter freshets. Juvenile coho in the Sandy River typically emigrate to the ocean as 1+ smolts at about 12 to 14 months of age (ODFW 1997). The timing of juvenile coho outmigration is usually late March through June, peaking in April and May (ODFW 1990). Coho salmon in the Lower Columbia River/Southwest Washington Coast ESU typically rear in the ocean for two summers and return as 3-year-olds, the primary exception are "jacks," which are sexually mature males that return to freshwater after spending one summer in the ocean (Iwamoto et al. 2003).

"Historically, Sandy River Basin coho salmon probably spawned and reared in the majority of the basin and its tributaries accessible to anadromy. Much like today, the major clear water tributaries above Marmot Dam (Salmon River, Boulder Creek, Clear Creek, Camp Creek, Lost Creek, Still Creek, and the Clear Fork of the Sandy River) were probably important coho producers, as were tributaries downstream of Marmot Dam (as found in SRBP 2005)."

Though natural reproduction continues to occur in the lower sub-basin below the former Marmot Dam site, primary spawning and rearing areas are currently located in the clear-water tributaries above Marmot Dam, with principal spawning and rearing habitat occurring in the Salmon River, Still Creek, and Clear Creek (USFS 2005, 2008, 2009).

Surveys conducted within Still Creek in 1978, 1984, and 1992 found presence of coho salmon up to RM 12.15 which is just below the Action Area (USFS 1992, USFS 1996). However, those fish were assumed to be planted hatchery juveniles and no coho have been observed that high in the basin since the late 1990's. More recent surveys have documented coho presence up to approximately RM 9.0 where steep gradients, and confined channels appear to naturally limit preferred rearing habitat and may also inhibit upstream migration (Mt. Hood National Forest, unpublished data 2004, 2006). However, the first true physical barrier occurs at the Highway 26 road crossing (RM 14) and then shortly thereafter two natural fish barriers occur at RM 14.4 and 15.1. Surveys conducted within the Action Area did not find any presence of LCR coho salmon in Still Creek (SE Group 2004, Jones & Stokes 2004). Suitable habitat exists within the Action Area and downstream in Still Creek.

LCR coho are also present in the Zigzag River Watershed up to Little Zigzag Falls which prevents anadromous fish passage into the upper watershed (~5 miles below the Action Area). As such, LCR coho are not known to occur within either the Glade or Sand Canyon tributaries of the Zigzag River and therefore are not present within the Action Area.

" Lower Columbia Fish Recovery Board designated the priority for contribution of this stock to meet recovery objectives in the ESU as "Primary." This classification means the Sandy River coho stock would be targeted to achieve viable population levels with greater than 95 percent probability of persistence negligible extinction risk within 100 years (as found in LCFRB, 2004)."

Columbia River Bull Trout

Bull trout are believed to be a glacial relict whose distribution has expanded and contracted with natural climate changes. Bull trout often occur upstream from barriers in many drainages, an indication of early colonization (Meehan et al. 1991). Bull trout live in a variety of habitats including small streams, large rivers, and lakes or reservoirs. In some drainages, the fish spend their lives in cold headwater streams. Basic rearing habitat requirements for juvenile bull trout include cold summer water temperatures (<15°C (59°F)) with sufficient surface and shallow groundwater flows. High sediment levels and embeddedness can result in decreased rearing densities. Adult bull trout would reside in the main-stem and larger tributaries until their spawning period during mid-August through September, at which time they would migrate upstream to smaller tributaries to spawn.

Bull trout spawn in the fall, and require clean gravel and very cold water temperatures for spawning and egg incubation. Bull trout fry utilize side channels, stream margins, and other low velocity areas. Adults require large pools with abundant cover in rivers. Presumably, the various forms of bull trout interbreed, which helps to maintain viable populations throughout their range.

The only known population of bull trout in the Forest is found in the Hood River watershed. Historic presence of bull trout in the Sandy River Basin is uncertain, although there have been at least three occasions since 1999 where adult bull trout were documented in the lower Sandy River. The first was caught (and photo-documented) by an angler in the Lower Sandy in November of 1999. In April 2000, ODFW fish survey crews identified an 18-inch bull trout caught in the trap at Marmot Dam. And finally, in January 2002 a bull trout was caught and released by an angler in the lower Sandy River below Oxbow Park (Muck, J. personal communication).

Potential suitable habitat exists within the Action Area in both the West Fork Salmon River and Still Creek sub-watersheds. However, no bull trout have ever been observed in presence/absence surveys conducted in those sub-watersheds since the early 1990s (USDA 1992; USDA 1996; Jeff Uebal, David Saiget, personal communication). Surveys conducted within the Project Area in

Still Creek and the West Fork Salmon River did not find any presence of bull trout (SE Group 2004, Jones & Stokes 2004). The Zigzag Watershed Analysis does not document the existence of bull trout in the 6th field Still Creek sub-watershed (USDA 1995b). The Salmon River Watershed Analysis mentions historic reports of bull trout in the Salmon River drainage as well as suitable habitat and isolation, but its presence within the watershed has not been confirmed (USDA 1995a). Based on the lack of historical evidence of bull trout presence in the Upper Sandy Basin and lack of sightings by survey crews, bull trout are not expected to be present within the Action Area.

Pacific Eulachon

Distribution

"Eulachon are endemic to the eastern Pacific Ocean, ranging from northern California to southwest Alaska and into the southeastern Bering Sea. In the continental United States, most eulachon originate in the Columbia River Basin. Other areas in the United States where eulachon have been documented include the Sacramento River, Russian River, Humboldt Bay and several nearby smaller coastal rivers (e.g., Mad River), and the Klamath River in California; the Rogue River and Umpqua Rivers in Oregon; and infrequently in coastal rivers and tributaries to Puget Sound, Washington (NMFS, 2011)."http://www.nmfs.noaa.gov/pr/species/fish/pacificeulachon.htm.

"Eulachon abundance exhibits considerable year-to-year variability. However, nearly all spawning runs from California to southeastern Alaska have declined in the past 20 years, especially since the mid 1990s. From 1938 to 1992, the median commercial catch of eulachon in the Columbia River was approximately 2 million pounds (900,000 kg) but from 1993 to 2006, the median catch had declined to approximately 43,000 pounds (19,500 kg), representing a nearly 98 percent reduction in catch from the prior period. Eulachon returns in the Fraser River and other British Columbia rivers similarly suffered severe declines in the mid-1990s and, despite increased returns during 2001 to 2003, presently remain at very low levels. The populations in the Klamath River, Mad River, Redwood Creek, and Sacramento River are likely "extirpated" or nearly so. (NMFS 2011)."

"Habitat loss and degradation threaten eulachon, particularly in the Columbia River basin. Hydroelectric dams block access to historical eulachon spawning grounds and affect the quality of spawning substrates through flow management, altered delivery of coarse sediments, and siltation. The release of fine sediments from behind a U.S. Army Corps of Engineers sediment retention structure on the Toutle River has been negatively correlated with Cowlitz River eulachon returns 3 to 4 years later and is thus implicated in harming eulachon in this river system, though the exact cause of the effect is undetermined. Dredging activities in the Cowlitz and Columbia rivers during spawning runs may entrain and kill fish or otherwise result in decreased spawning success (NMFS 2011)."

"Eulachon have been shown to carry high levels of chemical pollutants, and although it has not been demonstrated that high contaminant loads in eulachon result in increased mortality or reduced reproductive success, such effects have been shown in other fish species. Eulachon harvest has been curtailed significantly in response to population declines. However, existing regulatory mechanisms may be inadequate to recover eulachon stocks (NMFS 2011)."

There is no known suitable habitat for eulachon in the Action Area nor are they known to occur anywhere in the basin except in the lower Sandy River therefore they are not found in the Action Area.

US Forest Service, Region 6 Regional Forester's Special Status Sensitive Species

As part of the National Environmental Policy Act process the Forest Service reviews programs and activities to determine their potential effect on sensitive species. Species on the Mt. Hood National Forest included in the January 2008 Regional Forester's Special Status Species List are described below.

Redband Trout: Redband/inland rainbow trout (redband trout) occur in the White River and Fifteenmile Watersheds and are suspected in the Upper Sandy River Watershed but definitive genetic analysis has not been conducted. For this analysis, their presence is assumed within the fifth-field and local watershed scale. Spawning occurs in the spring. Fry emergence from the gravel normally occurs by the middle of July, but depends on water temperature and exact time of spawning. Redband trout prefer water temperatures from 50 to 57 ^{o}F, but have been found actively feeding at temperatures up to 77 ^{o}F in high desert streams of Oregon and have survived in waters up to 82 ^{o}F. Suitable habitat for Redband trout is present within the Project Area and the Action Area.

Scott's Apatanian Caddisfly: (***Allomyia scotti)*** may be a truly rare species (Wissman,2010). So far it has only been collected from the West Fork Salmon River drainage and the White River (Iron Creek) drainage on Mount Hood at elevations ranging from 3800 to about 5000'. The species is present in both the Project Area and Action Area which includes the majority of its known habitat range in Oregon. Habitat for this species occurs in both Still Creek and West Fork Salmon although in the most recent surveys, this caddisfly was only observed in the West Fork Salmon. In the locations it was found, the water was clear and cold, originating from springs supplied by permanent snowfields around the summit of Mt. Hood. Rocks in the stream bear dense growths of a wiry moss. It does not appear there is suitable habitat for this caddisfly in Glade or Sand Canyon.

The larva with its' horned head is so distinctive that it can't be missed (Wissman, 2010). Female Limnephilidae deposit their egg masses above the water in a gelatinous material on various objects (Usinger 1968). Newly hatched larvae drop or migrate into the water nearby. Larvae and pupae inhabit small, cold mountain streams, often at high elevations. The larvae occur at the base of moss fronds and pupal cases are attached to moss (Wigginis 1973). Larvae are shredders, chewing plant material, probably mosses (Merritt and Cummins 1984). Two years are required to complete the life cycle. Prepupae occur as early as June and are still present in September, but have changed to pupae by the following April. Based on gut content analysis of larvae in this genus, the diet is apparently consistent with the interpretation that *Allomyia* larvae scrape the upper surface of rocks and plants.

This species of caddisfly has been documented within the Action Area both historically and during surveys conduction in the summer of 2010 and the results of that survey are attached in Appendix B (Wissman, 2010). "The results of this survey, i.e. presence of the species only in the West Fork Salmon River tributaries, and not in the Still Creek headwater tributaries, suggest that the habitat requirements for this species is very narrow. Perhaps it formerly occurred in the Still Creek tributaries. It seems evident that these Still Creek tributaries have already experienced a much greater level of human impact than seen in the West Fork Salmon River tributaries (Wissman, 2010)."

"Unknown is how widely distributed Scott's apatanian caddisfly is in the Mount Hood area. Collectors have always targeted the easily accessible stream crossings afforded by Highways 26 and 35, the Old and New Timberline Lodge Roads, and access at campgrounds like the Still Creek Campground. Other than these convenient stream crossings, little, if any, collecting or surveys have occurred to my knowledge in the 4000-5500' elevation band around Mount Hood (Wissman, 2010)."

Columbia Duskysnail: This species of aquatic mollusk has been found across the Forest during surveys conducted over the past several years (Mt. Hood National Forest, unpublished data). Habitat requirements for this species are fairly specific: cold, well oxygenated springs, seeps, and small streams, preferring areas without aquatic macrophytes (Furnish and Monthey 1998). Individuals have not been found in larger streams and rivers, or glacial streams.

Surveys for the Columbia duskysnail have been conducted at sites across the Forest for a wide range of projects. This aquatic mollusk species has been found in many locations across the Forest and it is therefore presumed to be present in seeps, springs, and smaller streams within the Action Area.

Purple-lipped Juga: The Purple-lipped Juga snail is endemic to Oregon. It is found in large streams at low elevations. These snails prefer riffle habitat with stable gravel substrates, in cold well oxygenated water. It is more tolerant of silt and slack water than other Juga subspecies. The known range of the species is the Lower Deschutes River drainage, below Pelton Dam, and the Warm Springs River in Wasco and Sherman counties, Oregon. Sites where the species are known to occur are located on the Warm Springs Reservation and Prineville BLM in the Deschutes Wild and Scenic River Area. There are few locations on the Forest that match the above preferred habitat description. These locations are in larger rivers likely near the Forest boundary. Streams within or near the Action Area do not meet the above habitat description and thus it is assumed that this snail is not present in these locations although surveys have not been conducted.

Barren Juga: This species of aquatic mollusk is found in freshwater habitats in small to medium sized highly oxygenated cold water streams at low elevations. The species prefers streams that have moderate velocity level bottoms with stable gravel substrates. The known range of this species is the Columbia River Gorge in Oregon and Washington. They have been found in the Mt. Hood National Forest and the Columbia River Gorge National Scenic Area. They are also suspected to occur in the Gifford Pinchot National Forest. Since these species prefers low elevation habitat, it is assumed that the species in not present within or near the Action Area although surveys have not been conducted.

Basalt Juga: The Basalt Juga is not a sensitive species but it is on the Region 6 Regional Forester's Special Status Species list. It is a rare and uncommon species as outlined in the Northwest Forest Plan. Their habitat requirements appear similar to the Columbia duskysnail's (Furnish and Monthey 1998). These small snails have only been found in one survey on the Forest in North Fork Mill Creek. They have not been found in any other stream or water body surveyed since Forest personnel began surveying in 1998. They are not believed to reside in watersheds other than those that drain into the Columbia River near The Dalles, Oregon. Since these species appears to be present only on the east side of the mountain, it is assumed that the species in not present within or near the Action Area although surveys have not been conducted.

Other Important Management Indicator Aquatic Species (MIS)

Coastal cutthroat trout: Cutthroat trout residing in waters of the Forest are composed of two native stocks: an anadromous (sea run) form and resident stock. These fish are a Management Indicator Species on the Forest. Coastal cutthroat trout tend to spawn in small (first and second order) tributaries. They spawn from December to May; young emerge from gravel during June and July. Young fry move into channel margin and backwater habitats during the first several weeks. During the winter, juvenile cutthroat trout use low velocity pools and side channels with complex habitat created by large wood or other features. Coastal sea run cutthroat juveniles rear in freshwater for two to three years.

Resident populations of cutthroat are widespread throughout much of the Forest. Historically, sea run cutthroat trout occurred throughout the Sandy River, but anadromous cutthroat populations appear to have greatly declined throughout the watershed. Consistent indicators in abundance trends for most populations of either resident or sea run cutthroat trout do not exist. Resident cutthroat trout have been documented within the Action Area in both Still Creek and the West Fork Salmon River and due to the lack of any physical barriers, sea-run cutthroat are assumed to be present within the Action Area in Still Creek.

