Aquatic ESA Listed Species Baseline Conditions Report

The Summit at Snoqualmie Master Development Plan

Prepared for:

U.S. Forest Service
Mt. Baker Snoqualmie National Forest

and

Booth Creek Resorts

Prepared by:

Jones & Stokes
11820 Northup Way, Suite E 300
Bellevue, WA 98005

In association with:

SE Group
3245 146th Place SE, Suite 360
Bellevue, WA 98007

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Table of Contents

1. Executive Summary 1
2. Introduction 3
3. Aquatic Habitat in the Summit at Snoqualmie MDP Vicinity 5
3.1. Upper Yakima Aquatic Habitat 5
3.1.1. Keechelus Lake 5
3.1.2. Coal Creek 5
3.1.3. Mill Creek 6
3.1.4. Yakima River 6
3.2. Upper South Fork Snoqualmie Aquatic Habitat 6
4. Upper Yakima Watershed Environmental Baseline 7
4.1. Bull Trout Population Characteristics 8
4.1.1. Bull Trout Subpopulation Size 8
4.1.2. Bull Trout Growth and Survival 9
4.1.3. Bull Trout Life History and Isolation 9
4.1.4. Bull Trout Persistence and Genetic Integrity 10
4.2. Water Quality 10
4.2.1. Temperature 10
4.2.2. Sediment 11
4.2.3. Chemical Contaminants/Nutrients 11
4.3. Habitat Access 12
4.3.1. Physical Barriers 12
4.4. Habitat Elements 13
4.4.1. Substrate 13
4.4.2. Large Woody Debris 14
4.4.3. Pool Frequency and Quality 14
4.4.4. Off-Channel Habitat 15
4.4.5. Refugia 15
4.5. Channel Conditions and Dynamics 15
4.5.1. Channel Dimensions (Average Wetted Width/Maximum Depth Ratio) 15
4.5.2. Streambank Condition 16

4.5.3. Floodplain Connectivity 16
4.5.4. Changed Peak/Base Flows 16
4.5.5. Increases in Drainage Network 17
4.6. Watershed Conditions 17
4.6.1. Road Density/Location 17
4.6.2. Disturbance History/Regime 18
4.6.3. Riparian Reserves 18
4.7. Species and Habitat 19
5. Bull Trout Species Status 21
5.1. Status of the Species and Critical Habitat 21
5.2. Life History and Habitat Requirements 21
5.3. Survey History 21
5.3.1. Bull Trout Stocks in the Project Vicinity 22
5.3.2. Keechelus Lake Stock 22
5.4. Habitat Evaluation and Suitability 22
6. Essential Fish Habitat 25
6.1. Spring Chinook 25
6.2. Fall Chinook 25
6.3. Coho 25
7. Signature Page 27
7.1. Certification of Permittee(s) 27
8. References 29
8.1. Printed References 29
8.2. Personal Communication 31

List of Tables

Table 1. Legal Description of The Summit MDP Project Area 3
Table 2. USFWS (1998) Matrix of Habitat Pathways and Indicators – Upper Yakima Watershed. 8

List of Figures

Figure 1. Vicinity Map
Figure 2. Existing Fisheries Condition, The Summit
Figure 3. Existing Fisheries Conditions, Alphental

Appendices

Appendix A ..... Species Lists

1. Executive Summary

Booth Creek Resorts (BCR) is the operator of The Summit at Snoqualmie Ski Area and the holder of a Special Use Permit (SUP) on the Snoqualmie Ranger District of the Mt. Baker-Snoqualmie National Forest (MBSNF) and the Cle Elum Ranger District of the Okanogan-Wenatchee National Forest (OWNF). While representatives from both forests are involved in the NEPA process, the SUP is administered by the MBSNF. The Summit at Snoqualmie is located on a watershed boundary and operates in two separate watersheds, the Upper South Fork Snoqualmie, and the Upper Yakima. BCR has proposed a new Master Development Plan (MDP) for the development and operation of the ski area over the next 10 to 15 years. Project elements include construction and operation of lifts, trails, buildings and roads.

This baseline conditions report provides the environmental baseline of existing conditions found in the watersheds in which the ski area will operate. These conditions will provide the basis for analyzing the potential effects of the project on aquatic species listed as threatened or endangered under the federal Endangered Species Act (ESA) and will be available for inclusion in a biological assessment of the project for Section 7 ESA consultation with the U.S. Fish and Wildlife Service.

Within the Upper Yakima watershed, potential habitat exists for populations of two listed as threatened fish species: the bull trout (Salvelinus confluentus) and the Middle Columbia River steelhead (*Oncorhynchus mykiss*). Within the analysis area, bull trout have access to lower Coal Creek. Keechelus Dam prevents anadromous salmonids such as Middle Columbia seteelhead from reaching Keechelus Lake or the project area streams. The Yakima River and its tributaries below the Keechelus Dam have potential habitat for spawning and rearing of Middle Columbia River steelhead, although their presence in these streams has not been documented.

Factors affecting the existing conditions for fish and fish habitat in the Upper Yakima Watershed include:

- Alteration of flow regime due to management of the Yakima River for irrigation supply.
- Barriers to passage at the reservoirs and at the road crossings of several tributaries.
- Increased temperatures in the Yakima River and tributary streams due to reduced riparian vegetation.
- Accumulation of traction sand from paved roads and parking areas, especially in Coal Creek.
- Alteration of tributary stream morphology due to culverts and land use (ski area operation logging and historic logging).
- Alteration of stream hydrology as a result of logging, ski area operation, and roads.

Due to these factors, several environmental baseline indicators (U.S. Fish and Wildlife Service [USFWS] 1998) in the project action area are at risk, or not in properly functioning condition.

Bull trout are present in the Snoqualmie River, but have not been observed upstream of Snoqualmie Falls at Snoqualmie, WA. Based on the collective experience of professionals working in the watershed, the probability of bull trout presence above Snoqualmie Falls is so low that biologists of the U.S. Forest Service (USFS) and Washington Department of Fish and Wildlife (WDFW) assume that bull trout are not present for the purposes of managing federal lands in this area (Gall Pers. Comm, Kraemer 1996). In other watersheds, bull trout have been observed upstream of complete passage barriers, so their presence in the South Fork Snoqualmie River cannot be completely dismissed (Chan Pers. Comm. 2003).

However, in a reconnaissance survey, King County conducted bull trout surveys on 90 stream reaches upstream of Snoqualmie Falls with no native char detection, suggesting that they are not present above Snoqualmie Falls (Berge & Mavros 2001). Likewise, WDFW fish biologists working in the watershed have handled thousands of trout without any native char identifications from upstream of Snoqualmie Falls. The closest known occurrence of bull trout to the project area is below Snoqualmie Falls, a complete barrier to fish passage located approximately 31 river miles downstream of the project area. For this reason, the environmental baseline does not need to be documented for the South Fork Snoqualmie Watershed for ESA compliance and is not included here.

2. Introduction

The purpose of this report is to document the baseline conditions for aquatic Threatened or Endangered species potentially occurring in the Project Area. This will provide the basis for preparation of a project BA to be used for Section 7 Consultation between the USFS and the USFWS, and NOAA Fisheries. The project area is located within King and Kittitas Counties, Washington at Snoqualmie Pass. (Figures 1, 2) (Table 1).

Table 1. Legal Description of The Summit MDP Project Area

Area	Aquatic Features	Legal Description
Alpental	South Fork Snoqualmie River and tributary streams	T23N R11E Sections 28 29, 30, 31, 32
The Summit West	Tributaries to the South Fork Snoqualmie River, Beaver Lake Creek	T 22N R11E Sections 4, 5
The Summit Central	Tunnel Creek, Hyak Creek, Coal Creek	T 22N R11E Section 8, 9,16
The Summit East	Stream A, Stream B, Pulse Creek, Coal Creek, and Mill Creek	T 22N R11E Section 15, 16, 17, 21, 22

The project area is divided into public and private ownership. Publicly owned land includes portions of the MBSNF and OWNF. Privately owned land includes properties held by BCR and Plum Creek Timber Co. (Plum Creek), as well as other land owners with smaller holdings. Land owned by the USFS is managed as part of the Snoqualmie Pass Adaptive Management Area (USFS and USFWS 1997a, 1997b). Project vicinity land uses include timber production, private residences, outdoor recreation (winter sports, hunting, fishing, hiking), and wildlife conservation. Electrical transmission lines cross T22N R11 Section 16 and fiber-optic telecommunication lines are located along Interstate Highway 90 (I-90) and nearby roads (e.g., FS 4832).