Critical Habitat

NMFS designated critical habitat for LCR Chinook and steelhead on September 2, 2005 (70 FR 52630) and critical habitat for LCR coho and southern eulachon is pending. Essential features of designated critical habitat include aspects of substrate, water quality, water quantity, water temperature, food, riparian vegetation, access, water velocity, space, and safe passage that are associated with viability for the ESUs. Detailed maps of specific critical habitat boundaries for each ESU are provided in the Federal Register notice. Critical habitat maps and information are available at the following website (http://map.streamnet.org/website/bluecriticalhabitat/viewer.htm) (LCFRP, 2010). Much of the discussion concerning critical habitat, including effects analyses, will center on the primary constituent elements (PCE) described below for each species.

Steelhead trout and Chinook salmon Critical Habitat

Critical habitat for steelhead is present in both the Project Area and Action Area, as well as throughout the Salmon and Zigzag 5th field watersheds (**Error! Reference source not found.**). Critical habitat for LCR spring Chinook is present within the Salmon and Zigzag 5th field watersheds but below the Action Area.

Primary constituent elements for steelhead and Chinook are sites and habitat components that support one or more life stages. The first three, listed below, refer to freshwater habitat components, whereas the last three relate to estuarine or marine habitat components. Nothing in the proposed project would have an affect on estuarine or marine habitat components, thus they are not discussed.

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.
2. Freshwater rearing sites with:
    a. Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;
    b. Water quality and forage supporting juvenile development; and
    c. Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
3. Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions, and natural cover, such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

Bull Trout Critical Habitat

There is no designated critical habitat for bull trout in the Sandy River Watershed.

ESA listed fish and Regional Forester's Special Status Species presence/absence, as well as designated critical habitat and essential fish habitat within the Action Area is described in Table 5 below. Species and or suitable habitat found within the Action Area are designated with a "Y" in the table. The table is intended to give the reader a basic idea of where various aquatic fauna are located in relation to the proposed project.

Table 5. Presence of ESA listed fish, Regional Forester's Special Status Species, designated critical habitat, and essential fish habitat within the action area of the downhill bike park on the Mt. Hood National Forest.

Species/Habitat	**Glade Creek (Zigzag)**	**Sand Canyon (Zigzag)**	**Still Creek**	**W. Fork Salmon**
Bull Trout	N[1]	N[1]	N[1]	N[1]
Steelhead Trout (LCR)	N	N	**Y**	N
Chinook Salmon (LCR)	N	N	N	N
Coho Salmon (LCR)	N	N	N	N
Redband/ Inland Rainbow Trout	N	N	Unk	**Y**
Columbia duskysnail	**Y**	**Y**	**Y**	**Y**
Barren Juga	Unk	Unk	Unk	Unk
Purple-lipped Juga	Unk2	Unk2	Unk2	Unk2
Scott's Apatanian Caddisfly	Unk2	Unk2	**Y**	**Y**
Basalt Juga (Rare & Uncommon)	N	N	N	**Y**
Coastal Cutthroat Trout (MIS)	N	N	**Y**	**Y**
Bull Trout Critical Habitat	N	N	N	N
Steelhead Critical Habitat	N	N	**Y**	N
Chinook Critical Habitat	N	N	N	N
Coho Critical Habitat	--	--	--	--
Essential Fish Habitat	N	N	N	N

N – species/habitat not present
Y – species/habitat known to be present
Unk – species presence unknown but suspected either due to nearby surveys or presence of suitable habitat.
Unk2 – species presence unknown but not suspected due to habitat preferences (large, low elevation streams).
MIS – Mt. Hood National Forest Management Indicator Species

VI. Description of Indicator Baseline Condition and Effects of the Proposed Action

This section provides a description of the action area environmental baseline. Condition classification used the default biological requirement values as provided by the AP table entitled: *FWS/NOAA Fisheries Table Of Population And Habitat Indicators For Use In The Northwest Forest Plan Area*. The potential effects (negative, positive, or neutral) that the implementation of each project element may have on each indicator or group of indicators was assessed.

A. General Information

This project encompasses 1,732 acres of the Zigzag Ranger District (Figure 1). The proposed action would primarily occur in Still Creek, the West Fork Salmon River, and the two tributaries to the Zigzag River known as Sand Canyon and Glade (6^{th} field watersheds). These sub-watersheds are tributaries to Salmon and Zigzag 5^{th} field watersheds. Elevations within the action area range from approximately 6,000 feet at the upper reaches of the project and 4,800 feet at the lower reaches of the project. As previously described, LCR Steelhead and critical habitat are present within the action area in Still Creek. No listed species or critical habitat is present in the action area in the West Fork Salmon or Glade and Sand Canyon.

B. Land Ownership/Allocation

The proposed project is located entirely on National Forest Lands within the Zigzag Ranger District. Specific land allocations are found in the Forest Plan, as amended, which contains Forest-Wide Standards and Guidelines as well as Management Area Standards.

C. Summary of Environmental Baseline

Action Area Current Environmental Baseline

Aquatic habitat conditions within the Sandy River Basin vary depending on the location, past land management activities, and natural events such as floods, fire, and debris torrents. In general, streams that have experienced little to no land management are in good condition even though Forest Plan standards (i.e., pools per mile, pieces of wood per mile, etc.) are not always met. Some of these streams have been impacted by natural events and, indeed, were formed or maintained by such events. Glacial streams such as the headwaters of the Sandy and Zigzag Rivers are examples of streams exhibiting relatively degraded, but natural, conditions due to natural events (in this case repeated glacial debris flows).

Fish habitat conditions within the action area where land management has occurred range from poor to good, depending on the type and scale of disturbance, proximity to streams, timing and duration of land management activities, and sensitivity of channel type to perturbation. The four sub-watersheds within the action area of have been significantly altered by ski area development, road construction and maintenance, other recreational uses, and past logging practices. Separately and cumulatively, these activities have resulted in loss of function of natural processes such as large wood recruitment and movement, connectivity of habitat, reduction of stream shading, alteration in riparian vegetation and function, and increased sedimentation.

Both the West Fork and Salmon River are identified by Oregon Department of Environmental Quality as core cold water habitat and they currently meet those standards. However, both streams have significant problems with sediment and turbidity related to highway sanding, ski area development, and road surface erosion in the Action Area and downstream. The development associated with the Ski Area and Timberline Lodge in the headwaters of both Still Creek and the West Fork Salmon has resulted in a loss of riparian buffers and reduction in LWD. Pool depth and frequency are considered impaired in much of the project area and sediment levels are significantly higher than natural background levels (Table 6).

Table 6. Provides a summary of the current habitat and watershed conditions at the Action Area scale, utilizing the definitions provided in the AP table entitled: *FWS/NOAA Fisheries Table of Population and Habitat Indicators for Use in the Northwest Forest Plan Area.*

Indicator	Environmental Baseline Condition Category											
	Glade(Zigzag)			Sand Canyon (Zigzag)			Still Creek			W. Fork Salmon		
	PF	FAR	NPF	PF	FAR	NPF	PF	FAR	NPF	PF	FAR	NPF
Temperature	X			X			X			X		
Suspended Sediment/Turbidity		X[1]			X[1]				X			X
Chemicals/Nutrients	X[1]			X[1]				X		X		
Physical Barriers	X			X					X			X
Substrate Embeddedness			X			X			X		X	
Large Woody Material			X			X			X	X		
Pool Frequency and Quality			X			X			X	X		
Large Pools			X			X			X	X		
Off-channel Habitat			X[2]			X[2]			X	X		
Refugia			X[2]			X[2]			X	X		
Width:Depth Ratio			X[2]			X[2]		X[2]			X[2]	
Streambank Condition	X[2]			X[2]			X[2]			X[2]		
Floodplain Connectivity			X[2]			X[2]		X[2]			X[2]	
Change in Peak/Base Flows	X			X			X			X		
Drainage Network Increase		X			X			X			X	
Road Density & Location	X			X					X			X
Disturbance History	X			X				X			X	
Riparian Reserves		X			X			X			X	
Disturbance Regime	X			X				X			X	

1 = No direct data, No data
2 = limited data

Temperature

Environmental Baseline - Still Creek and West Fork Salmon River are identified by the Oregon Department of Environmental Quality (ODEQ) as core cold water habitat for salmonids with a water temperature standard of 16.0 degrees Celsius over a seven-day-average-daily-maximum (7DMAX). Monitoring of stream temperature has occurred within the Action Area and is well below the 7DMAX standard. Stream temperature surveys within the Zigzag River also meet DEQ water temperature standards for spawning and rearing. The lower-most section of the Salmon River near the confluence with the Sandy (RM 0 – 0.9) is 303d listed for temperature impairment (ODEQ, 1998). Please refer to the *Water Temperature* section of the *Hydrology* report in this EA for a complete discussion of observed temperatures within the Action Area. Baseline determination for all four sub-watersheds is: <u>Properly Functioning.</u>

Potential Effects of the Action – Bike Park construction/maintenance and watershed habitat restoration have the potential to remove trees that provide shade to perennial streams thus potentially affecting stream temperature in the short and long term. To limit adverse impacts to large diameter trees and their roots, trail construction and maintenance PDC's have been identified which ensure that no trees over 6"dbh are removed within riparian reserves, and measures to protect tree roots and understory vegetation are identified (PDC's; Veg-1,2,8,9,11, Soil-3, WS-15). Implementation of PDC's during construction, maintenance, and operation ensure there will be no short or long term change in water temperature.

Element 1: Trail and Skills Park Construction

Proximity - The potential effect to temperature is related primarily to the loss of riparian habitat in the Action Area. Proximity to ESA critical habitat ranges from 0 miles (< 50 feet) at the bottom of the project area to ~1.2miles at the top of the project area. All trails are within 0-2 miles of LCR winter steelhead and their designated critical habitat.

Probability - Trials built within riparian reserves will follow the PDC's described above and therefore should not result in the day-lighting of any streams or the reduction in riparian understory canopy which could alter temperature. The effect that this project will have on stream shade is negligible and should not change from current conditions.

Element Summary - The PDC's were developed to protect streamside trees and ensure that sufficient shade will remain for all streams in the Action Area. There will be a **neutral** effect on temperature related to trail and skills park construction**.**

Element 2: Trail and Skills Park Maintenance

Proximity- Proximity to LCR winter steelhead and critical habitat is the same as described in Element 1 above.

Probability: Trials built within riparian reserves will follow the PDC's described above and therefore should not result in the day-lighting of any streams or the reduction in riparian understory canopy which could alter temperature. The effect that this project will have on stream shade is negligible and should not change from current conditions.

Element Summary: Maintenance of the trails and skills park will not lead to loss of riparian shade or tree density, therefore there will be a **neutral** effect**.**

Element 3: Watershed Restoration

Proximity: A variety of road construction, maintenance, closure, decommissioning, and culvert maintenance will occur within the action area (watershed restoration). Of these components some road maintenance and landing construction will occur adjacent (<50 feet) to Still Creek and the West Fork Salmon.

Probability: Watershed restoration actions are expected to occur within existing road prisms and disturbed areas and therefore should not result in the day-lighting of any streams or the reduction in riparian understory canopy which could alter temperature. During construction, PDC's have been identified to reduce the potential for adverse impacts to riparian reserve habitat (

Magnitude: Proposed road work maintenance and decommissioning will take place adjacent to previously impacted streams but will require no tree or understory removal within Riparian Reserves. There would be no increase in direct solar radiation.

Element Summary: Because there is no probability to affect stream temperature the watershed restoration actions will have a **neutral** affect to the stream temperature indicator.

Temperature Indicator Summary – Stream shade would not be affected at the site scale for any of the proposed activities. The effect that this project will have on stream shade is negligible and should not change from current conditions. It is expected that the project elements would have a **low probability of negative effect,** which will be **insignificant in magnitude** on steelhead critical habitat and Region 6 Sensitive Species.

<u>Suspended Sediment/Tubidity & Substrate Character/Embededness</u>

Environmental Baseline - Considerable road building, water supply development, chairlift construction, and vegetation clearing for ski slopes has already occurred adjacent to and upslope of the four headwater tributaries in the Action Area. Each of these human activities increases fine sediment inputs to stream channels from the highly erodible volcanic soils in the area. These small stream channels naturally lack the hydraulic power or competence to effectively move fine sediment quickly downstream and erode down to bedrock. Thus, sand and fine gravel substrates dominate stream bottoms within the Action Area. Acceleration of fine sediment inputs from human activities may eventually cause sufficient habitat alteration to adversely impact TES fish species and Region 6 Sensitive or rare caddisfly species that are currently present (Wissman, 2010)." The annual sediment load caused by human activities within the Action Area is modeled to be ~150-400 tons, most of which is generated from the existing road network and winter sanding and plowing operations on Highway 26 and the Timberline Road (Timberline Express EIS). For a detailed description of the sediment transport associated with roads and trails in the Action Area, please refer to the *Soil & Hydrology Specialists Report* in this EA.

The existing road network in the action area is extensive (approximately 7.3 miles/mile^2 in Still Creek and 7.1 miles/mile^2 in West Fork Salmon River). Since road networks are the most important sources of accelerated delivery of sediment to fish bearing streams, this is cause for significant concern (FEMAT II-40). In addition, many of the lift access roads within this area are native surface and have visible signs of active erosion into the stream drainage network.

"Most notable are the roads at the bottom of the Stormin' Norman lift, which were rilled and are impacting a small drainageway. Westleg Road is paved, but the ditchline has not been maintained sufficiently to prevent water from moving sediment. In addition, some culverts and ditch relief pipes are blocked/not functioning. The bottom of Pucci Lift has a large compacted area where water runs across the surface. A similar situation exists at the bottom of the Jeff Flood lift where accumulated sediment is being routed into Still Creek. The Glade and Alpine Trails cutting across the area have erosion occurring on them as well (Hydrology Specialist Report)."

As a result, sediment and turbidity levels in the Action Area are higher than what would naturally occur. Levels of fine sediment (defined here as sand or silt <1 mm in diameter) in stream reaches are among the highest observed in clear-water tributaries on the Zigzag Ranger District. The watershed analsys' for both the Zigzag River and Salmon River identify sedimentation of streams in the upper watershed as a process of concern. "Wolman" Pebble counts collected in 2010, quantify these concerns. In Still Creek, surface fines were at 52% (Not Properly Functioning) and in the West Fork Salmon River, surface fines were at 44% (Not Properly Functioning) within the Action Area. Fine sediment data is not available for Glade or Sand Canyon but is <20% in the Zigzag River (Functioning at Risk).

The baseline determination for sediment/turbidity and embededness is **Functioning At Risk** for Glade and Sand Canyon and **Not Property Functioning** in Still Creek and the West Fork Salmon River.

Potential Effects of the Action – Bike Park construction/operation will significantly increase short term and long term fine sediment into Still Creek and the West Fork Salmon River (Table 7) (*Hydrology Specialist Report*). To offset this impact, a suite of watershed restoration actions were developed to reduce the total sediment load generated in the project area by approximately 2 times what is likely to be generated by construction and maintenance actions under "dry" conditions. The definition for "dry" conditions is fully described in PDC Soil-11 but generally describes the soil moisture and precipitation conditions under which the Bike Park would operate (this includes the construction period as well).

The reason for the distinction between "dry" and "non-dry" conditions is that the amount of annual sediment generated by the Bike Park increases by orders of magnitude if the operation/construction occurs during saturated soil conditions, at which point, the watershed restoration actions will no longer offset the sediment generated from the project (Table 5). To ensure the Bike Park is operated and built under conditions that meet the standards identified in the model, a suite of operational PDC's have been identified.

Table 7. Results from the sediment model analysis describing the annual amount of sediment expected to be generated under different soil moisture and rider-use conditions.

	"Dry" Operating Conditions	Outside Operating Conditions	
Park Traffic Use	**<1200 mm (47.2 in)**	**1200 mm - 3000 mm**	**>3000 mm (118.1 in)**
Heavy Use	20	50	120
Moderate	2	4	10
Light/Not Active	1	1	1
Light/Abandoned	.02	.05	.01

Element 1: Trail and Skills Park Construction

Proximity – During the first storm events following trail construction, there will likely be a sediment/turbidity pulse into Still Creek and the West Fork Salmon which will occur in LCR winter steelhead critical habitat and R6 Sensitive Scotts apatanian caddisfly habitat. Since trail construction in Glade and Sand Canyon is minimal, it is less likely that sediment will be delivered into those tributaries.

Moderate amounts of sediment may also be added at stream crossings where trail or bridge construction work loosened soils and removed vegetation.

Probability – Short-term turbidity and sediment input will likely be significant in Still Creek and West Fork and may be negligible in the Zigzag River tributaries.

Duration – Turbidity will likely increase during high flows for the first couple of storm events as unstable soils are carried into nearby stream channels. During winter storm events, the duration of increased turbidity will depend on the length of time and the intensity of the storm. Generally, turbidity will decrease as the water levels in the stream recede. It is likely that if disturbed soils are not re-vegetated after the first year, sediment and turbidity events will continue to be generated from project construction until the disturbed areas are stabilized by vegetation (1-5 years).

Timing – Turbidity and sediment increases are most likely expected to occur while juvenile steelhead are rearing in October and November during the first storm events when stream flows increase and may also occur the following spring when steelhead adults are spawning.

Nature – Turbidity increases may temporarily redistribute steelhead individuals as they either avoid it or move into it to feed on drifting invertebrates as they currently do in these actively eroding stream channels. Steelhead will redistribute to a more natural distribution as turbidity decreases. Sediment may reduce pool volume and increase embededness thereby negatively effecting steelhead critical habitat over a period of 1 to 5 years. Turbidity and sediment may also reduce preferred habitat for Scotts Apatanian caddisfly in Still Creek and West Fork Salmon River.

Element Summary – Turbidity and sediment increases from the new trail construction on and near steelhead habitat in Still Creek may be large enough to have a negative, significant affect on listed steelhead trout and critical habitat. Turbidity and sediment increases may also adversely effect sensitive Scotts Appatanian caddisfly populations. Although all construction work will use PDC's designed to minimize sediment increases in streams and LCR winter steelhead habitat, turbidity may increase enough to temporarily affect steelhead distribution within the action area and sediment increases of up to 5 years may reduce critically designated habitat. Sediment increases will be largest immediately below the project area and will decrease in magnitude as it moves downstream.

Element 2: Trail and Skills Park Operation & Maintenance

Proximity – Annual storm events and saturated soil conditions are likely to result in chronic sediment/turbidity pulses into Still Creek and the West Fork Salmon which will occur in steelhead critical habitat and Region 6 Sensitive Scotts apatanian caddisfly habitat. Since the trail network in Glade and Sand Canyon is minimal, it is less likely that significant amounts of sediment will be delivered into those tributaries. Moderate amounts of sediment may also be added at stream crossings where trail or bridge maintenance work loosened soils and removed vegetation.

Probability - Long-term turbidity and sediment input will likely increase significantly in the Still Creek and West Fork sub -watersheds and negligibly in Glade and Sand Canyon sub-watersheds as a result of the Bike Park.

Duration – Turbidity will likely increase in response to rain events throughout the year as unstable soils are carried into nearby stream channels. Generally, turbidity will decrease as the water levels in the stream recede.

Timing – Turbidity and sediment increases are expected to occur while juvenile steelhead are rearing in summer and fall following rain events and may also occur in spring when steelhead adults are spawning.

Nature – Turbidity increases may temporarily redistribute steelhead individuals as they either avoid it or move into it to feed on drifting invertebrates as they currently do in these actively eroding stream channels. Steelhead will redistribute to a more natural distribution as turbidity decreases. Over time, the continuous input of sediment may reduce pool volume and increase embededness thereby negatively effecting steelhead critical habitat over the period of years the Bike Park is operated. Turbidity and sediment may also reduce preferred habitat for Scotts Apatanian caddisfly in Still Creek and West Fork Salmon River and potentially negatively impact the population size and distribution.

Element Summary - Turbidity increases from the operation and maintenance of the Bike Park on and near LCR winter steelhead habitat in Still Creek may be large enough to have a negative, significant affect on listed steelhead trout and critical habitat. Turbidity and sediment increases may also adversely effect Region 6 Sensitive Scotts appatanian caddisfly populations in both the West Fork Salmon and Still Creek. Although operation plans and maintenance work will use PDC's designed to minimize sediment increases in streams and steelhead habitat, turbidity may increase enough to temporarily affect steelhead distribution within the action area and annual sediment increases may reduce the quality and quantity of designated critical habitat for steelhead. Sediment increases will be largest immediately below the project area and will decrease in magnitude as it moves downstream.

Element 3: Watershed Restoration

Proximity: As mentioned previously, there are 5 sub-elements for this project element. 1) Native road resurfacing, 2) Road Decommissioning: 3) Road to trail conversion, 4) Ski lift landing maintenance 5) culvert replacement and maintenance. Many of these activities will take place within close proximity to the West Fork Salmon River and to Still Creek which will occur in LCR winter steelhead trout critical habitat and Region 6 Sensitive Scotts apatanian caddisfly habitat. No restoration actions are planned adjacent to Glade or Sand Canyon.

Probability – As a result of the combined watershed restoration actions, the total load of sediment entering the action area should be reduced in both the short and long-term.

Duration – There will be both immediate reductions in sediment loads within Still Creek and the West Fork Salmon as well as long term reductions in those sub-watersheds as a result of this project element.

Timing – Watershed restoration activities will occur concurrently with the Bike Park construction to ensure that short term sediment impacts related to the project construction are immediately offset. Over time, as the vegetative cover re-establishes itself on decommissioned roads and ski area landings, the reduction in sediment into the four sub-watersheds should increase.

Nature – The amount of total sediment expected to be reduced as a result of the watershed restoration is small when compared with the total loads of sediment that are being generated from human caused disturbances within the action area *(Hydrology Specialist Report).* Therefore, sediment and turbidity levels will remain elevated within the action area but unchanged as a result of the project action. And the behavioral and habitat responses described above in the construction and operation elements should remain unchanged.

Element Summary - Turbidity and sediment should decrease in Still Creek and the West Fork Salmon River as a result of this project element but will not result in a significant reduction in the total amount of sediment being produced in the action area (Table 8).

Table 8. Modeled changes in fine sediment inputs in Still Creek and the West Fork Salmon River under current and proposed conditions.

Sediment Yield	Proposed Action	Current Condition
Number of Stream Crossings	Still Creek: 34	Still Creek: 12
	WF Salmon: 8	WF Salmon: 8
	Total: 42	Total: 20
Stream Crossings Sediment Delivery (tons/year)	Still Creek: 0.2	Still Creek: N/A
	WF Salmon: 0	WF Salmon: N/A
	Total: 0.2	Total: N/A
Road related Sediment Delivery (modeled tons/year) for properly maintained roads	Still Creek: 14.4	Still Creek: 13.3
	WF Salmon: 5.0	WF Salmon: 10.3
	Total: 20.7	Total: 23.5
Sediment Reduction from Projects not Captured in road modeling	Still Creek: 26.6	Still Creek: N/A
	WF Salmon: 8.9	WF Salmon: N/A
	Total: 35.4	Total: N/A

Sediment Indicator Summary – Human caused fine sediment generation into Still Creek and the West Fork Salmon River is a significant process of concern for LCR winter steelhead critical habitat and Region 6 Sensitive Scotts appatanian caddisfly species. Based on sediment modeling conducted for both this proposed project as well as the Timberline Express EIS, most of the sediment generated is related to the existing road network and winter-time sanding of Timberline Road and Highway 26. The construction and operation of the Bike Park is likely to generate additional sediment which will be offset by the watershed restoration elements of the project. However, the total amount of sediment generated within the action area resulting from human caused disturbance will remain high.

To ensure the amount of sediment generated by the project remains within the modeled range, a suite of PDC's have been developed which detail the soil moisture and precipitation conditions under which the Bike Park will operate. As a result there is a **high probability** that there will be **neutral** effect to these indicators associated with the implementation of this project.

<u>Chemical Contamination/Nutrients</u>

Environmental Baseline - There is one known point source of contamination within the action area. Salt application occurs on 320 acres of the Palmer snowfield annually during the summer months. Surface water runoff drains into Still Creek and the West Fork Salmon River but not the Zigzag River. In 1996, Timberline negotiated in-stream water quality conditions with ODEQ which limit the amount of total dissolved solids and provides limits on chloride (NaCL) exceedance. Those measures are:

- Instream continuous monitoring sites shall not exceed the weekly mean total dissolved solids (TDS) guidance value, or specific conductance guidance value if used as a substitute for TDS, of 117 mg/L TDS or 175 umhos/cm specific conductances
- Water quality samples shall not exceed the secondary drinking water criterion of 250 mg/L of chloride
- Water quality samples shall not exceed the National (EPA 440/5-88-001) freshwater chronic toxicity criterion for aquatic organisms of 230 mg/L for chloride; and
- Water quality samples shall not exceed the National (EPA 440/5-88-001) freshwater acute toxicity criterion for aquatic organisms of 860 mg/L for chloride.

Chloride concentrations at sampling stations have not been exceeded in any of the sub-watersheds within the Action area. However, total dissolved solids values are exceeded regularly in Still Creek (Table 9).

There are no ODEQ 303d reaches within the sub-watershed listed for contaminants. Some risk of contamination exists with normal vehicle use within the Action Area given the volume of traffic accessing Timberline Lodge and the ski area.

Table 9. Indication of exeedance (Y=Yes/N=No) of mean weekly total dissolved solids (TDS) or daily sample exceedance of chloride (NaCL) for the sample years 1997-2005 by Action Area sub-watershed (Golder, 2005).

Year	Zigzag River		W. Fork Salmon		Still Creek	
	TDS	NaCL	TDS	NaCL	TDS	NaCL
1997	N	N	ND	N	**Y**	N
1998	N	N	ND	N	**Y**	N
1999	N	N	ND	N	**Y**	N

2000	N	N	ND	N	**Y**	N
2001	N	N	N	N	**Y**	N
2002	N	N	N	N	**Y**	N
2003	N	N	ND	N	**Y**	N
2004	N	N	ND	N	**Y**	N
2005	N	N	ND	N	**Y**	N

The baseline determination for chemical/nutrients is **Functioning At Risk** for Still Creek, and **Property Functioning** in the West Fork Salmon River, Glade and Sand Canyon.

Potential Effects of the Action – There is a slight risk of spills or leaks associated with petroleum fuel products used for excavating equipment or other small power tools. PDC's for staging and refueling of equipment are identified for all elements of the proposed project. And a spill prevention and response plan would be developed and included in the Construction Plan/SWPCP (PDC; WS-5). Therefore, the probability of a negative chemical or nutrient contamination is very low, and discountable.

Elements 1-3: Trail and Skills Park Construction/Maintenance & Watershed Restoration

Proximity – Staging and refueling of equipment will occur at least 100 feet away from active stream channels. Maintenance equipment also uses petroleum products, and these typically are refueled at service locations, away from streams.

Probability – A spill prevention and response plan would be developed and included in the Construction Plan/SWPCP (PDC; WS-5). No fuels or construction machinery would be stored within riparian areas. Therefore the effect this element will have on contaminants and nutrients is negligible and should not change from current conditions.

Element Summary - The probability that a spill will occur in or near streams within the action area is low, and therefore discountable.

Chemical/Nutrient Indicator Summary – The probability that a spill will occur is low, and therefore **Low probability of negative effect,** which will be **insignificant in magnitude** on steelhead critical habitat and Region 6 Sensitive Species.

Habitat Access

Environmental Baseline - Connectivity from an aquatic species context relates primarily to the presence of human-made barriers that preclude or limit up and downstream migration of aquatic fauna. On the Forest, the most prevalent human-made barriers are road culverts, although low flows or subsurface flows from irrigation activities can impede or block migration as well. The Forest conducted a comprehensive fish passage survey on culverts across the Forest in 1999 and 2000 (Asbridge et al. 2001). Over 80 percent of surveyed culverts were rated as fish passage barriers. However, since 2000 most of the high priority culverts (i.e., those culverts in streams supporting anadromous fish or bull trout) have been removed or replaced with "fish-friendly" crossings. In this analysis, the presence of even one human made barrier within the watershed that restricts passage is considered to be “Not Properly Functioning.”

Culvert barriers exist both within the Action Area and downstream. The most significant passage barriers are the culverts that run under Highway 26. In Still Creek, three Highway 26 culverts are migration barriers to LCR steelhead and likely result in a significant loss of upstream and downstream movement for steelhead and resident trout. In the West Fork Salmon, the Highway 26 culvert was replaced in 2007 and there is now “fish friendly” passage above the highway. Currently, the culvert on the Timberline Road is the primary barrier to resident fish migration in the West Fork Salmon. There are no culvert barriers in the Zigzag River or its tributaries Glade and Sand Canyon.

Numerous resident fish culvert barriers remain above Highway 26 throughout the Action Area. There are multiple barrier culverts on Westleg and Timberline Roads as well as on the ski area access roads.

Based on AP indicators, the baseline determination for habitat access is **Not Properly Functioning** for Still Creek and the West Fork Salmon River and **Properly Functioning** in Glade and Sand Canyon.