Personal communications as well as a website containing updated ESA status information were consulted regarding species under jurisdiction of National Marine Fisheries Service (NMFS) (NMFS 2004). Direct written correspondence was used to identify species under the jurisdiction of the USFWS (Appendix A). Surveys for aquatic species including habitat and fish distribution surveys were conducted on several streams crossing I-90 between the Hyak and Easton exits in 2001 and 2002, including Coal Creek (Jones & Stokes 2002a). The level of listed species use within the project area was evaluated for each identified species.

3. Aquatic Habitat in the Summit at Snoqualmie MDP Vicinity

3.1. Upper Yakima Aquatic Habitat

3.1.1. Keechelus Lake

Keechelus Lake is 8.85 km (5.5 miles long) and has a storage capacity of 194.6 x 106 m3 (157,800 acre-feet). The 39 meters (128-foot) high dam was constructed between 1913 and 1917 (USFS and Plum Creek Timber 1999) enlarging the natural lake to its current size.

Historically, Keechelus Lake harbored bull trout, sockeye salmon, chinook salmon, coho salmon and steelhead (USFS 1996) as well as resident species. Construction of the dam formed a complete barrier to anadromous fish and other fish were released into the lake over the years. Currently, the lake is known to support bull trout, rainbow trout, eastern brook trout, westslope cutthroat trout, kokanee, mountain whitefish, pygmy whitefish, burbot, redside shiner, bridgelip sucker, and sculpins (USBR 2001, Jones & Stokes 2002).

During a typical year, the lake level fluctuates by about 18.3 meters (60 feet). Keechelus Lake freezes over in the winter and stratifies with a thermocline at about 15 meters (50 feet) in the summer. The reservoir is oligotrophic and well-oxygenated throughout the year (Goodwin and Westley 1967). Due to the large fluctuation in lake level, the riparian zone includes a large seasonally flooded area with poor soil development. The area is colonized only by clumps of vegetation that either can withstand periods of flooding or are fast growing (e.g., weeds) and can complete their life cycle between periods of inundation. Steep slopes and rocky shores characterize the east shore of the lake from about MP 56 to about MP 59 (through Slide Curve). From Slide Curve to the dam (about MP 60.5) the east shore is not as steep, but still has fairly rocky substrate and limited vegetation and soil development due to the seasonal inundation of this area.

Research on the distribution of bull trout in another Central Cascades reservoir, the Chester Morse Reservoir, indicates that bull trout use all areas of that reservoir. It is assumed that bull trout use all wetted portions of Keechelus Lake as well.

3.1.2. Coal Creek

Coal Creek has a watershed area of about 1,457 hectares [3,600 acres] [TetraTech 2002]). However, the available habitat and elevation may be inadequate to support a spawning population of adfluvial bull trout. During 2001, Jones & Stokes biologists observed westslope cutthroat trout upstream and downstream of I-90.

Habitat in this stream has been degraded by timber harvest practices, channel relocation, and proximity to roads. Temperatures in Coal Creek are too high to be functioning appropriately for bull trout habitat with daily and 7-day average maximum temperatures exceeding 18°C (66.2°F) (Craig, unpublished, Thomas 2001, TetraTech 2002). Coal Creek runs parallel to I-90 and FR 4832 and runs adjacent to the WSDOT Hyak Maintenance Facility. These areas have little riparian vegetation and are sources of a considerable input of traction sand into the stream. The overall condition of this stream is inadequate to support bull trout.

3.1.3. Mill Creek

Mill Creek has a watershed area of 1,122 acres (1.75 square miles). Elevation of the watershed ranges from the highest point, the summit of Mount Catherine at 5,043 feet to the outlet into Keechelus Lake at 2,497 feet (above mean sea level). The upper Mill Creek drainage is dominated by gently rolling terrain, several small lakes, and mature forest. The lower Mill Creek drainage contains somewhat steeper slopes and more recent harvest. Details on the condition of this watershed may be found in the Mill Creek watershed condition assessment (Jones & Stokes 2004).

Access to this stream by adfluvial fish is blocked by intermittent flow during summer and fall downstream of the John Wayne Trail, a culvert at the John Wayne Trail, and several natural falls.

3.1.4. Yakima River

The Yakima River below Keechelus Dam supports bull trout, summer steelhead, spring chinook, rainbow trout, westslope cutthroat trout, brook trout, and many other fish species (Haring 2001). The Yakima River does not have any direct contact with the project, but provides the most significant bull trout and steelhead habitat downstream of the project area. The Easton to Keechelus Reach has excellent quality instream habitat, floodplain connectivity, and riparian condition. However, the regulated Keechelus outlet has resulted in an unnatural flow regime that affects the function of the Yakima River ecosystem. Small numbers of bull trout have been observed spawning in the Easton to Keechelus Reach of the Yakima River.

3.2. Upper South Fork Snoqualmie Aquatic Habitat

There is no access for anadromous fish above Snoqualmie Falls located 31 miles downstream of the project on the South Fork Snoqualmie River (Williams et al 1975). Therefore, salmon are not considered here. The Level I Analysis team including USFWS and USFS personnel evaluated the possibility of native char in the South Fork Snoqualmie watershed and determined that the probability of native char (or of any Pacific salmon species) presence upstream of Snoqualmie Falls is small enough that it is assumed they are not present (Gall Pers. Comm. 2003, Kraemer 1996). Therefore, the aquatic habitat conditions in the Upper South Fork Snoqualmie Watershed are not discussed further here.

4. Upper Yakima Watershed Environmental Baseline

This section describes the overall conditions of habitat indicators in the Upper Yakima River watershed. The terminology used here is from the USFWS guidance for determining effects on bull trout (USFWS 1998). The criteria for the three categories of baseline conditions—"functioning appropriately", "functioning at risk", and "functioning at unacceptable risk"—are taken from the USFWS guidance document (USFWS 1998).

The environmental baseline was determined from a variety of sources including a Yakima Watershed Biological Assessment (MacDonald et al. 1999), discussions with Eric Anderson (WDFW District Fish Biologist), Brent Renfrow (WDFW Local Habitat Biologist), Barry Gall (USFS Fish Biologist), and Tina Mayo (USFS Fish Biologist), published sources, and surveys completed by Jones & Stokes for the Summit at Snoqualmie, SE Group, and the Washington State Department of Transportation (WSDOT) (Jones & Stokes 2001, 2002a, 2002b, 2004).

The aquatic habitat conditions in the Upper Yakima River watershed are heavily influenced by the existence and operation of the Keechelus Lake Dam, timber harvesting, I-90, and other roads and development in the watershed. The Keechelus Dam is a complete barrier to fish migration. Isolated bull trout and westslope cutthroat trout populations are found upstream and downstream of the dam. Steelhead are limited to streams downstream of the Keechelus Dam. The flow of the Yakima River is also regulated at the Keechelus Dam to attempt to balance the needs of flood control, storage for irrigation, and maintenance of viable fish populations. Timber harvest has contributed to the degradation of some tributaries causing elevated water temperatures and changes in sediment quality, debris flows in some channels, as well as reducing large woody debris (LWD) recruitment in tributary streams. The hydrology and morphology of tributaries to Keechelus Lake and the Yakima River are affected by I-90, local roads, and power line and ski area access roads. Coal Creek and its tributaries, and Mill Creek and its tributaries have culverts and natural falls that are barriers to fish migration. Keechelus Lake and Yakima River tributaries also have partial or complete barriers to fish passage. In addition to blocking culverts, roadways also interfere with local hydrology contributing to discontinuous flow in some of the tributaries during late summer. Development in the Upper Yakima River watershed includes The Summit at Snoqualmie ski area, a few businesses at Snoqualmie Pass, the WSDOT Hyak Maintenance Facility and residences and vacation homes at Snoqualmie Pass, Cle Elum, and Ellensburg.

A portion of the project area is owned and administered by the USFS, Wenatchee National Forest. This area is located within the Snoqualmie Pass Adaptive Management Plan area defined by the USFS and USFWS (USFS and USFWS 1997a, 1997b). Management guidelines for the Snoqualmie Pass Adaptive Management Area concentrate on providing late-successional forest and habitat connectivity, conserving threatened or endangered species, and limiting road density (with the goal of 3.22 kilometers/2.59 km2 [2.0 miles of road per square mile]) at the subwatershed scale (USFS and USFWS 1997a, 1997b).

Following the discussion of habitat indicators in Table 2 is a brief description of habitat indicators for each of the fish bearing streams and lakes in the vicinity of the project. The "effects of the action" portion of the table will be completed for the project Biological Assessment based on analysis of the project and its impacts.