Potential Effects of the Action and Element Summary – Approximately 25 ephemeral stream channels will be crossed by trails in the Bike Park. Only bridges and fords will be used depending on the length of the crossing and steepness of the approach. No culverts will be used. In addition, PDC’s have been developed that ensure the design and construction of all bridges and fords will not limit aquatic passage (PDC; WS-1) . Therefore, the project elements have no casual mechanisms to affect this indicator and are thus **neutral**.

Elements 1-3: Trail and Skills Park Construction/Maintenance & Watershed Restoration

Proximity – At least 25 ephemeral stream channels will be crossed by Bike Park trails. None of these stream crossings are over LCR winter steelhead critical habitat but are within ¼ to 1.5 miles of critical habitat.

Probability –No culverts will be used to cross stream channels and PDC’s are in place to ensure that bridge and ford structures will not impede aquatic passage.

Element Summary - The probability that a Bike Park structure will impede aquatic passage within the Action Area is extremely low, and therefore discountable.

Aquatic Passage Summary – The probability that stream crossing structures will impair aquatic passage is low, and therefore **Low probability of negative effect,** which will be **insignificant in magnitude** on steelhead critical habitat and Region 6 Sensitive Species.

Large Woody Debris

Environmental Baseline- Large wood counts do not meet AP or Forest Management Plan standards in Still Creek or the upper reaches of the Zigzag River (no data exists for Sand Canyon or Glade) but are met in the West Fork Salmon River. All four sub-watersheds have had riparian and upland forest habitat reduced as a result of ski area development (approximately 19 acres of riparian habitat has been lost in the ski area), road and trail networks, utility corridors, and campgrounds which limit large wood recruitment. In the upper Still Creek sub-watershed Level II surveys found large wood frequency is approximately 11 pieces per mile, in the upper West Fork sub-watershed wood frequency is approximately 196 pieces per mile, and in the Upper reaches of the Zigzag River it is less than 5 pieces per mile.

The baseline determination for large woody debris is **Not Properly Functioning** for Still Creek and Zigzag, and **Property Functioning** in the West Fork Salmon River.

Potential Effects of the Action – The construction element of this project will remove small diameter trees (<6" dbh) within riparian reserves, which could have a negative affect on large wood recruitment over the long term depending on how many trees are removed. Construction and operation of the park could also result in damage to trees and root systems within riparian reserves which could lead to a long term loss of standing green trees. If those trees are not replaced there could be an overall reduction in riparian health and complexity which could reduce large wood recruitment. To minimize these negative impacts, PDC's have been developed to reduce the amount of trees removed during construction and to protect trees and their roots from damage by trail maintenance.

Element 1: Trail and Skills Park Construction

Proximity – Small diameter trees (<6"dbh) will be removed within riparian reserves adjacent to all four sub-watersheds.

Probability – PDC's are in place to ensure that riparian wood removal negligible and should not change from current conditions.

Element Summary - The PDC's were developed to protect riparian habitat and ensure that the overall health and complexity of riparian reserves is not negatively affected in the Action Area. Therefore, there will be a **neutral** effect on large wood related to trail and skills park construction**.**

Element 2: Trail and Skills Park Operation & Maintenance

Proximity- Park operation may result in damage to mature trees and their root systems in riparian reserves in all four sub-watersheds.

Probability: PDC's for this element of the project are in place to ensure that trails will protect tree roots. Therefore, the effect that this project will have on large wood is negligible and should not change from current conditions.

Element Summary: The PDC's were developed to protect riparian habitat and ensure that the overall health and complexity of riparian reserves is not negatively affected in the Action Area. There will be a **neutral** effect on large wood related to trail and skills park construction**.**

Element 3: Watershed Restoration

Element Summary: There is no probability that watershed restoration action will affect large woody debris in riparian reserves, therefore this project element will have a **neutral** affect to the four sub-watersheds.

Large Woody Debris Indicator Summary – The construction and operation elements of this indicator could have a **slight to moderate negative** which are offset by the PDC's developed for these elements. Watershed restoration has no causal mechanism to affect this indicator. There will be a **neutral** effect on steelhead critical habitat and Region 6 Sensitive Species.

Pool frequency/quality and presence of large pools

Environmental Baseline - Pool frequency and quality do not meet AP or Forest Management Plan standards in Still Creek, W. Fork Salmon, or the Zigzag River (no data exists for Sand Canyon or Glade). All four sub-watersheds have had riparian and upland forest habitat reduced as a result of ski area development, road and trail networks, utility corridors, and campgrounds which limits large wood recruitment and cause sediment related impacts to pool volume. In the upper Still Creek sub-watershed, primary pool frequency (>3') is one per mile with total pool frequency of 32 per mile. In both the upper Zigzag River reaches pool frequency is 50 total pools per mile and in the W. Fork Salmon River pool frequency is 5.3 per mile. Given the steep topography within these upper watersheds it is likely the pool habitat frequency and quality is naturally limited and may not have met the above standards. However, given the lack of large wood and the significant volumes of fine sediment related to human caused disturbance, pool frequency and quality are considered to be not properly functioning in all four sub-watersheds.

Forest Management Plan and AP standards for large pools are similar (pools greater than 3 feet are present or absent within a reach). This metric is not met within the Still Creek or Zigzag River sub-watersheds, but is met within the West Fork Salmon River.

The baseline determination for pool quality and large pools is **Not Properly Functioning** for Still Creek, Glade and Sand Canyon, and **Property Functioning** in the West Fork Salmon River.

Potential Effects of the Action and Large Pool Indicator Summary – The Bike Park project elements have the potential to reduce pool habitat quality and the presence of large pools through two mechanisms; sediment, and large woody debris. For a full description of how those habitat attributes are effected by this project, please refer to those sections.

The construction and operation elements of this indicator could have a slight to moderate negative affect on large woody debris recruitment and steelhead habitat if PDC's are not followed. Watershed restoration has no causal mechanism to affect this large wood and are thus neutral. There is a high probability that there will be neutral effect to sediment indicators associated with pool quality. This habitat element has a high probability of **neutral** effect and is therefore **insignificant in magnitude** to steelhead critical habitat and Region 6 Sensitive Species.

Off-Channel and Refugia Habitat

Environmental Baseline - Off-channel habitat and refugia is not a measured attribute for stream surveys on the Forest and therefore no data exists for this metric. Based on familiarity with the Action area and professional judgment, a general description can be made about connectivity of streams and floodplain habitat. The upper portions of Still Creek, the Zigzag River, and the West Fork Salmon are often entrenched in V shaped canyons that are naturally steep, thus limiting connectivity to floodplain habitat. In Still Creek there is a low gradient section below Highway 26 and a low gradient section around the Jeff Flood lift. These two areas likely provide off-channel habitat and slower water. In the West Fork Salmon River, a large wet meadow/small lake complex exists between Highway 26 and Timberline road which provides excellent rearing habitat. However, the balance of the habitat in those two sub-basins is high gradient (11-15%) on average.

Given the steep gradient and the lack of large wood and pool habitat in the Zigzag River and Still Creek, its unlikely there is much slow-water or off-channel habitat available in the Action Area. Therefore, this analysis assumes that off-channel and refugia habitat is not properly functioning in those sub-watersheds within the Action Area. In the West Fork Salmon, the presence of large wood and more frequent pool habitat combined with the excellent rearing habitat discussed above, likely results in more opportunities for slow water refuge.

The baseline determination for off-channel and refugia habitat is **Not Properly Functioning** for Still Creek, Glade and Sand Canyon, and **Property Functioning** in the West Fork Salmon River.

Potential Effects of the Action and Indicator Summary The project elements have no causal mechanism to affect this indicator, and they would have a **neutral** effect on steelhead critical habitat and Region 6 Sensitive Species.

Wetted Width, Floodplain and Channel Stability

Environmental Baseline –Level II stream surveys indicate that width to depth ratios are very low in Still Creek and the West Fork Salmon. No data exists for Glade and Sand Canyon. Naturally steep channel conditions may be impacting width to depth, however the lack of LWD also simplify's the stream system. Level II stream surveys indicate that width to depth ratios are **Not Properly Functioning** in Still Creek and the West Fork Salmon. No data exists for Glade and Sand Canyon but is **Functioning at Risk** in the Zigzag River.

Significant stream bed and bank erosion in the lower perennial reaches of Still Creek and the West Fork Salmon was not observed during stream mapping and characterization surveys associated with the Environmental Impact Statement associated with the Timberline Express Project that were conducted in 2002 and 2003 (SE Group, 2004a). Channel stability is therefore assumed to be **Properly Functioning** in all four sub-watersheds.

Floodplain connectivity is not a measured attribute for stream surveys on the Forest and therefore no data exists for this metric. However, based on field familiarity, some general descriptions can be made about the connectivity of streams within the Action Area, The upper portions of Still Creek, Glade and Sand Canyon, and the West Fork Salmon are primarily entrenched within steep gradient channels which prevent wide floodplain habitat to occur. The lower portions of the W. Fork Salmon and Still Creek are lower gradient and have moderate connectively to their floodplain. As a result this indicator is **Functioning at Risk** for all the streams in the Action Area.

Potential Effects of the Action and Indicator Summary – The project elements have no causal mechanism to affect this indicator, and they would have a **neutral** effect on steelhead critical habitat and Region 6 Sensitive Species.

***C*hange in Peak/Base Flows and Drainage Area Network**

Environmental Baseline – Peak streamflows in the action area are influenced by runoff from rapid snowmelt and rainfall during rain on snow events. Data from Still Creek and the West Fork Salmon River indicate that summer low flows are influenced by groundwater rather than direct run-off from the snowfield and are therefore "buffered" by the constant influx of groundwater *(Hydrology Specialist Report* in the EA). For a complete discussion about peak/base flow conditions in the Action Area, please refer to the *Hydrology Specialists Report* in this EA. AP peak/base flow values for the four sub-watersheds are considered to be **Properly Functioning**.

The relatively impermeable surfaces of roads and trails cause surface runoff of rain and snowmelt to bypass longer, slowing subsurface flow routes in soils (*Hydrology Specialist Report* in this EA). Roads and trails are hydrologically connected by ditchlines and gullies and therefore, the stream network is considered lengthened wherever they inter-relate. Due to the high density of both roads and trails within the Action Area this AP indicator is considered to be **Functioning At Risk** in all of the four sub-watersheds.

Potential Effects of the Action– Bike Park construction/operation will increase the stream drainage network in the four sub-watersheds. However, the watershed restoration action should result in a net reduction of the drainage area network within the project area (Table 10).

Table 10. Modeled stream drainage network enhancement (Hyrdology Specialist Report).

Watershed	**Current Condition (%)**	**Proposed Action (%)**
Glade	0.0	0.0
Sand Canyon	0.0	0.0
Still Creek	23.0	24.0
W. Fork_Salmon	16.0	10.0
Grand Total	15.0%	14.0%

Element 1: Trail and Skills Park Construction & Operation

Proximity – Bike Park construction and operation will take place within close proximity to streams in all four sub-watersheds which will occur in steelhead trout critical habitat and Scotts Apatanian caddisfly habitat.

Probability – this project element will increase the stream drainage network by approximately 1,300 lineal feet . That amount will be offset by the reduction in drainage area network associated with the watershed restoration project elements.

Element Summary – This project element will have a significant **negative** affect on the stream drainage network.

Element 3: Watershed Restoration

Proximity: As mentioned previously, there are 5 sub-elements for this project element. 1) Native road resurfacing, 2) Road Decommissioning: 3) Road to trail conversion, 4) Ski lift landing maintenance 5) culvert replacement and maintenance. Many of these activities will take place within close proximity to the West Fork Salmon River and to Still Creek which will occur in steelhead trout critical habitat and Scotts Apatanian caddisfly habitat. No restoration actions are planned adjacent to Glade of Sand Canyon.

Probability – The stream drainage network will be reduced by approximately 2,000 lineal feet.

Probability – As a result of the combined watershed restoration actions, the total amount of stream drainage network should be reduced within the action area.

Element Summary – Total stream drainage network associated with this element will be reduced Still Creek and the West Fork Salmon River as a result of this project element but will have a **positive** effect on the total reduction in stream drainage within the Action Area.

Stream Drainage Network Indicator Summary – The project elements have both positive and negative affects this indicator, combined there is a **high probability** that there will be **neutral** effect on steelhead critical habitat and Region 6 Sensitive Species.

<u>Road Density and Location</u>

Environmental Baseline - Currently, both the road and trail network density is very high within the action area (approximately 7.3 miles/mile^2 of road in Still Creek and 7.1 miles/mile^2 of road in the West Fork Salmon River). Many of the roads are native surface and actively eroding and as such are a high risk to aquatic habitat (Table 11). This analysis assumes that the Bike Trails are similar to roads in the way they impact hydrologic process associated with stream-flow (*Hydrology Specialist Report* in the EA). Based on the existing road network (trails are not included) this AP indicator is **Not Properly Functioning** in Still Creek and the West Fork Salmon and **Properly Functioning** in Glade and Sand Canyon.

Table 11. Comparison of road surface types within the Project Area (total Action Area not included).

Watershed	Gravel	Native	Paved	Grand Total
Glade_WSD	0.0	0.2	0.0	0.2
Sand_WSD	0.0	0.1	0.0	0.1
Still_WSD	0.1	3.4	0.0	3.5
W. Fork_Salmon	0.0	2.1	0.2	2.3
Grand Total	0.1	5.9	0.2	6.2

Potential Effects of the Action – This project will increase the trail (road) network in the Action Area by approximately 1.3%. This increase in the trail(road) network will be offset by a number of watershed restoration elements.

Element 1: Trail and Skills Park Construction & Operation

Proximity – Bike Park construction and operation will take place within close proximity to streams in all four sub-watersheds which will occur in steelhead trout critical habitat and Scotts Apatanian caddisfly habitat.

Probability – this project element will increase the road (trail) network by approximately XX Miles. That amount will be offset by the reduction in road network associated with the watershed restoration project elements.

Element Summary – This project element will be increase the stream drainage network and have a **negative** effect on this habitat element.

Element 3: Watershed Restoration

Proximity: As mentioned previously, there are 5 sub-elements for this project element. 1) Native road resurfacing, 2) Road Decommissioning: 3) Road to trail conversion, 4) Ski lift landing maintenance 5) culvert replacement and maintenance. Many of these activities will take place within close proximity to the West Fork Salmon River and to Still Creek which will occur in steelhead trout critical habitat and Scotts Apatanian caddisfly habitat. No restoration actions are planned adjacent to Glade of Sand Canyon.

Probability – The stream road network will be reduced by approximately XX miles.

Probability – As a result of the combined watershed restoration actions, the total amount of road network should be reduced within the action area.

Element Summary – Total stream drainage network associated with this element will be reduced Still Creek and the West Fork Salmon River as a result of this project element but will have a **positive** effect on the total reduction in stream drainage within the Action Area.

Road (trail) Network Indicator Summary – The project elements have both positive and negative affects on this indicator, combined there is a **high probability** that there will be **neutral** effect to these indicators associated with the implementation of this project.

<u>Riparian Reserves (Northwest Forest Plan)</u>

Environmental Baseline - Riparian reserves in the four sub-watersheds have been impacted by both past management and natural disturbances. Field observations and review of aerial photographs found that riparian areas within the ski area remain in a fragmented state where they are intersected by ski runs, lifts, and access roads and approximately 19 acres have been lost as a result. In addition, roads, trails, campground, utility lines, and parking lots have permanently removed riparian cover in the larger Action Area. Since the implementation of the NW Forest

Plan, there have been fewer reductions in riparian habitat loss and riparian conditions are improving in some portions of the Action Area.

Riparian condition and fragmentation is not a measured attribute for stream surveys on the Forest and therefore no data exists for this metric. However, based on reviews of aerial photographs and professional judgment there appears to be a moderate loss of connectivity or function in all the streams in the action area therefore, this AP indicator is assumed to be **Functioning At Risk** in all four sub-watersheds.

Potential Effects of the Action – The Potential effect to riparian reserves is related primarily to the loss of riparian cover and increase in fragmentation related to trail construction.

Element 1 – 3: Trail Construction, Operation, and Watershed Restoration

Proximity - Small diameter trees (<6"dbh) will be removed within close proximity to the West Fork Salmon River and to Still Creek but will not occur directly within critical habitat.

Probability -The effect that this project will have on riparian reserves is negligible and should not change from current conditions. As previously described in the Large Wood Attribute Section, PDC's have been developed to ensure that trails built within riparian reserves will not cut trees larger than 6 inches dbh and all tree removal will be kept to a minimum. No clearing is expected for any of the project elements so an increase in fragmentation is negligible.

Element Summary - The PDC's were developed to protect riparian cover and ensure that riparian reserves are not affected for all streams in the Action Area. The project elements will have a **neutral** effect on riparian reserves **.**

Riparian Reserve Indicator Summary – The potential effect to riparian reserves is related primarily to the loss of riparian cover and increase in fragmentation related to trail construction. As previously described in the Large Wood Attribute Section, trials built within riparian reserves will not cut trees larger than 6 inches dbh and all tree removal will be kept to a minimum . There may be a slightly <u>negative</u> effect on large and small wood recruitment at the site scale. This habitat element has a high probability of **neutral** effect and is therefore **insignificant in magnitude** to listed fish or their critical habitat.

<u>Disturbance History/Regime</u>

Environmental Baseline – The primary human caused disturbance in the Action Area is related to the ski area development and supporting infrastructure and Highway 26. This AP attribute is considered to be **Functioning at Risk** for Still Creek and West Fork Salmon and **Properly Functioning** for Glade and Sand Canyon.

Potential Effects of the Action – This project will result in approximately 13 additional acres of disturbance within the Action Area. This increase in disturbed area will be offset by the decommissioning of some roads and trails and revegetation of those areas to a more natural state. The additional disturbance will not result in a change to the baseline disturbance condition.

Element 1 & 2: Trail and Skills Park Construction & Operation

Proximity – Bike Park construction and operation will take place within close proximity to streams in all four sub-watersheds which will occur in critical habitat and Region 6 Sensitive species habitat.

Probability – this project element will increase the disturbed area by approximately 13 acres. That amount will be somewhat offset by the reduction in road network and devegetated areas associated with the watershed restoration project elements.

Element Summary – This project element will be increase the disturbed area within the four sub-watersheds and result in a **negativ**e affect to this habitat element.

Element 3: Watershed Restoration

Proximity: As mentioned previously, there are 5 sub-elements for this project element. 1) Native road resurfacing, 2) Road Decommissioning: 3) Road to trail conversion, 4) Ski lift landing maintenance 5) culvert replacement and maintenance. Many of these activities will take place within close proximity to the West Fork Salmon River and to Still Creek which will occur in critical habitat and Region 6 Sensitive species habitat. No restoration actions are planned adjacent to Glade of Sand Canyon.

Probability – The disturbed area will be reduced by approximately 5.9 acres.

Probability – As a result of the combined watershed restoration actions, the total amount of disturbed areas will be reduced.

Element Summary – Total disturbed area associated with this element will be reduced in Still Creek and the West Fork Salmon River as a result of this project element and will have a **positive** effect on the total reduction in stream drainage within the Action Area.

Disturbance History/Regime Indicator Summary – Environmental disturbance will occur as a result this action over the long term. Restoration project activities will reverse some of the previous disturbance activities. Bike Park disturbance will be predictable and will not initiate any catastrophic events or changes in the short-term or long-term. The project would have an **insignificant change, both positive and negative** to the disturbance history/regime indicators.

<u>Direct Effects To ESA Listed Fish – Non Habitat Project Elements</u>

Potential Effects of the Action – Project effects to habitat indicators were analyzed and described in the previous section. This section describes the possibility of direct take occurring in conjunction with a project element. There are no project elements which are expected to result in direct effects to listed LCR winter steelhead.

<u>Project Effects to Population Indicators</u>

The AP directs the assessment of population indicators when recovery plans are available for listed species. A recovery plan has been developed for LCR winter steelhead. The effects to population indicators (population size and distribution, growth and survival, life history diversity and isolation, and persistence and genetic integrity) are analyzed below and are considered for LCR winter steelhead.

Population Size and Distribution: Implementation of the project is not expected to affect population size or distribution for winter steelhead. The project will not generate any increase in existing displacement or stressors to juvenile and/or adults (**neutral effect**).

Growth and Survival: As stated previously, this project is not expected to generate any type of displacement or stressor to juvenile and/or adults and as a result there will be no effect to growth and survival **(neutral).**

Life History Diversity and Isolation: This project would not result in changed conditions to the extent that it creates a migration barrier or reduces the baseline condition of habitat utilization through the action area. Post-project use is expected to remain the same (**neutral effect**).

Persistence and Genetic Integrity : Genetic isolation for steelhead will not change as a result of this project. Currently, the Highway 26 culvert acts as a barrier to migration in and out of the project area. This project would have no negative effect to persistence and genetic integrity (**neutral effect**).

Project Effects to Primary Constituent Elements (PCEs) of Critical Habitat

Freshwater Spawning Sites: Marginal quality spawning habitat is present in the upper Still Creek system below Highway 26 and poor spawning habitat is present above the Highway 26. Stream temperatures are within the preferred range during the summer and during spawning season. Incubation/larval development temperatures are appropriate. Embededness levels associated with elevated sediment may reduce the quality of available spawning habitat. This PCE would not change as a result of this project and therefore will have a **neutral effect** on spawning sites**.**

Freshwater Rearing Sites: Rearing habitat is marginal in Still Creek within the Action Area. Large wood levels are impaired and off-channel habitat is limited as a consequence. Large, deep pool habitat for adult steelhead is marginal. Temperature metrics for adults and juveniles are excellent. This project would not result in any negative effect to this PCE, although there would be site scale effects they would not be realized in critical habitat. This project would not result in any loss to the total available habitat for juvenile steelhead. No change in floodplain connectivity is expected. (**neutral effect).**

Freshwater Migration Corridors: The Highway 26 crossing is a significant barrier to steelhead migration in the Action Area. However, there are no flow or temperature barriers and Still Creek provides adequate stream flow and water quality to provide passage. This PCE would not be affected by the project because no project activity would create any artificial barriers to listed fish within the action area (**neutral effect**).

VII. ESA Effect Determination and Critical Habitat

The analysis of potential effects to LCR winter steelhead using a habitat approach was discussed in detail in the previous section. All indicators had a summary determination of Insignificant or or Discountable. No direct effects were identified to listed fish or critical habitat. Sediment indicators were greater than insignificant due to the potential for high turbidity resulting from the Bike Park construction and operation but were offset by the overall reduction in sediment related to the watershed restoration project elements (Table 12). The following table describes the baseline conditions observed in Still Creek, which is the only sub-watershed where ESA listed fish are present within the Action Area.

Table 12. Summary of baseline habitat conditions in Still Creek and the effect each project element will have on those conditions with a summary of effects to LCR winter steelhead and critical habitat.

		Temperature	Turbidity-DO	Chemical	Barriers	Substrate	LWD	Pool Freq.	Large Pools	Off-Channel	Refugia	Width/Depth	Streambank	Floodplain	Flows	Drainage Net.	Road Density	Disturbance	Riparian	Regime	PCE - Forage	Direct Effects
Baseline		P	N	R	N	N	N	N	N	N	N	R	P	R	P	R	N	R	R	R		
Element Summary	Const.	D	-	D	D	-	-	-	-	D	D	-	D	D	D	-	-	-	-	D		
	Oper.	D	-	D	D	-	-	-	-	D	D	-	D	D	D	-	-	-	-	D		
	Rest.	D	+	D	D	+	D	+	+	D	D	D	D	D	D	+	+	+	D	D		
Indicator Summary	Effect on Steelhead	**D**	**I**	**D**	**D**	**I**	**I**	**I**	I	D	D	I	D	D	D	I	**I**	**I**	**I**	**D**		

P = Properly Functioning, R = At Risk, N = Not Properly Functioning; Nu = Neutral, No Effect,
D = Discountable Effect, I = insignificant effect, >I = greater than insignificant effect, - = Negative Effect, + = Positive Effect

The AP provides a dichotomous key which is utilized to reach the appropriate ESA effect determination. Utilizing the indicator summaries from Table 7 the key provided an effect determination of **Not Likely to Adversely Affect** (NLAA) LCR steelhead individuals and Critical Habitat (Table 13).

Table 13. ESA Effects Determination dichotomous key.

AP Project Effects Determination Key For Species and Critical Habitat	
1) Do any of the indicators summaries have a positive or negative conclusion?	
X	Yes - Go to 2
	No – No Effect
2) Are the indicator summary results only positive?	
	Yes – NLAA
X	No – Go to 3
3) If any of the indicator summary results are negative, are the effects insignificant or discountable?	
X	Yes – NLAA
	No – LAA, fill out Adverse Effects Form

The project was design elements and PDC's minimize any negative effects to listed and sensitive species. Some of the project elements will have minor negative effects, but these effects will likely only effect indicators at the site scale. Effects to habitat occupied by steelhead will be mostly insignificant or discountable. Greater than insignificant effects to the sediment and substrate indicators are expected but will be offset by watershed restoration activities. Overall, these greater than insignificant effects will be insignificant at the watershed scale. The effects to Critical Habitat for LCR winter steelhead will be similar to the habitat effects described in this BA. No direct effect to winter steelhead individuals were identified.

VIII. Aggregated Federal Effects

We are not aware of any proposed federal actions for which a Biological Assessment has been submitted contemporaneously with this BA for ESA consultation, which would affect the ESA action area for this project. All ongoing actions with potential adverse effects (where ESA consultation has been concluded), and effects of completed federal actions, are included in the environmental baseline for each indicator and have been considered in this analysis.

IX. **Cumulative Effects**

Endangered Species Act cumulative effects are the future effects of state, tribal, local, and private actions that are reasonably certain to occur within the action area associated with the federal action. A full description of cumulative effects for all alternatives is found in Table 14. Findings relevant to aquatic fauna and habitat are summarized below.

Table 14. Summary of cumulative effects to aquatic fauna and habitat for all alternatives. Effects are based on description in the column titled "Extent, Detectable?"

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species and Stream Habitat Effects
		Time	Space			
Ongoing Road Maintenance (Westleg, Timberline Road, Hwy 26)	Suspended Sediment	Yes	Yes	Not Measurable	An overlap in time and location exists with these road networks and the trails project. There is both short-term introduction of fine sediment that may mix with the fine sediment from the down-hill trail project. Some of the high-risk areas are in Still Creek at the Jeff Flood chair-lift. Project elements and PDC's have been designed to mitigate effects so they are insignificant or discountable.	Potential for cumulative effects to fish is expected to be localized with a potential for some sediment avoidance behavior. Aquatic invertebrate species may have low levels of short-term negative stream conditions. Except for culvert replacements and some road reconstruction, mitigation measures reduce the amount of sediment delivered to streams and affecting aquatic resources to a level that is not measurable and is insignificant, and have a low risk of cumulative effects.
USFS Trail Ongoing Maintenance (Glade Trail, Alpine Trail, Timberline to Town Trail)	Suspended Sediment	Yes	Yes	Not Measurable	There may be an overlap in timing and location of these projects with the bike park project; these projects have a chance of some short-term introduction of fine sediment that may mix with fine sediment from the bike park project. Some of the high risk areas would be in Still Creek and West Fork Salmon River. Other listed projects have a low risk of cumulative effects due to implementation of mitigation and project design criteria that minimize erosion and sediment input.	Potential for cumulative effects to fish is expected to be localized with a potential for some sediment avoidance behavior. Aquatic invertebrate species may have low levels of short-term negative stream conditions. Project elements and PDC' reduce the amount of sediment delivered to streams and affected aquatic resources to a level that is not measurable and is insignificant, and have a low risk of cumulative effects.
	Trail	Yes	Yes	No	No cumulative effects are	None

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species and Stream Habitat Effects
		Time	Space			
	Equipment Related Chemicals				expected due to mitigation measures and design criteria implementation, conformance with existing standards and guidelines on the existing projects.	
New Trail Construction (Timberline to Town)	Suspended Sediment	Yes	Yes	Not Measurable	Some projects are completed so there are no remaining sediment effects due to natural recovery. Other ongoing projects on adjacent private land such as road maintenance and vegetation manipulation have a chance of some short-term introduction of fine sediment that may mix with minor fine sediment from the Bike Park project.	Potential for cumulative effects to fish is expected to be localized with a potential for some sediment avoidance behavior. Aquatic invertebrate species may have low levels of short-term negative stream conditions. Project elements and PDC' reduce the amount of sediment delivered to streams and affected aquatic resources to a level that is not measurable and is insignificant, and have a low risk of cumulative effects.
	Trail Equipment Related Chemicals	Yes	Yes	No	No cumulative effects are expected due to mitigation measures and design criteria implementation, conformance with existing standards and guidelines on the existing projects.	None
Misc. Tree Salvage (Hazard Trees)	Suspended Sediment	Yes	Yes	Not Measurable	There may be an overlap in timing of this project with the bike park project; any minor suspended sediment would not be measurable due to implementation of mitigation measures and design criteria and conformance with existing standards and guidelines in the	Any cumulative effect would be of minor magnitude due to the localized, minor impact of miscellaneous tree salvage when overlapped with effects of the bike park project. Any effects to aquatics would be minor and not be measurable.