Table 2. USFWS (1998) Matrix of Habitat Pathways and Indicators – Upper Yakima Watershed.

Pathways/Indicators	Environmental Baseline			Effects of the Action(s)		
	Functioning Appropriately	At Risk	Functioning at Unacceptable Risk	Restore	Maintain	Degrade
Bull Trout Subpopulation Characteristics						
Subpopulation size			U, C, M			
Growth and survival			U, C, M			
Life history, diversity, and isolation			U, C, M			
Persistence and genetic integrity			U, C, M			
Water Quality						
Temperature			U, C, M			
Sediment		U, M	C			
Chemical contaminant/nutrients	M	U	C			
Habitat Access						
Physical barriers			U, C, M			
Habitat Elements						
Substrate	M	U	C			
LWD	M		U, C			
Pool frequency		M	U, C			
Pool quality			U, C, M			
Off channel habitat		U, C, M				
Refugia			U, C, M			
Channel Conditions and Dynamics						
Width/depth ratio	M	U, C				
Streambank conditions		U, C, M				
Floodplain connectivity	M	U	C			
Flow/Hydrology						
Peak/base flows		M	U, C			
Drainage network increase		U	C, M			
Watershed Conditions						
Road density and location			U, C, M			
Disturbance		M	U, C			
Riparian reserves			U, C, M			
Species and Habitat						
Integration of Species and Habitat Conditions			U, C, M			

Notes: U = Upper Yakima 5th field watershed, C = Coal Creek 6th Field Watershed (Coal Creek, Hyak Creek, Beaver Lake Creek), M = Mill Creek 6th Field Watershed (Mill Creek).

4.1. Bull Trout Population Characteristics

4.1.1. Bull Trout Subpopulation Size

4.1.1.1. Upper Yakima Watershed

In the Upper Yakima watershed, bull trout are known to spawn in populations that are isolated from each other by the Yakima dams, none of which have fish passage. In the area affected by the MDP, there is one

population located upstream of the Keechelus Dam. This population is only known to spawn in one stream, Gold Creek. Since 1984, Bull trout redd counts in Gold Creek generally have included less than 50 individuals (Haring 2001). Although some adults may not spawn each year, the subpopulation size is certainly quite small. Likewise, very few bull trout have been observed in the Keechelus Reach of the Yakima River. The Yakima River and Gold Creek stocks are both considered "critical" by WDFW (WDFW 1998). Therefore, the bull trout subpopulation size is functioning at unacceptable risk.

4.1.1.2. Coal Creek Subwatershed

No bull trout have ever been reported from any stream in the Coal Creek sub-watershed. Jones & Stokes (2002a) fish biologists detected no bull trout during night snorkel surveys on the Lower 900 meters (2,952 feet) of Coal Creek (from Keechelus Lake to about 100 meters upstream of I-90), or during day time snorkel reconnaissance surveys of Coal Creek from Keechelus Lake to the furthest upstream I-90 culvert (Jones & Stokes 2001). Given the relatively low elevation of Coal Creek headwaters, high temperatures, and barriers to passage at the I-90 culverts, it is unlikely that bull trout are present in Coal Creek. Therefore, the bull trout subpopulation size is functioning at unacceptable risk.

4.1.1.3. Mill Creek Subwatershed

No bull trout have been reported from the Mill Creek subwatershed. Stream bank surveys have been reported by Jones & Stokes (2004) and by also have been conducted by Cupp (1997), with no bull trout detections. Given the relatively low elevation of Mill Creek headwaters, high temperatures, and barriers to passage at the John Wayne Trail culvert as well as a seasonally dewatered segment in the Lake Keechelus shoreline and a natural falls at about stream mile 0.7, it is unlikely that bull trout are present in Mill Creek. Therefore, the bull trout subpopulation size is functioning at unacceptable risk.

4.1.2. Bull Trout Growth and Survival

The numbers of bull trout recorded in Gold Creek and the Yakima River are low enough to conclude that growth and survival in these stocks is functioning at unacceptable risk.

4.1.2.1. Coal Creek Subwatershed

With numbers of bull trout below detection, it is assumed that bull trout growth and survival are functioning at unacceptable risk, although they may never have inhabited Coal Creek.

4.1.2.2. Mill Creek Subwatershed

With numbers of bull trout below detection, it is assumed that bull trout growth and survival are functioning at unacceptable risk, although they may never have inhabited Mill Creek.

4.1.3. Bull Trout Life History and Isolation

Physical and thermal barriers have isolated Yakima River bull trout into 13 separate stocks (Haring 2001, WDFW 1998). The Keechelus Dam in the project area has isolated the Keechelus stock from the Yakima River stock. Dewatering in Gold Creek often isolates some members of the Keechelus stock spawning population from the rest of the population with some pairs spawning upstream and some downstream of the dewatered zone. Therefore, life history and isolation is functioning at unacceptable risk.

4.1.3.1. Coal Creek Subwatershed

With numbers of bull trout below detection, and barriers to passage at the I-90 culverts, it is assumed that bull trout life history and isolation are functioning at unacceptable risk, although they may never have inhabited Coal Creek.

4.1.3.2. Mill Creek Subwatershed

With numbers of bull trout below detection, and barriers to passage at the John Wayne Trail, and other locations, it is assumed that bull trout life history and isolation are functioning at unacceptable risk, although they may never have inhabited Mill Creek.

4.1.4. Bull Trout Persistence and Genetic Integrity

Due to the low numbers and genetic isolation of stocks in the Yakima River watershed , as well as the potential for cross breeding with eastern brook trout that are widely distributed throughout the watershed, bull trout stocks are functioning at unacceptable risk with regard to persistence and genetic integrity.

4.1.4.1. Coal Creek Subwatershed

With numbers of bull trout below detection, it is assumed that bull trout persistence and genetic integrity are functioning at unacceptable risk, although they may never have inhabited Coal Creek.

4.1.4.2. Mill Creek Subwatershed

With numbers of bull trout below detection, it is assumed that bull trout persistence and genetic integrity are functioning at unacceptable risk, although they may never have inhabited Mill Creek.

4.2. Water Quality

4.2.1. Temperature

Temperature in the Upper Yakima River watershed is generally functioning at unacceptable risk for bull trout rearing due to high summer temperatures in the mainstem and tributaries. The Upper Yakima River is listed as an impaired waterway with regard to temperature due to high temperature readings taken near the mouth of the river into Lake Easton, and near Ellensburg (Ecology 1998).

During 2001, a water quality study conducted for WDDOT monitored stream temperature in the Yakima River using continuously recording temperature sensors at the following locations: Crystal Springs; Lake Easton; Cabin, Coal, Gold, Wolfe, Rocky Run, Resort, Townsend (ETR-1), Price, Swamp, Toll, Cedar, Telephone, and Hudson Creeks; and the Kachess River (TetraTech 2002). The study period (March through October 2001) was warmer and drier than usual and so presents something of a worst case scenario. During the study period, maximum temperatures exceeded state temperature standards (18°C [64.4°F]) at all three Yakima River stations, as well as at Coal, Gold, Rocky Run, Swamp, Telephone, and Hudson Creeks and the Kachess River. These stream temperatures all exceeded the temperature criteria for properly functioning conditions for steelhead (NMFS 1996) in these streams (17.8°C [64°F]). In addition, Price Creek had daily temperature maximums that exceeded the properly functioning criteria for steelhead (17.8°C [64°F]) (NMFS 1996).

The USFWS criteria for appropriate functioning condition for bull trout is based on the 7 day average temperature (USFWS 1998). The 2001 temperature measurements (TetraTech 2002) indicate that all three Yakima River sites, as well as Coal, Gold, Wolfe, Rocky Run, Price, Swamp, Telephone, and Hudson Creeks and the Kachess River were all “functioning at unacceptable risk” for rearing life history stages of bull trout during some period of July and/or August. This finding is consistent with the earlier data reported in the USFS Yakima River Watershed BA (MacDonald et al. 1999). Additional data on temperatures of four Keechelus Lake tributaries over a summer season was collected and reported by Thomas (2001). Thomas (2001) found that Coal, Gold, and Meadow Creeks all had 7-day average daily temperatures well above 12°C (53.6°F) and 7-day average daily temperature maximums of greater than 15°C (59°F) degrees.

4.2.1.1. Coal Creek Subwatershed

Thomas (2001) found that Coal Creeks had 7-day average daily temperatures well above 12°C (53.6°F) and 7 day average daily temperature maximums of greater than 15°C (59°F) degrees and so would also be considered "functioning at unacceptable risk" for temperature.