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species and Stream Habitat Effects
		Time	Space			
					projects.	
	Riparian Habitat loss	Yes	Yes	No	Project elements and PDC's are in place to ensure that riparian reserves are not impacted by either project	None
Ski Area Operations	Suspended Sediment	Yes	Yes	Not Measurable	The loss of riparian buffers, the development of road networks, and the clearing of vegetation for ski slopes has increased both the short and long-term introduction of fine sediment that may mix with fine sediment from the bike park project. The highest risk of this would be in Still Creek and West Fork Salmon as those sub-watersheds are most heavily impacted by the ski area. Long-term restoration of a more natural sediment regime should occur as mitigation measures and design criteria identified in the EA is implemented.	Potential for cumulative effects to fish is expected to be localized with a potential for some sediment avoidance behavior. Aquatic invertebrate species may have low levels of short-term negative stream conditions. Project elements and PDC' reduce the amount of sediment delivered to streams and affected aquatic resources to a level that is not measurable and is insignificant, and have a low risk of cumulative effects.
Ongoing maintenance and management of Jeff Flood base area	Suspended Sediment	Yes	Yes	Yes	There may be an overlap in timing and location of these projects with the Bike Park project; these projects have a chance of some short-term introduction of fine sediment that may mix with fine sediment from the Bike Park project. Some of the high risk areas would be in Still Creek and West Fork Salmon River due to their close proximity to this project.	Potential for cumulative effects to fish is expected to be localized with a potential for some sediment avoidance behavior. Aquatic invertebrate species may have low levels of short-term negative stream conditions. Project elements and PDC' reduce the amount of sediment delivered to streams and affected aquatic resources to a level that is not measurable and is insignificant, and have a

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species and Stream Habitat Effects
		Time	Space			
						low risk of cumulative effects.
	Equipment Related Chemicals	Yes	Yes	No	No cumulative effects are expected due to mitigation measures and design criteria implementation, conformance with existing standards and guidelines on the existing projects.	None
ODOT Winter Sand & Plowing	Suspended Sediment	Yes	Yes	Not Measurable	There may be an overlap in timing of this project with the Bike Park project; significant, measurable sediment is resulting both in the short term and long term as a result of winter sanding and plowing throughout the Action Area and is negatively impacting both LCR winter steelhead/critical habitat as well as Region 6 Sensitive macro-invertebrates which are assumed or known to inhabit the Action Area.	Potential for cumulative effects to fish is expected to be localized with a potential for some sediment avoidance behavior. Aquatic invertebrate species may have low levels of short-term negative stream conditions. Project elements and PDC' reduce the amount of sediment delivered to streams and affected aquatic resources to a level that is not measurable and is insignificant, and have a low risk of cumulative effects.
	Road Equipment Related Chemicals	Yes	Yes	No	No cumulative effects are expected due to mitigation measures and design criteria implementation, conformance with existing standards and guidelines on the existing projects.	None
Timberline Lodge Waterline Replacement	Suspended Sediment	No	Yes	Not Measurable	There may be an overlap in timing of these project effects with the Bike Park project. Any minor suspended sediment may slightly slow the recovery resulting from restoration	Potential for cumulative effects to fish is expected to be localized with a potential for some sediment avoidance behavior. Aquatic invertebrate species may have low levels of

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species and Stream Habitat Effects
		Time	Space			
					project implementation, but this would not be measurable due to implementation of mitigation measures and design criteria and conformance with existing standards and guidelines in the projects.	short-term negative stream conditions. Project elements and PDC' reduce the amount of sediment delivered to streams and affected aquatic resources to a level that is not measurable and is insignificant, and have a low risk of cumulative effects.
	Equipment Related Chemicals	Yes	Yes	No	No cumulative effects are expected due to mitigation measures and design criteria implementation, conformance with existing standards and guidelines on the existing projects.	None
East Leg Road Decommissioning	Suspended Sediment	Yes	Yes	Not Measurable	There may be a spatial and temporal overlap of effects of this project with the Bike Park project. Any minor suspended sediment may slightly slow the recovery resulting from restoration project implementation but this would not be measurable due to implementation of mitigation measures and design criteria and conformance with existing standards and guidelines in all projects on National Forest.	Potential for cumulative effects to fish is expected to be localized with a potential for some sediment avoidance behavior. Aquatic invertebrate species may have low levels of short-term negative stream conditions.

X. Determination of Effect
Determinations for the Proposed Action were made as a result of analysis at both fifth-field watershed scale (Salmon River, Zigzag River) and sixth-field watershed scale (Still Creek, West Fork Salmon River, Glade and Sand Canyon). The checklist for *Documenting Environmental Baseline and Effects of Proposed Action(s) on Relevant Indicators* was consulted for this project and a cumulative effects analysis was completed.

There will be measurable change from baseline conditions resulting from implementation of this project which may affect critical habitat and associated listed fish species, as well as Region 6 Sensitive aquatic macroinvertebrate species. Our review of potential impacts to listed species and/or their critical habitat found that project elements relating to the operation and maintenance of the Bike Park would significantly increase sediment, turbidity and embededness, and road (trail) density within critical habitat for LCR winter steelhead. Those same project elements would also increase the stream drainage network. Additional habitat element impacts were documented as a result of construction activities. To mitigate for these adverse effects to habitat, a suite of watershed restoration actions were identified as part of the project action. These mitigation measures include; reducing the existing road network through decommissioning or conversion of road to trail, improving road surfaces, storm-proofing ditch-lines, and a host of PDC's identified to ensure that the Bike Park is constructed and operated in ways that will reduce sediment related impacts.

Our analysis found the magnitude and duration of sediment related impacts would be strongly influenced by the soil moisture conditions present during construction/operation of the Bike Park. The sediment model predicted a range of sediment delivered to the stream as a result of soil-moisture conditions. Under "dry" conditions, the amount of sediment generated annually was easily offset (two times) by the watershed restoration actions. Operations outside of "dry" conditions would result in both short and long-term fine sediment delivery to Still Creek and the West Fork Salmon. As a result, specific monitoring and operating PDC's were developed to ensure that the Bike Park operated only under "dry" conditions.

Therefore, the proposed actions **"May Affect, Not Likely to Adversely Affect"** listed fish species and critical habitat and

Surveys for the rare and uncommon Scotts appatanian caddisfly were conducted as part of this project as their only known location in Oregon is in streams near Timberline Lodge. This species was found in multiple sampling sites within the project area in the West Fork Salmon River but was not observed in adjacent sampling sites in Still Creek. In addition, suitable habitat is present for Columbia duskysnail and Redband Trout and both species are therefore assumed to be present.

Project elements and design criteria are in place that would greatly minimize, if not eliminate, effects to habitat or individuals in each of the four sub-watersheds. Therefore, the proposed actions "**May Impact Individuals or Habitat"** Forest Service Special Status Species which are known/assumed to be present.

The following discussion summarizes effects to ESA listed fish, their critical habitat, Regional Forester's Sensitive aquatic species, and Essential Fish Habitat for all project elements (Table 15). A brief rationale is given for each.

Table 15. Effects determination summary for proposed action for ESA listed fish and designated critical habitat, Regional Forester's Special Status Species, and Essential Fish Habitat.

	Date of Listing & Critical Habitat	Critical Habitat Present	Species Present	Effects of Actions	
Endangered Species Act Listing by ESU/DPS ***Threatened***				**Construction**	**Operation**
Lower Columbia River steelhead & CH (*Oncorhynchus mykiss*)	1/06 9/05	Y	Y	NLAA	NLAA
Lower Columbia River Chinook & CH (*Oncorhynchus tshawytscha)*	6/05 9/05	N	N	NE	NE
Columbia River Bull Trout (*Salvelinus confluentus*)	6/98	N	N	NE	NE
Lower Columbia River coho *(Oncorhynchus kisutch)*	6/05	N/A	N	NE	NE
Southern DPS Smelt (*Th. Pacificus*)	3/10	N/A	N	NE	NE
Regional Forester's Special Status Species List					
Interior Redband Trout *(Oncorhynchus mykiss spp.)*	7/04	Y*	Y	MIIH	MIIH
Columbia duskysnail *(Colligyrus sp. nov. 1)*	1/08	Y*	Y	MIIH	MIIH
Barren Juga *(Juga hemphilli hemphilli)*	1/08	N	Unk	NI	NI
Purple-lipped Juga *(Juga hemphilli maupinensis)***	1/08	N	Unk	NI	NI
Scott's Apatanian Caddisfly *(Allomyia scotti)*	1/08	Y*	Y	MIIH	MIIH
Essential Fish Habitat		N/A	N	NAA	NAA

*Suitable habitat exists within the Action Area for this species.

Endangered Species Act Abbreviations/ Acronyms:		**Essential Fish Habitat Abbreviations/ Acronyms:**	
NE	No Effect	NAA	Not Adversely Affected
NLAA	May Affect, Not Likely to Adversely Affect	AE	Adverse Effects
LAA	May Affect, Likely to Adversely Affect		
Regional Forester's Sensitive Species List Abbreviations/ Acronyms:			
Unk	Species presence unknown but suspected		
NI	No Impact		
MIIH	May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing loss of viability to the population or species		

Federally Listed Species & Designated Critical Habitat (NMFS)

Suitable habitat for Lower Columbia River (LCR) steelhead trout exists within and downstream of the Project and Action area in Still Creek. Suitable habitat for (LCR) Chinook and LCR coho salmon does not exist within the Action Area but is present downstream in the Salmon River and Zigzag River Watershed. Sediment, stream drainage network increases, and disturbance of riparian reserves would be the most likely avenue of potential effects. However, For this reason the proposed action **"May Affect,**

Not Likely to Adversely Affect" LCR steelhead trout and designated crticial habitat, and will have **"No Effect"** to LCR coho salmon, LCR Chinook salmon and associated designated critical habitat.

Federally Listed Species (USFWS)

Although bull trout have been found in neighboring basins (Willamette River and Hood River) and isolated occurrences of adult bull trout have been reported in the lower Sandy River basin, there is no substantiated historical or present evidence that bull trout populations reside in the Upper Sandy River Watershed. For this reason, the proposed action will have **"No Effect"** on bull trout or its critical habitat.

Forest Service Region 6 Regional Forester's Special Status Species

Redband Trout
On the Zigzag Ranger District, Redband trout are suspected to be present in the Upper Sandy River Watershed. Habitat may exist for Redband trout at some of the projects sites on small-medium sized streams. Silted water and disturbance would be the most likely avenue of potential effects. Project elements and design criteria are in place that would greatly minimize, if not eliminate, effects to habitat or individuals in each of the four sub-watersheds. Thus, this project "**May Impact Individuals or Habitat"** but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species.

Columbia Dusky Snail
Suitable habitat for the Columbia Dusky Snail is present in the Action area and therefore this snail is assumed to be present. Silted water and disturbance would be the most likely avenue of potential effects. Project elements and design criteria are in place that would greatly minimize, if not eliminate, effects to habitat or individuals in each of the four sub-watersheds. Thus, this project "**May Impact Individuals or Habitat"** but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species.

Barren Juga
Habitat for the Barren Juga is low elevation; cold, pure, well-oxygenated water in springs and small-medium streams and therefore, this snail species is not expected to be present in the Action area. Thus, this project will have "**No Impact"** for individuals or habitat of the Columbia Dusky Snail.

Purple-lipped Juga
Habitat for the Purple-lipped Juga is low elevation; cold, pure, well-oxygenated water in large streams and therefore, this snail species is not expected to be present in the Action area. Thus, this project will have "**No Impact"** for individuals or habitat of the Columbia Dusky Snail.

Scott's Apatanian Caddisfly
Surveys for the rare and uncommon Scotts appatanian caddisfly were conducted as part of this project as their only known location in Oregon is in streams near Timberline Lodge. This species was found in multiple sampling sites within the project area in the West Fork Salmon River but was not observed in adjacent sampling sites in Still Creek. Project elements and design criteria are in place that would greatly minimize, if not eliminate, effects to habitat or individuals in each of the four sub-watersheds. Therefore, the proposed actions "**May Impact Individuals or Habitat"** Scott's appatanian caddisfly.

MIS effect language goes here

XI. Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance essential fish habitat (EFH) for those salmon species regulated under a Federal fisheries management plan. The Pacific Fisheries Managedment Council (PFMC) has recommended an EFH designation for Pacific salmon fishery that would include those waters and substate necessary to ensure the production needed to support a long-term sustainable fishery.

Salmon fishery EFH includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to the three salmonid species identified under the MSA, coho salmon, Chinook and Puget Sound pink salmon in Washington, Oregon, Idaho, and California, except above impassable barriers identified by PFMC (PFMC 1999). Salmon EFH excludes areas upstream of longstanding naturally impassable barriers (i.e. natural waterfalls in existence for several hundred years).

EFH is commensurate with critical fish habitat where designated. If critical habitat has not been designated then the action agency defines the extent of EFH based on known or suspected fish distribution. There is no EFH in any of the streams within the Action Area as coho and Chinook are not present.

/s/ Kathryn Arendt

KATHRYN ARENDT
Fisheries Biologist
Zigzag Ranger Districts

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Appendix A

Project Design Criteria

PDC #	Project Design Criteria (PDC)	Construction or Operation?
	Monitoring (Mon)	
Mon-1	The Forest Service Permit Administrator will monitor construction and operations on regular basis and will have the authority to provide direction and/or take action if construction or operations are not conducted according to the project design criteria.	Both
Mon-2	RLK would provide a written annual report to the Forest Service detailing any trail damage, soil erosion, vegetation trampling, wildlife issues, "rogue riders," user conflicts, successes and issues, and restoration efforts in the mountain bike park. The Forest Service would review the report and, if need be, work with RLK to institute needed changes in the management of the mountain bike park.	Both
	Heritage Resources (Her)	
Her-1	Trails and trail terrain features would be sited to be the least visible from West Leg Road, allowing for consideration of riparian protection.	Both
Her-2	No new man-made openings would be created for this project. Trail crossings would utilize naturally occurring or previously created clearings/openings.	Construction
Her-3	No cutting of trees larger than 6" dbh would occur along West Leg Road.	Both
Her-4	Historic culverts would be avoided; no trails would be placed adjacent to culvert locations.	Construction
Her-5	No treated lumber would be used for terrain features.	Both
Her-6	Vegetative screening, to the extent possible, would be utilized to lessen any visual impacts associated with the proposed development.	Both
Her-7	Deleted	

Her-8	As specified in the Signage Plan (see Rec-6), bike trail signs or any types of barriers along West Leg Road would be compatible with the character and design of the historic roadway. Wood posts or stone barriers are compatible options.	Both
Her-9	Wood or stone barriers would be used to delineate the skills park.	Both
Recreation (Rec)		
Rec-1	Parallel trails would be joined into one trail prior to crossing West Leg Road. Mountain bikers would enter each crossing through a chicane which would slow the rider down and give him/her clear sight lines down and up the road for at least 50 yards. Signage would be placed to warn mountain bikers and motorists of trail crossings over the road.	Both
Rec-2	Bike trail crossings of Forest Service trails and West Leg Road would include the use of chicanes (i.e., S-curves) and uphill grades to reduce the speed of bikers as they cross the road.	Construction
Rec-3	Bike trail crossings of Forest Service trails and West Leg Road would include signage directing bikers to stay on designated bike trails.	Operations
Rec-4	Forest Service trails and West Leg Road would include signage at bike trail crossings and throughout the bike park to warn trail users/motorists of the presence of cyclists and trail crossings.	Operations
Rec-5	A Spectator Management Plan would be prepared by RLK and approved by the Forest Service to address the management of spectators during different types of mountain bike park events. The plan would address the following: • Spectator viewing areas would be located in existing disturbed areas; location of viewing areas would be dependent on the event type and location (e.g., skills park or specific bike trail). • Defining spectator areas with rope, fencing, or other similar means. • Access corridors for spectators via West Leg Road, or other roads and trails. • Preventing spectator access to sensitive areas such as wetlands, meadows, subalpine-timberline environments, and designated riparian areas. • Restroom facility location (Porta Potties not allowed	Operations

	at the bottom terminal of the *Jeff Flood* chairlift.) The Forest Service Permit Administrator would review each upcoming event with RLK to assess spectator locations and access. The Forest Service Permit Administrator would review the site after each event to assess the success of the Plan and provide direction to RLK to address issues for future events.	
Rec-6	A signage Plan would be prepared by RLK and approved by the Forest Service prior to the installation of bike park signs, Forest Service trail signs, and signs along West Leg Road.	
Rec-7	The Glade Trail conversion from road to trail would meet Forest Service standards for trail construction as contained in the Forest Service Manual and Handbook. A qualified trails designer would oversee the trail layout and design and the final design would be approved by the Forest Service Permit Administrator. Trail maintenance for the converted Glade Trail within the Timberline SUP area would be carried out by RLK. The converted section of the Glade Trail would meet the Forest Wide Standards and Guidelines on page Four-115 and 116 of the Forest Plan for visual quality within five to ten years of conversion activities. Any new trail that is not converted on the road bed (e.g., new switchbacks in the trail that extend outside of the existing road bed) should meet standards within one year of construction.	Construction
Soil Resources (Soil)		
Soil-1	Stabilization of mountain bike trail surface would be accomplished through a combination of rock armoring and wooden features or other similar protective measures. Any rock used for armoring would be sourced from either the bike park/ watershed restoration construction limits or from an approved offsite source. No quarrying of rock materials would take place.	Both
Soil-2	The spacing of surface water control structures along the length of the bike trail network would be per Forest Service Handbook guidelines at a minimum. The spacing of surface water control structures (e.g., grade reversals, drain dips, water bars) along mountain bike trails within 200 feet of a stream crossing would be no less than 50 feet to minimize extension of the stream drainage network and to minimize sediment delivery to riparian reserves. Water bar placement along decommissioned roads would be determined in the field	Construction

	based on site conditions and approved by the Forest Service Permit Administrator.	
Soil-3	Wood features (e.g., ladder bridges, boardwalks), native soil causeways, and/or rock armoring would be incorporated into mountain bike trails to avoid impacting sensitive resources such as unstable soils, tree roots, vegetation, and wet areas Wood materials would be sourced from local suppliers and would be free of invasive species.	Both
Soil-4	Additional surface water controls, rock armoring, wooden features, or other acceptable measures would be installed on trails that exhibit unacceptable erosion.	Both
Soil-5	Bike park staff (RLK) would monitor trail conditions throughout the hours of operation on a daily basis to ensure that erosion or sediment mobilization away from the trail corridor is not occurring and/or to implement corrective action in accordance with the project design criteria.	Both
Soil-6	A Travel Route Plan would be required and included in the SWPCP/Construction Plan for the project to minimize compaction of soils by limiting equipment to designated travel-ways (e.g., existing roads, bike trails that are under construction) as approved by the Forest Service .	Construction
Soil-7	All exposed mineral soil not included in bike trail treadwidth would be mulched with certified weed-free Woodstraw or equivalent at a rate to achieve 70% ground cover (approximately 7 tons per acre) or mulched with a certified weed-free straw, at approximately 3,000 pounds per acre and seeded with approved seed at a predetermined rate. Application rates would be validated and verified in the field to ensure that mulch application is not too sparse or too excessive.	Construction
Soil-8	Temporary erosion and sediment control measures (e.g., plastic sheeting, mulching) would be in place prior to the end of each work day or prior to any rain event (as defined by when the National Weather Service, or other accepted source, predicts a 50% or higher chance of measurable precipitation for the local area).	Construction
Soil-9	The bike park staff (RLK) would patrol the park on a daily basis to ensure that re-vegetated areas are not disturbed, or to remedy disturbance to re-vegetated areas	Both

	(see also Soil-5). Project areas with any ground disturbance would be surveyed annually to ensure success of re-vegetation efforts. If seeding or other re-vegetation efforts are not successful in re-vegetating disturbed areas, the Forest Service Permit Administrator would be contacted and a site-specific, alternative, re-vegetation solution would be developed.	
Soil-10	In cleared areas, topsoil would be carefully removed and stockpiled for placement onto the cleared area outside of the trail tread width. During construction, topsoil would be carefully stored using approved erosion and sediment control methods. Additional measures (e.g., plastic covering) to cover exposed soils would occur during inclement weather. Excess topsoil from trail construction may be hauled to other construction/restoration sites for placement.	Construction
Soil-11	RLK would install a rain gauge near the middle elevation in the bike park. The rain gauge would be accessible and monitored by RLK and the Forest Service via the internet. Earth-disturbing operations (construction and/or bike park operations) would be suspended if there is more than 1inch of rain in a 24-hour period and/or the Bull Run River above the reservoirs exceeds 200 cubic feet per second (suggesting a rise in base flows in the watershed). Operations would remain suspended until the Bull Run River drops below 200 cubic feet per second and there is less than 1 inch of rain in a 24-hour period or onsite conditions are dry enough to allow operation. Prior to suspending all bike park operations, the Forest Service Permit Administrator may decide to close certain trails, or portions of trails, to allow continued operation of the bike park in locations where trail conditions are dry enough for operation and there is no risk of sediment delivery to the stream system. (See also Soil-5)	Both
Soil-12	Stockpile areas, temporary roads, and other areas where soil compaction has occurred from this project would be ripped or scarified prior to the start of re-vegetation.	Construction
Soil-13	Activities for the season would be suspended if soil moisture is recharged and stream flows rise above baseflow levels and are predicted to stay above baseflow levels (i.e., 200 cfs in the Bull Run River, upstream of the reservoirs) and/or if onsite conditions warrant closure of the park. (See also Soil-11).	Both

Vegetation (Veg)		
Veg-1	All mountain bike trails would be designed to avoid the cutting of trees with a diameter at breast height (dbh) greater than 6" to reduce impacts to upland forest and riparian reserves. No whitebark pine would be cut. Bike park trails would be routed around large trees and, where possible, around the roots of larger trees to prevent damage to tree roots. (See also Soil-3).	Construction
Veg-2	Clearing limits for bike park trail, including any trees greater than 6"dbh that cannot be avoided, would be reviewed in the field and approved by the Forest Service Permit Administrator.	Construction
Veg-3	If any new populations of special-status plant species are encountered during the construction process, work would be suspended in that area until the Forest Service Permit Administrator is consulted.	Construction
Veg-4	Clean heavy equipment either: A) prior to arrival on MHNF, to prevent the introduction of invasive plant seed or other vegetative propagules (e.g., stem and root fragments). The contract administrator or project activity coordinator would inspect all project equipment before it is allowed to operate at the project site. The equipment should be free of soil clumps and vegetative matter or other debris that could contain or hold seeds or other vegetative propagules. Cleaning of the equipment would include pressure washing and should be done outside of the National Forest boundary; or B) a self-contained heavy equipment cleaning station may be set up at the project site, for cleaning the equipment thoroughly in order to remove soil clumps and vegetative matter or other debris that could contain or hold weed seeds.	Construction
Veg-5	If gravel, soil, or wood is imported from outside the project area, it should be determined to be from a source approved by the Forest Service Permit Administrator, who will consult with the MHNF botanist to determine if the soil, gravel, or wood is free of invasive species.	Construction
Veg-6	Survey project areas with any ground disturbance or vehicular traffic annually, during the time of year when invasive non-native plants, including noxious weeds, are identifiable. Long-term control must include periodic removal of any invasive non-native plant species and reporting of their presence and exact location (UTM coordinates in NAD-83 datum), when found, to the	Both

	Forest Service Permit Administrator, who will consult with the MHNF Forest botanist within one month of finding.	
Veg-7	Avoid daylighting the trail by protecting overstory vegetation and defining the limits of the bike trails with vegetation, wood, rocks, or other native materials.	Both
Veg-8	Aggressively treat invasive plants by manual control or with herbicides. The Forest Service Permit Administrator will consult with the MHNF botanist on which method works best for which species.	Operations
Veg-9	Bike park staff (RLK) would monitor trail conditions throughout the hours of operation on a daily basis to ensure that unauthorized trails or terrain features are not created by riders.	Operations
Veg-10	RLK would prepare a Plant Salvage Plan in conjunction with the Forest Service. The plan will be approved by the Forest Service prior to construction. The plan will identify methods (outlined in the botany specialist report) and locations for the salvage of whole plants from proposed trails in advance of trail construction. The plan will also identify transplant locations for re-planting once construction is completed (e.g., areas along trails where excavated material has been sidecast, in restoration projects, or in sparsely vegetated areas in adjacent ski runs). The objective is to make use of (i.e., salvage) plants in the area that would needlessly be destroyed during trail construction.	Construction
Veg-11	Vegetation transplanting would be carried out as described in the section “Plant Propagation & Restoration” in the botany specialist report.	Construction
Veg-12	Collect seed from native plants in the special-use permit area and propagate seedlings from this seed in a nursery for restoration of disturbed areas in subsequent years. Directly sow collected seed in disturbed areas for those species for which this method is effective. Consult with Mt. Hood National Forest botanist for details.	Construction

Veg-13	Use only native plant materials (seed, transplants, seedlings, divisions, cuttings) collected locally on the Mt. Hood National Forest. If supplies of locally collected native seed (e.g., mountain brome, blue wildrye grass) are low and erosion control or restoration of disturbed areas is urgent, use annual ryegrass (*Lolium perenne* ssp. *multiflorum*), which is a nonpersistent nonnative grass species, or a mix of native species mixed with annual ryegrass.	Construction
Veg-14	Use GIS and GPS mapping technology and photopoints to provide an accurate and informative assessment of the impact of mountain bike riders on trails in the mountain bike park. Repeating the assessment at regular intervals (e.g., annually) can identify problems (e.g., trail widening, excessive soil disturbance, vegetation trampling, informal trails), document informal trails, and determine where re-vegetation or other remedies are needed. Include this information in the Annual Monitoring Report (see Mon-2).	Both
Veg-15	Through signage, educate riders about the environmental consequences of unauthorized trail development, about the benefits of low-impact riding practices (e.g., avoiding skidding on the trail, riding within established trail corridors, avoiding impacts to vegetation) and about invasive non-native plants and the potential for the transport of invasive plant seed or vegetative propagules on mountain bikers (e.g., tires, wheels, spokes, frame, pedals, shoes, clothing). Educate riders that dirt and mud on their clothes and shoes from riding elsewhere before coming to the Timberline downhill mountain bike park could harbor and spread invasive plant seed or propagules.	Operations
Veg-16	RLK would provide a cleaning station for mountain bikes near the proposed skills park in the Wy'East parking lot area and require that all riders coming to the bike park for the first time from riding elsewhere (outside the park) ~~to~~ clean their bikes of mud, dirt, and other debris, which could harbor invasive plant seeds or	Operations

	propagules.	
Veg-17	Open the mountain bike park each summer only after trails are snow-free and soils are not saturated. Snow drifts may be removed from the trails when the surrounding ground is snow-free, provided no earth or vegetation disturbance takes place.	Operations
Veg-18	Regulate access to trails and the skills park by use of physical barriers (e.g., boulders, fences, logs, vegetation).	Operations
Veg-19	Patrol for trash and clean up trash along trails and elsewhere in the mountain bike park.	Operations
Veg-20	Salvage plants currently occupying the proposed skills park and proposed bike park trails and transplant them in and around the historic Timberline Lodge. (See also Veg-11).	Construction
Veg-21	Confine soil disturbance around the skills park using entrances and barriers. Prevent soil disturbance and trampling/denudation of vegetation around and outside the skills park.	Operations
Wildlife (Wild)		
Wild-1	A review of proposed hazard tree removal along the Bike trails would be conducted by RLK and a Forest Service Permit Administrator prior to implementation. Hazard trees that must be felled would remain on site for habitat purposes. For example, if a tree is felled across a trail, cut out a section of the log to allow riders to proceed along the trail, but leave the rest of the log in place for the ecological/ecosystem functions it provides and to confine riders to the trail.	Both
Wild-2	If any nest, den, or reproductive sites of vertebrate species are discovered along a mountain bike trail, a Forest Service Permit Administrator would be consulted and measures to ensure reproductive success at the site would be negotiated. Factors such as rarity, likelihood of disruption or reproductive failure, and timing would be	Both

	considered.	
Wild-3	Mountain bike park operations would be limited to daytime use only (i.e., from one hour after sunrise to one hour before sunset) to minimize disturbance to nocturnal wildlife.	Both
Watershed Resources (WS)		
WS-1	Prior to construction, the Forest Service Permit Administrator and Forest Service specialists (watershed and/or fisheries) would walk the flagged trails with RLK to examine each proposed stream crossing and to determine the appropriate crossing type. Bridge length would span the distance 1.5 times bankfull width and no piers would be placed within this width. For higher-elevation, ephemeral streams, the Forest Service and RLK would apply the following criteria for placement of crossing structure (in order of most impactful to least): 1 – Use out-sloped ford, contoured native material and/or rock-fortified for all ephemeral channels with low-gradient approach (3-5%) 2 – Bridge all intermittent and perennial channels, and ephemeral channels with steep approach (>5%).	Construction
WS-2	No mountain bike trails would cross jurisdictional wetlands.	Construction
WS-3	Bike park patrol (RLK) staff would review the trails each day to locate wet soil areas or mud puddles. If the problem persists, the area would be crossed, if necessary, using a combination of raised mineral soil causeways, raised wooden boardwalks, and/or rock armoring.	Operations
WS-4	A Construction Plan and Stormwater Pollution Control Plan (SWPCP) would be prepared for each year of construction to guide decision-making by contractors, RLK staff, and Forest Service staff during construction.	Construction
WS-5	A spill prevention and response plan would be developed and included in the Construction Plan/SWPCP. No fuels or construction machinery would be stored within riparian areas.	Construction
WS-6	Deleted	