4.2.1.2. Mill Creek Subwatershed

Only spot temperature measurements are available for Mill Creek. However, these measurements are consistent with those at Coal Creek, indicating that temperatures in Mill Creek are likely to commonly exceed the criteria for proper functioning as well (Jones & Stokes 2004). Therefore, it is assumed that the Mill Creek sub-watershed is functioning at unacceptable risk for temperature.

4.2.2. Sediment

Sediment quality in the Yakima River watershed is variable. The Yakima River itself has a relatively low proportion of fine sediment in the Keechelus Reach and is influenced by Keechelus Lake and operation of the Keechelus Dam. The lake acts as a sedimentation trap so that downstream from the reservoir the river receives relatively little sediment from upstream. However, sediment in many tributaries to the Yakima River contain 15 to 20 percent fines (MacDonald et al. 1999, Jones & Stokes 2002a). Therefore, sediment in the watershed as a whole is functioning at risk with regard to sediment quality, though high quality sediment is found in spawning habitat in the Yakima River itself.

4.2.2.1. Coal Creek Subwatershed

In Coal Creek, fine sediments generally make up greater than 15% of the bed substrate especially downstream of I-90 (Jones & Stokes 2002a.) and would be considered functioning at unacceptable risk. Traction sand from highway runoff is suspected to be a major contributor to the fine sediment load in this stream.

Traction sand is currently stored adjacent to Coal Creek. Following the 2000 and 2002 winter snow seasons, traction sand was observed on the ground between the sand storage area of the Hyak Maintenance Facility and Coal Creek, including atop the adjacent Jersey barriers and boulders.

Aquatic macroinvertebrate community composition parameters can provide useful information on the condition of a stream with regard to water quality, sediment condition, and disturbance regime. Because these species are relatively immobile and are present in a stream over a relatively long period of time, they can give a time-integrated measure of habitat quality. Aquatic macroinvertebrate sampling conducted for WSDOT during August of 2001 indicate that Coal Creek demonstrated some habitat impairment relative to other streams crossing I-90. Of the nine streams investigated, only Coal Creek scored lower downstream of I-90 than upstream (Jones & Stokes 2002a).

4.2.2.2. Mill Creek Subwatershed

Visual estimates of Mill Creek sediment composition indicate that fine sediment is a minor component in the lower reaches of the stream, but may approach 15% in the reach just downstream of the ski area. Therefore, sediment quality is estimated to be functioning at risk in Mill Creek.

4.2.3. Chemical Contaminants/Nutrients

In the Upper Yakima Watershed, there were no excursions of toxic contaminants recorded in the last 303d listing decision matrix of impaired water bodies upstream of Cle Elum (Ecology 1998). The pesticides DDT, Dieldrin, and 4,4' DDE, and the metals mercury, copper, cadmium, and silver have been observed in the Upper Yakima River in or downstream from Cle Elum the project area (Ecology 1998). No new

segments of the Yakima were listed as impaired in the draft 2004 303(d) list of impaired waterbodies compiled by the Washington State Department of Ecology (Ecology 2002/2004).

Water quality of road runoff and streams crossing the I-90 between The Summit East and Easton was investigated during 2001 (TetraTech 2002). At various times, samples of highway runoff and streams crossing the project violated state water quality standards for fecal coliform bacteria, turbidity, lead, antimony, arsenic, and chromium. Lead was detected during fall and winter rain events in highway runoff at several locations. Antimony and arsenic were detected in low concentrations that could potentially be due to sample contamination (TetraTech 2002). Another contaminant detected was motor oil found in two highway runoff samples (TetraTech 2002). Deleterious substances were diluted by the time they got to the Yakima River, but were elevated in some of the tributary streams. Since one reach of the Upper Yakima River is a 303d listed stream, the Upper Yakima River is functioning at risk with regard to chemical contaminants.

4.2.3.1. Coal Creek Subwatershed

Because Coal Creek runs parallel to I-90, it is exposed to a considerable quantity of road runoff that may be contaminated by toxic substances on vehicles or cargos. Storm water quality sampling conducted by WSDOT as part of their Snoqualmie Pass East Project environmental planning and compliance indicated exceedances of WAC 173-201a water quality standards for lead and arsenic in stormwater runoff and Coal Creek downstream of I-90 (TetraTech 2001). Due to these exceedences, Coal Creek is considered to be functioning at unacceptable risk with regard to chemical contamination.

4.2.3.2. Mill Creek Subwatershed

No sampling or analysis for chemical contamination has been reported for Mill Creek. However, since the land uses are limited to timber regrowth and winter recreation, Mill Creek is assumed to be functioning appropriately with regard to chemical contamination.

4.3. Habitat Access

4.3.1. Physical Barriers

Barriers to fish passage occur at many locations in the watershed including:

- A complete barrier at the Keechelus Dam.
- A partial barrier at the Easton Diversion Dam.
- Complete barriers at culverts and falls on many watershed tributaries including:
    - Coal Creek (three I 90 culverts).
    - Mill Creek (culvert at John Wayne trail and falls at several points upstream).
    - Streams A & B (culvert and falls at SR 906 – no viable habitat upstream).
    - Hyak Creek (falls 200 feet upstream of Coal Creek).
    - Tunnel Creek (falls at confluence with Hyak Creek –little or no viable habitat upstream).
    - Beaver Lake Creek (culvert at Summit Central maintenance shop- little or no viable habitat upstream).

The U.S. Bureau of Reclamation (USBR) has entered into a mitigation agreement with the Washington State Department of Ecology (Ecology) and WDFW (Ecology 2002) for the work proposed under the Keechelus Safety of Dams project. Under this agreement, USBR has initiated an assessment of the

desirability and feasibility of restoring fish passage at the Yakima storage reservoirs, including Keechelus Lake. Where passage is determined to be desirable, USBR will collaborate with WDFW to provide interim fish passage until permanent passage facilities can be built. Under this agreement, it is feasible that passage could be restored between the Yakima River and Keechelus Lake. Under the agreement, USBR has also committed to restoring passage between Keechelus Lake and Cold Creek, a major tributary on the west side of the lake (Ecology 2002). The USBR has prepared a feasibility study for restoring passage at five Yakima dams (USBR 2003). However, at this time, the USBR has not begun designing any passage facilities at the Keechelus dam, and this is a lower priority than at some of the other dams (Hudson, Pers. Comm.) and would not likely occur during the MDP period.

The Easton Diversion Dam has a fish ladder allowing passage; however, this is only opened during certain times and certain years when water stored in Keechelus Lake is sufficient to maintain spawning areas during the fall (Haring 2001). Upstream of Keechelus Dam, seasonal barriers to passage occur at Gold Creek (seasonally dewatered portion upstream of I-90), Resort and Townsend (ETR-1) Creeks (accessible when Keechelus Lake is filled), and Mill Creek. Mill Creek was dry during the summer of 2002 between the John Wayne Trail and Keechelus Reservoir. The causes of dewatering in Gold Creek and the degree to which dewatering is the result of human activities have not been conclusively determined. Several tributaries to the Yakima River downstream of Keechelus dam also have blocking culverts or intermittent flow. Therefore, the Upper Yakima River watershed is functioning at unacceptable risk with regard to access.

4.3.1.1. Coal Creek Subwatershed

Due to man made impassable barriers along the mainstem of Coal Creek at the I-90 culverts and on Stream A at SR 906, and natural barriers on Hyak and Tunnel Creeks, the Coal Creek subwatershed is considered to be functioning at unacceptable risk with regard to habitat access.

4.3.1.2. Mill Creek Subwatershed

Natural and barriers limit passage to and within the Mill Creek subwatershed. During late summer and early fall of 2002, the lower reach of Mill Creek was dewatered in the seasonally inundated portion of Lake Keechelus, blocking access to fall spawning adfluvial fish such as bull trout and kokanee trout. A culvert at the John Wayne (Iron Horse) trail further blocks passage to the watershed. Therefore, the Mill Creek subwatershed is functioning at unacceptable risk with regard to habitat access.

4.4. Habitat Elements

4.4.1. Substrate

Overall, the streams in the Upper Yakima that have been examined are not considered embedded. However, project area stream, Coal Creek is a notable exception. In a few point locations observed during the Jones & Stokes 2001 surveys for WSDOT, the Yakima River and side channels were not embedded (Jones & Stokes 2002a). Given the lack of detailed information on substrate condition in the watershed as a whole, the watershed is considered to be functioning at risk with regard to substrate quality.