WS-7	Turns in bike trails would generally be in-sloped to drain toward the uphill into a sediment trap or into a pipe under the tread that discharges to a sediment trap.	Construction
WS-8	Sediment traps would be rock-fortified. Drainage pipes would be located at least three inches from the bottom of sediment traps to allow for sediment to settle out. Sediment basins would be sized to accommodate a minimum of two significant rain events (e.g., 1" in 24 hours) before maintenance is needed. The outlets of sediment traps would not release water directly to any water bodies.	Both
WS-9	During sediment trap maintenance, sediment that is cleaned out of sediment traps would be returned to the mountain bike trails.	Operations
WS-10	The skills park would include perimeter drainage diversion structures, drainage ditches, and a sediment basin to capture silt.	Both
WS-11	During construction activities, a soil and water protection coordinator would be assigned by RLK and assigned the following duties, to be documented in the SWPCP/Construction Plan: 1.) Oversee the implementation of the soil and water protection design criteria; 2.) Conduct or oversee daily site inspections to ensure effectiveness of soil and water protection design criteria; 3.) Oversee the maintenance of structural soil and water protection design criteria; 4.) Ensure that any changes to the construction site plans are addressed by coordinating with the Forest Service aquatics staff and insuring that any new soil and water protection design criteria are implemented; 5.) Coordinate job site activities with the RLK Project Manager, the Forest Service Project Coordinator, agency representatives, and contractors.	Construction
WS-12	Prior to construction, a National Pollutant Discharge Elimination System (NPDES) permit with an associated Erosion and Sediment Control Plan (ESCP) would be obtained if required under current regulations. The permit would be included in the SWPCP/ Construction Plan.	Construction
WS-13	An erosion control plan would be included in the	Construction

	SWPCP/ Construction Plan and approved by the Forest Service prior to earth-disturbing activities and the plan would be revised annually to minimize erosion.	
WS-14	Redundant erosion protection (such as two rows of silt fence, straw bales, and/or more permanent structures such as logs) would be provided between streams and construction areas close to stream channels.	Construction
WS-15	No access corridors, staging areas, spoils piles, or other construction-related materials would be staged or stored within riparian reserves.	Construction
WS-16	Stream turbidity would be monitored during construction in a manner that allows for evaluation of the effects of the project on turbidity (e.g., monitoring above and below construction, paired stream monitoring). If an increase in turbidity, as a result from project operations, exceeds 10 Nephelometric Turbidy Units (NTU's) for a period exceeding 30 minutes, operations would cease until a plan has been developed and approved to address the cause of increased turbidity. Operations would cease immediately if turbidity is over 100 NTU's and would not resume until a plan has been developed and approved to address the cause of increased turbidity.	Construction
WS-17	A water quality monitoring plan would be included in the SWPCP/Construction Plan and would be updated annually assessing project activities. At a minimum Still Creek and West Fork Salmon River would be monitored in the vicinity of the project.	Both

Appendix B

Survey for Sensitive Aquatic Invertebrate Species in Tributaries of Still Creek and the West Fork Salmon River in the Vicinity of Proposed Mountain Bike Trails for the Timberline Lodge Winter Sports Area, Mount Hood, Mount Hood National Forest, Oregon, August 9-10, 2010.

For: Zigzag Ranger District, Mount Hood National Forest, 70220 East Highway 26, Zigzag, OR, 97049, Kathryn Arendt, Fisheries Biologist, karendt@fs.fed.us

By: Aquatic Biology Associates, Inc., 3490 NW Deer Run Street, Corvallis, OR 97330, Robert Wisseman, Senior Scientist, bobwisseman@mac.com

The Timberline Lodge Ski Area has proposed the construction of mountain bike trails on public land in the current Timberline Lodge Winter Sports Area, between elevations of about 4500-6000' on slopes drained by headwater tributaries of Still Creek and the West Fork Salmon River. The potential of these trails to increase sedimentation in perennial stream channels is of concern, both to downstream fisheries and to sensitive aquatic invertebrate species that may be in the project area.

Robert Wisseman of Aquatic Biology Associates, reviewed sensitive species lists maintained by The Interagency Special Status/Sensitive Species Program (ISSSSP of the Forest Service and Bureau of Land Management http://www.fs.fed.us/r6/sfpnw/issssp/agency-policy/) and determined that the following aquatic invertebrates listed as **Sensitive** or **Strategic** could be found within the project area based on near-by collection records and best professional judgment as to the likely habitat requirements of these species. The headwater tributaries in the project area are higher elevation Cascade Mountain streams, fed by snowmelt and have a year-round cold-water temperature regime. Sensitive aquatic invertebrate taxa found in Oregon and Washington not associated with this type of habitat are not listed below. However, the collection techniques employed during this survey are generally suitable for determining their presence.

Allomyia scotti, Scott's apatanian caddisfly, **Sensitive**. Collected in the vicinity of the project area. Larva of this distinctive species can be identified to the species level. It is thus far known only from Mount Hood.

Moselyana comosa, a caddisfly, **Strategic**. Collected at Camp Creek (unknown elevation), Still Creek at Still Creek Campground, and a tributary to the Salmon River (probably the West Fork near the Timberline Lodge Road). The genus is monotypic (single species) and larva can be identified to the species level. This species is patchily distributed montane areas of California, Oregon and Washington.

Oligophlebodes mostbento, tombstone prairie caddisfly, **Strategic**. Collected from high elevation streams in the Cascade Mountains from BC south to Lane County, OR, and in the northern Rocky Mountains of Montana. Larva can only be identified to the genus level.

Rhyacophila unipunctata, one-spot rhyacophilan caddisfly, **Strategic**. Collected from the Barlow Pass area of Mount Hood. The larva is unknown, but is in the Sibirica Group of the genus *Rhyacophila*. It is known only from a few collections in the high Cascade Mountains of Oregon.

Pristinicola hemphilli, pristine springsnail, **Strategic**. Collected at various sites around Mount Hood and in the upper Clackamas River, OR. Adults and juveniles can readily be identified to the species level. This species appears to be widely but patchily distributed in the Pacific Northwest.

Zigzag Ranger District personnel requested that this survey be sufficient to detect for the possible presence of Sensitive snail species in the genus *Juga*, particularly ***Juga hemphilli maupenensis***, purple-lipped juga, that have been found at lower elevations around Mount Hood.

Two other rare caddisfly species are known from collections near the project area. These species are currently not listed as Sensitive or Strategic but are considered by Robert Wisseman to be suitable candidates for listing. Both are known only from limited collections in higher elevation, cold-water streams in the Cascade Mountains and northern Rocky Mountains. Populations of these glacial relict species are isolated.

Allomyia cidoipes Schmid, 1968 (Trichoptera: Apataniidae). Previously collected from streams below Timberline Lodge. This species is patchily distributed in isolated , high elevation populations in the Cascade, Sierra Nevada and Northern Rocky Mountains.

Eobrachycentrus gelidae Wiggins, 1965 (Trichoptera: Brachycentridae), Mount Hood primitive brachycentrid caddisfly. This species was proposed as a candidate Endangered and Threatened species by the Fish and Wildlife Service in 1984 (Federal Register, May 22, 1984). This species was originally collected in streams below Timberline Lodge. It is a glacial relict found in the Cascade Mountains from BC south to Oregon.

Survey Area and Techniques

Four fisheries personnel from the Zigzag Ranger District and Robert Wisseman surveyed the headwater tributaries of Still Creek that are adjacent to the Timberline Express chairlift on August 9, 2010. Included in the survey were 2nd order branches of this tributary that flow just to the east and west of the chairlift and continuing south and downstream past their junction at about 4800' elevation into a 3rd order channel. Perennial springs and first order channels of both the East and West branches just to the north of the chairlift were also surveyed. Springs feeding numerous tributary channels all emerge around the 5000' contour about a 1000' to the north of the chairlift. Stream channels above this contour level are all seasonal snowmelt channels and were dry on August 9.

Zigzag Ranger District personnel were trained by Robert Wisseman to collect caddisflies and snails. They performed collections on the 2nd and 3rd order reaches of the Still Creek tributary. D-frame kick-nets were used to acquire multi-habitat kick net samples from about a 10 meter stream reach at each collection site. Samples were placed in white tubs and repeatedly elutriated with fresh stream water to separate organic material and invertebrates from mineral substrates. Mineral substrates were carefully checked for the presence of stone cased caddisfly larva and snails and then discarded. Sample organic material was then refloated in fresh stream water and any caddisflies or snails seen moving removed with tweezers and preserved. GPS coordinates at each collection site were taken when possible. Robert Wisseman collected spring and first order sites by the above method or by direct observation and picking from stream substrates. About 20 sites were collected on August 9th from the Still Creek headwater tributaries.

Tributaries to the West Fork Salmon River were surveyed using the same techniques and personnel on August 10, 2010. Springs and stream channels surveyed were in the vicinity of the spur road off the Old Timberline Road that accesses the pump house for the Timberline Lodge water supply. Multiple springs emerge from along the 5000-5100' contour in this area. Robert Wisseman surveyed springs and 1st order channels as above, while Zigzag personnel collected the 2nd and 3rd order channels to the south and east of the spur road and pump house. About 20 sites were collected on August 10th from the West Fork Salmon River headwater tributaries.

Survey Results

Stream reaches in the survey area traverse relatively recent volcanic terrain. Year-round water temperatures are cold. Mineral substrates are almost entirely sand and fine gravel. Cobbles and boulders are rare. Most stream reaches have moderate to dense shading from subalpine conifers and mountain alder. There are some open meadow and wetland areas, particularly just to the north of the spur road to the Timberline Lodge pump house. Coniferous detritus and woody material loading is high in most stream reaches. Aquatic mosses are abundant.

See Table 1.

No snails were found at any of the sites surveyed. Cold year-round water temperature combined with scour when sand and gravel is mobilized during spring snowmelt make stream reaches at these elevations unsuitable habitat for most aquatic snail species. Also, this terrain is shaped by relatively recent volcanic activity. Snail species with low dispersal capabilities may have not had time to colonize these stream reaches.

Allomyia scotti, **Scott's apatanian caddisfly,** a Region 6 Regional Forester's Special Status Sensitive Species was found at 7 sites in the West Fork Salmon River tributaries only. It was not found in the headwater tributaries of Still Creek. Presence in the West Fork Salmon River and apparent absence in the nearby Still Creek tributaries is curious. Habitat conditions of the two streams appear similar. This species is also more prevalent in the larger 2nd and 3rd order stream channels (5 of 7 collections). Most *Allomyia* species are associated with seeps, springs and first order channels.

Larva of ***Oligophlebodes mostbento***, tombstone prairie caddisfly, a **Strategic** species are undescribed. However, an unknown larval form of this genus was collected at one spring and 1st order site in the Still Creek drainage. It is an unknown larval form that is not the common species found in the Cascade Mountains (*Oligophlebodes minutus/sierra*).

Oligophlebodes mostbento is the only other species in the genus known from the general area, so this specimen may be this species.

A possible larva of ***Rhyacophila unipunctata***, one-spot rhyacophilan caddisfly, a **Strategic** species, was collected at a spring and first order stream channel site in the Still Creek drainage. The larva of this species is unknown, however it is in the Sibirica Group of the genus *Rhyacophila*. The larva collected is an unknown larval form in the Sibirica Group. *Rhyacophila unipunctata* is the only Sibirica Group species from the Mount Hood area for which the larval form is unknown and undescribed. Thus, this larva is possibly *Rhyacophila unipunctata*.

Moselyana comosa, a caddisfly, a **Strategic species**, was not found during the August 9-10, 2010 survey. However, the collection techniques used during this survey were inadequate to determine presence or absence. This is a small species found in organic detritus and moss of spring seeps. It is difficult to see with the naked eye. Laboratory extraction or sorting techniques are required to remove larva from substrates. There are many seeps in the project area that may provide suitable habitat for the species.

Eobrachycentrus gelidae, Mount Hood primitive brachycentrid caddisfly, previously but not currently listed as a **Sensitive** species, was found at two sites in the survey area, one in the Still Creek drainage, and one in the West Fork Salmon River tributary drainage. Both sites were springs and 1^{st} order spring channels. This is a glacial relict species that is very patchily distributed at higher elevations in the Cascade Mountains, and should probably be listed as a Sensitive or Strategic species.

Allomyia cidoipes, a caddisfly, not currently listed as a Sensitive species, was found at 3 sites in headwater channels and springs of the Still Creek drainage. Like all *Allomyia* species, this species is a glacial relict that is very patchily distributed at higher elevations, and should probably be listed as a Sensitive or Strategic species.

Risks

Considerable road building, water supply development, chairlift construction, and vegetation clearing for ski slopes has already occurred adjacent to and upslope of the headwater tributaries of Still Creek and the West Fork Salmon River that we surveyed. Each of these human activities increases fine sediment inputs to stream channels from the highly erodible volcanic soils in the area. These stream channels appear to naturally lack the hydraulic power or competence to effectively move fine sediment quickly downstream and erode down to bedrock. Thus, sand and fine gravel substrates dominate stream bottoms. Acceleration of fine sediment inputs from human activities may eventually cause sufficient habitat alteration to adversely impact populations of Sensitive or rare caddisfly species that are currently present.

Allomyia scotti, Scott’s apatania caddisfly, may be a truly rare species. So far it has only been collected from the West Fork Salmon River drainage on Mount Hood at elevations ranging from 3800 to about 5000’. The larva with its’ horned head is so distinctive that it can’t be missed. The results of this survey, i.e. presence of the species only in the West Fork Salmon River tributaries, and not in the Still Creek headwater tributaries, suggest that the habitat requirements for this species is very narrow. Perhaps it formerly occurred in the Still Creek tributaries. It seems evident that these Still Creek tributaries have already experienced a much greater level of human impact than seen in the West Fork Salmon River tributaries.

Unknown is how widely distributed Scott’s apatanian caddisfly is in the Mount Hood area. Collectors have always targeted the easily accessible stream crossings afforded by Highways 26 and 35, the Old and New Timberline Lodge Roads, and access at campgrounds like the Still Creek Campground. Other than these convenient stream crossings, little, if any, collecting or surveys have occurred to my knowledge in the 4000-5500’ elevation band around Mount Hood.