4.4.1.1. Coal Creek Subwatershed

A significant fraction of embedded substrate has been observed in Coal Creek and would be considered to be functioning at unacceptable risk. Fine sediments associated with runoff from I-90 and other nearby roads appeared to be the cause of embedded substrate in Coal Creek.

4.4.1.2. Mill Creek Subwatershed

Substrate in Mill Creek segments are mostly free of fine sediment. Little if any embedded substrate was observed during stream habitat reconnaissance surveys (Jones & Stokes 2004). Mill Creek substrate is functioning appropriately.

4.4.2. Large Woody Debris

Haring (2001) reported that LWD was poor to fair in the Upper Yakima River, and poor in the Keechelus Lake lower tributaries. Dams block wood in tributaries from reaching the Yakima River (MacDonald et al. 1999) and recent timber harvesting has left a large proportion of riparian areas without good LWD recruitment potential. Several other streams in the Upper Yakima Watershed lack adequate quantity or recruitment of LWD (Jones & Stokes 2002b). Therefore, the watershed is functioning at unacceptable risk with regard to LWD.

4.4.2.1. Coal Creek Subwatershed

Of the fish bearing streams in the Coal Creek Subwatershed, Beaver Lake Creek and Tunnel Creek are highly modified with large sections covered or in culverts with no LWD. Hyak Creek, Stream A, and Stream B probably have adequate LWD, although LWD has not been surveyed in these streams. Because LWD is inadequate in Coal Creek (Jones & Stokes 2001), the main fish bearing stream, The subwatershed is functioning at unacceptable risk with regard to LWD.

4.4.2.2. Mill Creek Subwatershed

Portions of Mill Creek were surveyed for LWD, results indicate this stream is functioning appropriately with regard to LWD although bedrock segments tend to transport rather than retain LWD (Jones & Stokes 2004).

4.4.3. Pool Frequency and Quality

Overall, the watershed is functioning at unacceptable risk with regard to pool frequency and quality. Haring (2001) reported that the channel condition in the Yakima River was generally good upstream of Selah Gap, with data gaps for the reaches between Wilson Creek and the Teanaway River. However, the condition of tributary streams is generally lacking in the LWD necessary for adequate pool frequency and quality of pools (MacDonald et al. 1999). Few deep pools were located in the project area streams, and frequency was low in all streams. Due to the size of these streams, relatively few deep pools would be expected. However, with a greater quantity of LWD, more deep pools would be present.

4.4.3.1. Coal Creek Subwatershed

Coal Creek is lacking sufficient LWD to form a large number of deep pools, and fish bearing tributaries are generally too small for a significant number of deep pools to develop. Hyak Creek probably has an adequate number of deep pools upstream of a complete barrier to passage. However, downstream of Hyak Falls, there is very little habitat and few if any deep pools. Therefore, the Coal Creek subwatershed is functioning at unacceptable risk with regard to pool frequency and quality.

4.4.3.2. Mill Creek Subwatershed

Pool frequency is reasonably good in Mill Creek although there are few deep pools (Jones & Stokes 2004). Therefore, the Mill Creek subwatershed is functioning at risk with regard to pool frequency and functioning at unacceptable risk with regard to pool quality.

4.4.4. Off-Channel Habitat

The Easton to Keechelus Reach of the Yakima River provides excellent off channel habitat (Haring 2001). However, throughout the watershed, side channel habitat is assumed to be functioning at risk with regard to off channel habitat. The lower reaches of several Yakima River tributaries join into a network of wetlands and channels within the Yakima floodplain. Hence, below Keechelus Dam and downstream of I-90, those creeks are functioning appropriately. The upper reaches of those streams, and those that drain the project area are more confined headwater streams that provide no off channel habitat.

4.4.4.1. Coal Creek Subwatershed.

Off channel habitat is functioning at risk in the Coal Creek subwatershed. Coal Creek has some off-channel habitat in wetlands adjacent to I-90, but this habitat is poorly connected to the main channel. A notable exception is the high quality open water pond and wetland habitat of Mardee Lake, a tributary to Coal Creek located east of I-90 and FR 4832. Off channel habitat is naturally lacking in the steep, confined tributary channels to Coal Creek that drain from the ski areas.

4.4.4.2. Mill Creek Watershed

Off channel habitat in Mill Creek is mostly in the form of pocket pools outside of the stream thalweg. There are few if any off channel ponds due to the natural morphology of this confined, higher gradient channel. Therefore, the Mill Creek watershed is estimated to be functioning at risk with regard to off-channel habitat.

4.4.5. Refugia

Refugia in the watershed are isolated by thermal and physical barriers. Dams, hydrologic discontinuity, and barrier culverts all contribute to fragmentation of habitat. Therefore, refugia in the watershed are functioning at unacceptable risk.

4.4.5.1. Coal Creek Subwatershed

Barrier culverts isolate habitat within portions of Coal Creek. This discontinuity of habitat, along with high temperatures, prevents portions of the watershed functioning as effective refugia. Therefore, the Coal Creek subwatershed is functioning at unacceptable risk with regard to refugia.

4.4.5.2. Mill Creek Subwatershed

A barrier culvert and falls isolate habitat within portions of Mill Creek. This discontinuity of habitat, prevent functioning as effective refugia. Therefore, the Mill Creek subwatershed is functioning at unacceptable risk with regard to refugia.

4.5. Channel Conditions and Dynamics

4.5.1. Channel Dimensions (Average Wetted Width/Maximum Depth Ratio)

The condition of channel dimensions in the watershed is considered functioning at risk overall due to floodplain development on the mainstem of the Yakima River and apparent channel widening in Lower Cabin and Gold Creeks (MacDonald et al. 1999).

4.5.1.1. Coal Creek Subwatershed

Coal Creek and its tributaries are mostly confined channels with adequate width/depth ratios (Jones & Stokes 2001). Sedimentation in Coal Creek may have increased width depth ratio slightly, therefore,this indicator is rated as functioning at risk in the Coal Creek subwatershed.

4.5.1.2. Mill Creek Subwatershed

Mill Creek is well confined with adequate width depth ratio for most of it's length. The lowest reach located in the seasonally inundated portion of Lake Keechelus becomes dewatered during summer and fall. At this time of year the width depth ratio of this stream segment is high. Otherwise channel dimensions in Mill Creek are functioning appropriately.

4.5.2. Streambank Condition

In the absence of watershed wide information on streambank stability, this indicator is considered to be functioning at risk (MacDonald et al. 1999). Riparian buffers have not been maintained on all headwater streams during the last cycle of timber harvest and this is assumed to have resulted in some loss in streambank stability.

4.5.2.1. Coal Creek Subwatershed

Moderate bank erosion has been observed in discrete locations along Coal Creek and Hyak Creek (Jones & Stokes 2001). Streambank condition is considered to be functioning at risk.

4.5.2.2. Mill Creek Subwatershed

Moderate bank erosion has been observed in discrete locations along Mill Creek (Jones & Stokes 2004). Streambank condition is considered to be functioning at risk.

4.5.3. Floodplain Connectivity

Road development along the mainstem Yakima River and some tributaries has reduced floodplain connectivity in the watershed (MacDonald et al. 1999). Therefore, this indicator is considered to be functioning at risk. In the Easton to Keechelus Dam segment of the Yakima River, tributaries connect into a network of wetlands and channels within the well connected floodplain of the Yakima River.

4.5.3.1. Coal Creek Subwatershed

Floodplain connectivity of Coal Creek has been altered to some degree by I-90. Prior to construction of this highway, Coal Creek probably had some floodplain wetlands where the highway is now. Higher gradient naturally have very limited floodplain area. Floodplain connectivity in the watershed is estimated to be functioning at unacceptable risk due to the presumed impact of I-90 on Coal Creek floodplain wetlands.

4.5.3.2. Mill Creek Subwatershed

Mill Creek is a confined channel with a narrow floodplain. Although there are limited riparian wetlands and floodplains associated with the mainstem of Mill Creek, floodplains are functioning appropriately, in a natural condition.

4.5.4. Changed Peak/Base Flows

The Yakima River is entirely regulated by operation of the reservoirs in the watershed. Furthermore, 56% of the watershed is in a hydrologically immature condition (MacDonald et al. 1999) characterized by

rapid runoff following precipitation or snow melt causing higher peak flows and lower subsequent base flows. The hydrologically immature condition dominates the project area with a large percentage of the area in a non-forested condition. With 30% of the watershed located in the rain-on-snow elevation zone, streams in the watershed are especially prone to changes in peak flow. Overall, the watershed is functioning at unacceptable risk with regard to alteration of peak and base flows.

4.5.4.1. Coal Creek Subwatershed

The Coal Creek subwatershed is maintained in a less than fully forested condition. Vegetative cover, an increase in the drainage network from ditches and waterbars, and long culverted stream segments all contribute to a reduced condition of hydrologic maturity. It is not known the exact impact that this has on peak and base flow conditions. However, hydrologic immaturity results in increased peak flow with decreased base flows. Therefore, this indicator is estimated to be functioning at unacceptable risk at risk for peak/base flows.

4.5.4.2. Mill Creek Subwatershed

Approximately 95% of the Mill Creek subwatershed is forested (although this includes large areas of sapling and immature trees) and has intermediate hydrologic maturity (Jones & Stokes 2004). Peak flow from the watershed is estimated to be elevated about 3.3% above a fully hydrologically mature condition (Jones &Stokes 2004). Base flows in the fall of 2002 were insufficient to maintain flow in the lowest reach of the stream where it flows across the seasonally flooded portion of Lake Keechelus, although this could be due in part to deposition of sediment from the stream at the stream mouth when the lake is at a high pool elevation and very dry conditions prior to this observation. Peak/base flows are estimated to be altered from natural conditions, but only slightly. Therefore, this indicator is estimated to be functioning at risk in the Mill Creek subwatershed.

4.5.5. Increases in Drainage Network

There are approximately 1,962 km (1,219 miles) of mapped streams and 1,900 road crossings in the watershed (MacDonald et al. 1999). The roads are estimated to add 348 km (216 miles) to the stream drainage network (MacDonald et al. 1999), or about 17%. There are also an estimated 200 km (124 miles) of trails (MacDonald et al. 1999). However, it is thought that the trails do not add significantly to the drainage network. Therefore, the watershed is functioning at risk with regard to increases in drainage network.

4.5.5.1. Coal Creek Subwatershed

The high density of roads in the Coal Creek subwatershed is estimated to increase the drainage network significantly. Therefore, this indicator is considered to be functioning at unacceptable risk.

4.5.5.2. Mill Creek Subwatershed

The high density of roads in the Mill Creek subwatershed is estimated to increase the drainage network significantly. Therefore, this indicator is considered to be functioning at unacceptable risk.

4.6. Watershed Conditions

4.6.1. Road Density/Location

Road density in the watershed is 2.24 km/km2 (3.6 miles/square mile) and therefore,functioning at unacceptable risk (MacDonald et al. 1999). Roadways include valley bottom roads along the Yakima River and in the historic Yakima River floodplain.

Within the project area, the road density is even higher with 6.43 miles/square mile in the Upper Yakima Watershed.

4.6.1.1. Coal Creek Subwatershed

Road density in the Coal Creek subwatershed is significantly greater than 2 mi/square mile. In the MDP Study Area, road density is 6.25 miles/square mile. Outside the Study Area, a six-lane highway, I-90, runs parallel and adjacent to Coal Creek. Therefore, road density is functioning at unacceptable risk in the Coal Creek subwatershed.

4.6.1.2. Mill Creek Subwatershed

Road density in the Mill Creek subwatershed is high at approximately 7.1 miles/square mile. There are three crossings of fish bearing stream segments (one trail and two roads), and many crossings of non-fish bearing stream segments. This indicator is functioning at unacceptable risk.

4.6.2. Disturbance History/Regime

The Yakima River watershed is functioning at unacceptable risk with regard to disturbance history. Although about 44% of the watershed is classified as being in mature condition, the equivalent clearcut area is well above 15% (MacDonald et al. 1999).

4.6.2.1. Coal Creek Subwatershed

The portion of the Summit at Snoqualmie project area in the Coal Creek Subwatershed has a relatively large proportion (about 39%) of the riparian area in this subwatershed is in a modified non-forested condition. Therefore, the Coal Creek subwatershed disturbance regime is functioning at unacceptable risk.

4.6.2.2. Mill Creek Subwatershed

A significant portion of the Mill Creek subwatershed has been harvested in recent years. Approximately 60% of the watershed is in a hydrologically mature (forested) condition. Approximately 35 % of the watershed is of intermediate hydrologic maturity, and 5% is hydrologically immature (non-forested, non developed) area (Jones & Stokes 2004). In addition, about 87% of the riparian area is in a modified condition. Therefore, the Mill Creek subwatershed disturbance regime is functioning at unacceptable risk.

4.6.3. Riparian Reserves

Riparian reserves are functioning at unacceptable risk for the Yakima River Watershed due to timber harvest on private lands without maintaining adequate riparian buffers and roads built along streams and in valley bottoms (MacDonald et al. 1999).

4.6.3.1. Coal Creek Subwatershed

Coal Creek also has a very poor condition riparian corridor with almost no buffer between Coal Creek and I-90 and FR4832 (Jones & Stokes 2001). In the project Study Area, Beaver Lake Creek and Tunnel Creek are largely covered or culverted, resulting in a drastic reduction in riparian reserve area. The other project area streams, Hyak Creek, Stream A, Stream B, and Pulse Creek have comparatively intact riparian areas. However, in consideration of the poor condition of the Coal Creek mainstem, riparian reserve condition for the subwatershed is considered to be functioning at unacceptable risk.

4.6.3.2. Mill Creek Subwatershed

Most of the riparian buffer area in the Mill Creek subwatershed has been modified by recent timber harvest leaving only a very narrow strip of trees along the stream banks. Overall the riparian condition is functioning at unacceptable risk.

4.7. Species and Habitat

USFWS guidance (USFWS 1998) for ESA evaluations includes an environmental indicator that is an integration of species and habitat conditions. This indicator describes the sensitivity of populations to local habitat conditions and the time scale under which habitat conditions can be expected to improve. In the Upper Yakima River, the Keechelus Dam has isolated populations for many generations. The USBR has agreed to evaluate the feasibility of restoring passage at the Keechelus Dam and to provide interim passage through trapping and hauling in coordination with WDFW (Ecology 2002). Restoration of passage will not result in an immediate reestablishment of population interconnectivity, although that would be the trend over the long term. Given the history of isolation, and the persistence of suboptimal habitat conditions with regard to many habitat indicators, integrated species and habitat conditions are functioning at unacceptable risk in the Upper Yakima watershed.

4.7.1.1. Coal Creek Subwatershed

The integration of species and habitat indicates the success of a species in maintaining a viable population. In the Coal Creek subwatershed, several aspects of habitat are suboptimal or inadequate for the survival of bull trout. In addition, barriers to passage limit colonization by adfluvial individuals from Lake Keechelus. No bull trout have been observed in the Coal Creek subwatershed. Therefore, the integrated species and habitat indicator is functioning at unacceptable risk in the Coal Creek subwatershed.

4.7.1.2. Mill Creek Subwatershed

The integration of species and habitat indicates the success of a species in maintaining a viable population. In the Mill Creek subwatershed, barriers to passage limit colonization by adfluvial individuals from Lake Keechelus. No bull trout have been observed in the Mill Creek subwatershed. Therefore, the integrated species and habitat indicator is functioning at unacceptable risk in the Mill Creek subwatershed.

5. Bull Trout Species Status

5.1. Status of the Species and Critical Habitat

USFWS listed the Columbia River distinct population segment of bull trout as threatened on June 10, 1998 (63 FR 31647). All naturally spawning populations of bull trout in the continental United States are included in the listing. Critical habitat for Columbia River bull trout was listed on September 21, 2004 (50 CFR 17:59996-60076). Designated Critical Habitat includes Gold Creek and the Yakima River downstream from Keechelus Lake, but not Keechelus Lake or other Keechelus tributaries.

5.2. Life History and Habitat Requirements

Three life forms of bull trout are recognized, each having a different life history pattern. Bull trout occur as migratory (adfluvial or fluvial) or resident fish (Rieman and McIntyre 1993). The adfluvial forms mature in lakes or reservoirs and spawn in tributaries where juveniles rear for 1 to 4 years (Meehan and Bjorn 1991). Fluvial bull trout have a similar life history to adfluvial, but move between mainstem rivers and smaller tributaries. Migratory forms may make extensive migrations, attain sexual maturity at age 5 or 6, and may live up to 10 years. They may reach a size exceeding 9.98 kilograms (22 pounds) (Fraley and Shepard 1989). Stream resident bull trout spend their entire lives in smaller, high elevation streams, apparently moving very little and seldom reaching a size of over 305 mm (12 inches) (Brown 1992a).

All forms of bull trout inhabit cool clear streams with water temperatures rarely exceeding 15°C (59°F). Adults spawn in the fall in areas of streams with suitable gravel, often near seeps or springs. Egg incubation is slow, taking up to 225 days (Craig 1997). Upon emerging, juveniles rear in cool water areas with abundant cover, usually in the form of LWD. Bull trout abundance is positively correlated with complex forms of cover and pools (Rieman and McIntyre 1993).

Adfluvial adults mature in lakes where they use a variety of habitats from nearshore to deep water (Thompson and Tufts 1967). In Chester Morse Lake, bull trout are widely distributed and use profundal and littoral zones of the lake (Connor et al. 1997). In Flathead Lake (Montana), bull trout travel along the shoreline, but have been found as deep as 109.4 meters (360 feet) (Hanzel 1965). Adults are found throughout the water column in most lakes during the fall, winter and spring, moving to deeper cooler water in the summer (Shepard 1985). Adult bull trout sometimes follow their primary prey species. In Flathead Lake, adults move into the lower reaches of the river in the fall to consume pygmy whitefish (Andrusak and Northcote 1971) and move along the lakeshore to locate spawning salmon (Shepard et al. 1984). Similar patterns of use and distribution are expected in Keechelus Lake.

5.3. Survey History

Fish species distribution and habitat information comes from several sources. Watershed-scale habitat conditions have been reported by the Washington State Conservation Commission (Haring 2001), EES (2000), and the USFS (MacDonald et al. 1999, USFS 1997). Terrapin Environmental (Cupp 1997) completed a comprehensive watershed assessment of the Keechelus and Mosquito Creek watersheds for Plum Creek Timber. This assessment is in draft form and has not been officially released. Various biologists from the USFWS, USFS, WDFW, USBR, and Central Washington University have conducted surveys for bull trout on Gold Creek annually since 1984, and at various times in the Yakima River and other streams in the watershed. Gold Creek bull trout spawning counts for the period of 1984 through 2000 taken by WDFW were recently reported by Haring (2001). In 2001, Jones & Stokes conducted habitat surveys and night snorkel surveys of Coal Creek as part of a study for WSDOT.

Other fish habitat surveys in the Upper Yakima watershed have been reported by Jones & Stokes (Jones & Stokes 2001) for the USFS and Booth Creek Ski Holdings, Ltd. Jones & Stokes' Watershed Analysis Report (2001) describes watershed conditions in the Coal Creek and Upper Snoqualmie River watersheds as they relate to The Summit at Snoqualmie ski area.

5.3.1. Bull Trout Stocks in the Project Vicinity

Nine bull trout stocks occur in the Yakima River basin (WDFW 1998). Two stocks which occur downstream of the project are the Keechelus Lake stock and the Yakima River stock. The Keechelus Lake stock is considered a distinct stock due to its geographic isolation. The Keechelus Lake stock is the only one of concern for this project, since Keechelus Dam blocks the Yakima River stock from the action area.

5.3.2. Keechelus Lake Stock

Construction of the Keechelus Dam between 1913 and 1917 isolated the Keechelus Lake stock. Currently, the only known population in Keechelus Lake spawns in Gold Creek. A single juvenile bull trout was reported to have been observed in Rocky Run Creek, a tributary on the eastern side of Keechelus Lake, in 1983 (Brown 1992b). However, natural and manmade barriers to passage exist on the lower reaches of Rocky Run Creek that would prevent upstream migration from Keechelus Reservoir. Jones & Stokes conducted night snorkel surveys of 5 Keechelus tributary streams crossing I-90 the project (Coal, Gold, Rocky Run, Resort, and Townsend Creeks) in 2001 and detected bull trout only in Gold Creek. Two other sizeable streams in the Keechelus basin with bull trout habitat potential are Meadow and Cold Creeks (Craig 1997). Access to Cold Creek is blocked where this stream is crossed by the John Wayne Trail, although the USBR has agreed to restore passage at this location as a mitigation measure for Keechelus Dam safety renovation work (Ecology 2002). High summer temperatures may also limit use of Coal and Mill (Craig 1997) Creeks.

Gold Creek is a third-order stream with a basin area of 35.2 square kilometers (21.9 square miles). Upstream migration of adults occurs from July to mid-August (WDFW 1998). Spawning occurs from late September through early October. In 1996, most redds were found in a spring-fed channel near river mile (RM) 4.1 and near the mouth of Silver Creek (Wissmar and Craig 1997). Spawning has also been observed in the outlet channel from Gold Creek Pond and in the main channel between the FS 4832 bridge (Meyer pers. comm., Jones & Stokes 2002). Craig (1997) estimated an incubation time of 200 days in Gold Creek with emergence occurring in May. Juveniles likely remain in Gold Creek for 1 to 3 years. Outmigration may occur throughout the year. Adult bull trout in Keechelus Lake are probably primarily piscivorous. Likely prey species available to adult bull trout in Keechelus Lake include kokanee, whitefish, redside shiner, rainbow trout, and brook trout.

Detections of spawners in Gold Creek have varied from two in 1984 and 1985 to 51 in 1996 (Haring 2001). Gold Creek stock is considered critical, primarily because of its chronically low redd counts (WDFW 1998) and its isolation from other stocks.

5.4. Habitat Evaluation and Suitability

Suitable habitat for bull trout in the vicinity of the project area includes Keechelus Lake. Management of Keechelus Lake as a water supply reservoir reduces the quality of the lake riparian and littoral zones. Fluctuations in water elevation prevent the shoreline from developing climax vegetation communities, reduce usable stream habitat, reduce development of the benthic invertebrate community in the seasonally inundated area, and impair passage of fish from the lake into several of the tributary streams. Because the lake level fluctuates by up to 18.3 meters (60 vertical feet) each year, riparian trees are set back from the lake's edge except when the reservoir is completely filled. As a result, shading and cover is also reduced

in Keechelus Lake. Although lake surface temperatures (and the temperature of water released to the Yakima River) may be increased during the summer and fall, the lake is large and deep enough that the lack of shade has no effect on the temperature of a large part of the lake that remains at or below 4 C all year.

Stream habitat used by the Keechelus stock is limited to Gold Creek. A short description of Gold Creek conditions is presented here, although this stream is not downstream of the project area. The quality of habitat in Gold Creek is impaired due to dewatering of a reach of the stream during periods of low flow and high summer temperatures. During late summer, a portion of Gold Creek is dewatered. Dewatering of 0.7 to 3.3 km (0.44 to 2 miles) was observed during 1993, 1994, 1995, 1996,1998, 1999, and 2000 (Haring 2001, Craig 1997, WSDOT 1998). A considerable distance of dewatered channel was also observed by Jones & Stokes biologists in 2001. Whether or not this is a naturally occurring condition, or if it is caused by human actions, is not understood at this time (Thomas 2001). Speculative (Haring 2001, Mayo pers. comm.) causes for this dewatering include:

- The lost recruitment of LWD key pieces due to clearing old growth from the lower watershed, which may have resulted in excessive bank erosion and stream aggradation to the point that low flows cannot maintain surface water.
- Alteration of groundwater hydrology related to the Gold Creek pond.
- Withdrawal of groundwater in the vicinity of the dewatered area from wells.
- Aggradation of the streambed due to historic mining activity in the Gold Creek Valley and or backwater effects of the high pool elevation of Keechelus Lake.

Water temperature in Gold Creek is generally cold enough during the spawning and incubation period. However, it reaches temperatures above the properly functioning range during July and August downstream from the dewatered zone and in August upstream of the dewatered zone (Thomas 2001).

6. Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) includes a mandate that NMFS must identify Essential Fish Habitat (EFH) for federally-managed marine fish and federal agencies must consult with NMFS on all activities, or proposed activities, authorized, funded, or undertaken by the agency that may adversely affect EFH. EFH is defined as "the waters and benthos necessary to a species spawning, breeding, feeding, or growth to maturity – its full life cycle" (PFMC 1999).

The Pacific Fishery Management Council (PFMC 1999), with the concurrence of the U.S. Secretary of Commerce, defines freshwater salmon EFH as "the aquatic component of streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon (except above certain impassable barriers) in Washington, Oregon, Idaho, and California identified by USGS hydrologic units."

The species to which the Magnuson-Stevens Act applies include chinook and coho salmon in the Yakima River. Because the project is located upstream of a complete barrier to passage of these species there would be no effect on chinook or coho salmon.

6.1. Spring Chinook

When they are allowed passage at the Easton Diversion Dam, spring chinook salmon spawn in the Easton to Keechelus Reach of the Yakima River, and possibly in the short reach of the Kachess River downstream from Kachess Dam. Historically, chinook would have migrated through Keechelus Lake to Gold Creek; however, passage to Keechelus Lake has been blocked since 1901.

6.2. Fall Chinook

Yakima River fall chinook do not generally migrate upstream beyond Wymer, Washington, far downstream from the project.

6.3. Coho

Historically, coho spawned and reared in the Yakima River and its tributaries, including those crossed by the project. However, the upstream distribution of coho presently does not extend past the Easton Diversion Dam.

7. Signature Page

7.1. Certification of Permittee(s)

"I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. The information submitted is, to the best of my knowledge and belief, true, accurate, and complete."

Representative's Printed Name	Title
Representative's Signature	Date

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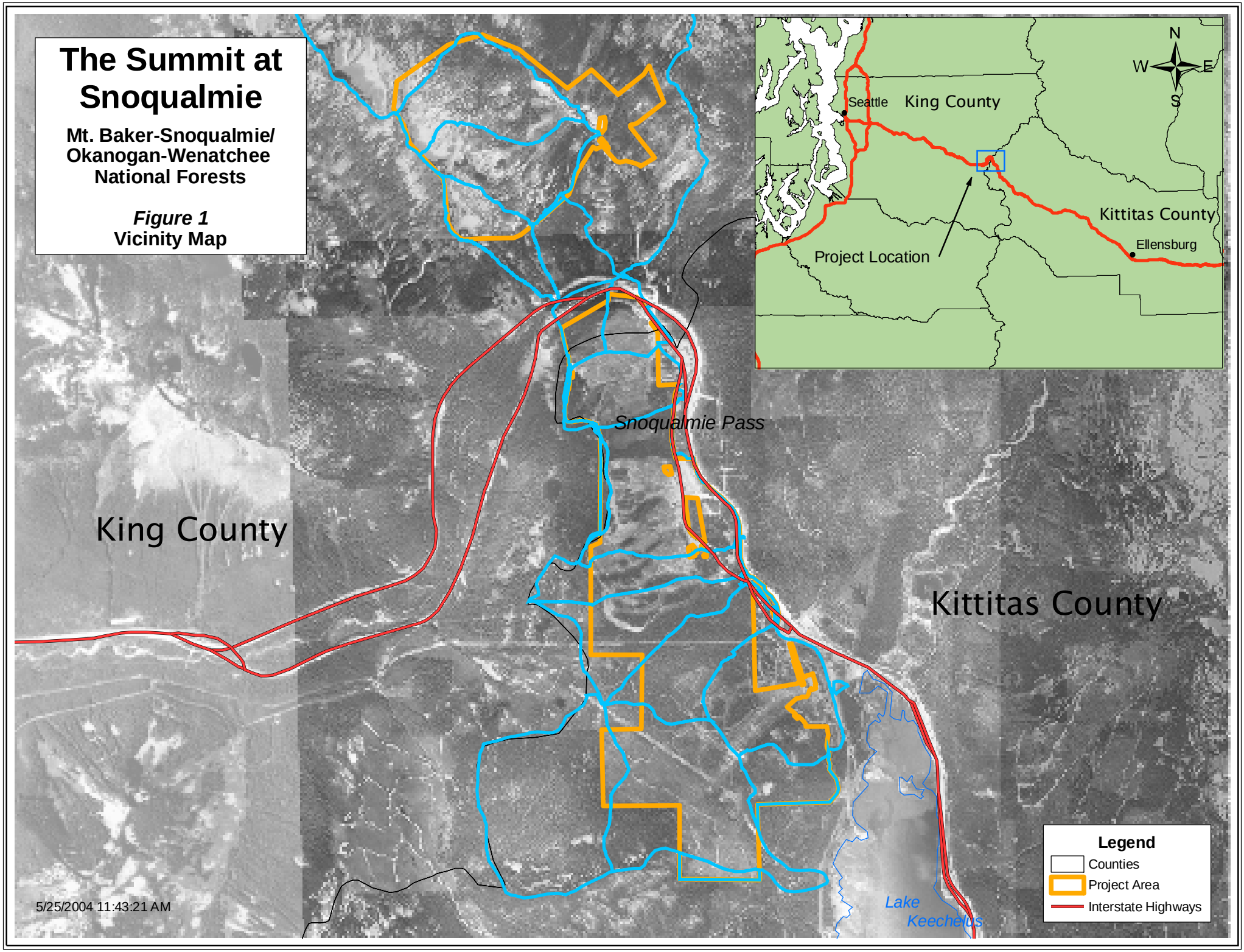
Figures


The Summit at Snoqualmie
Mt. Baker-Snoqualmie/ Okanogan-Wenatchee National Forests
Figure 1
Vicinity Map
Seattle
King County
Kittitas County
Ellensburg
Project Location
N
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Snoqualmie Pass
King County
Kittitas County
Lake Keechelus
Legend
Counties
Project Area
Interstate Highways
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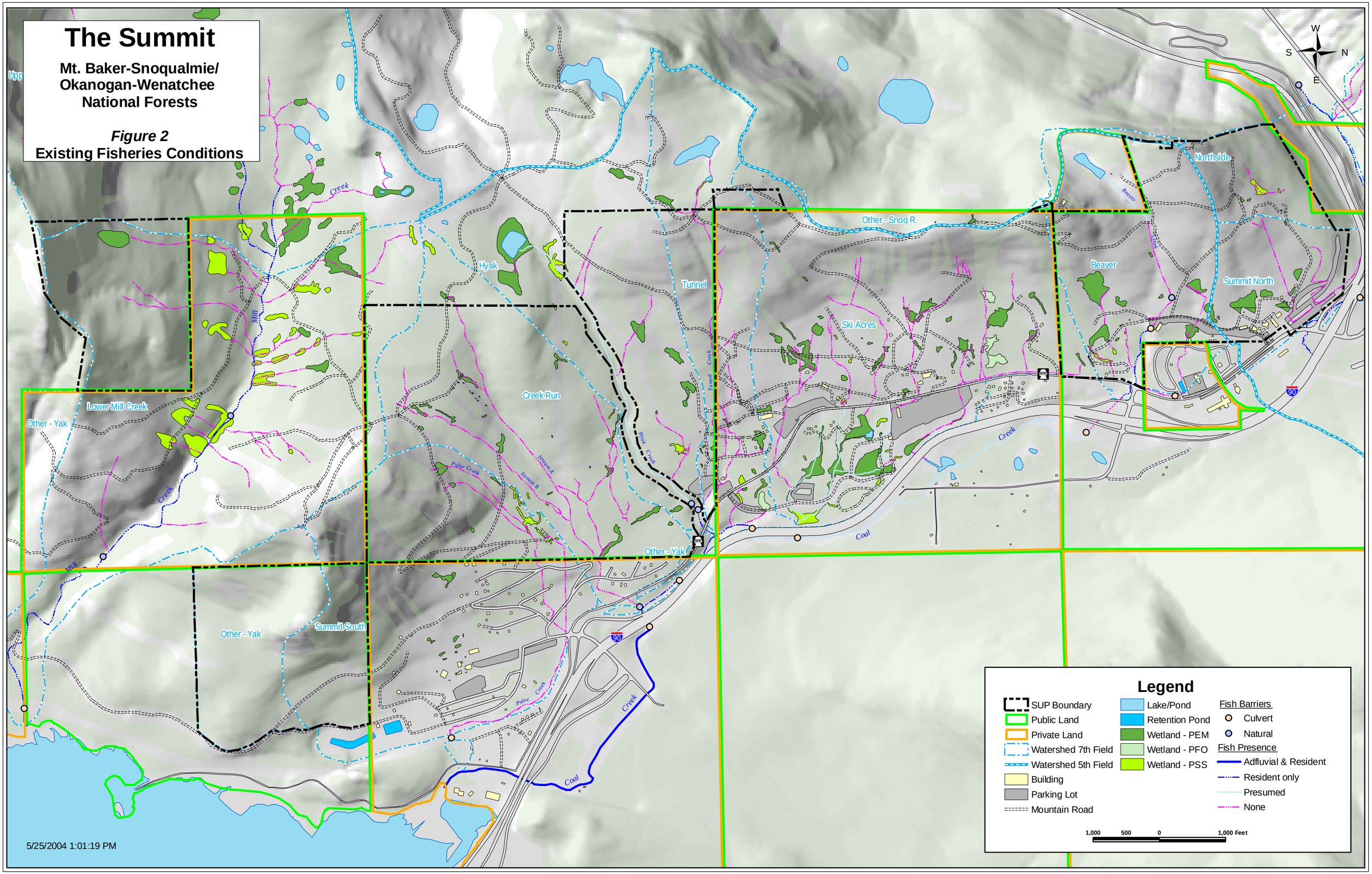
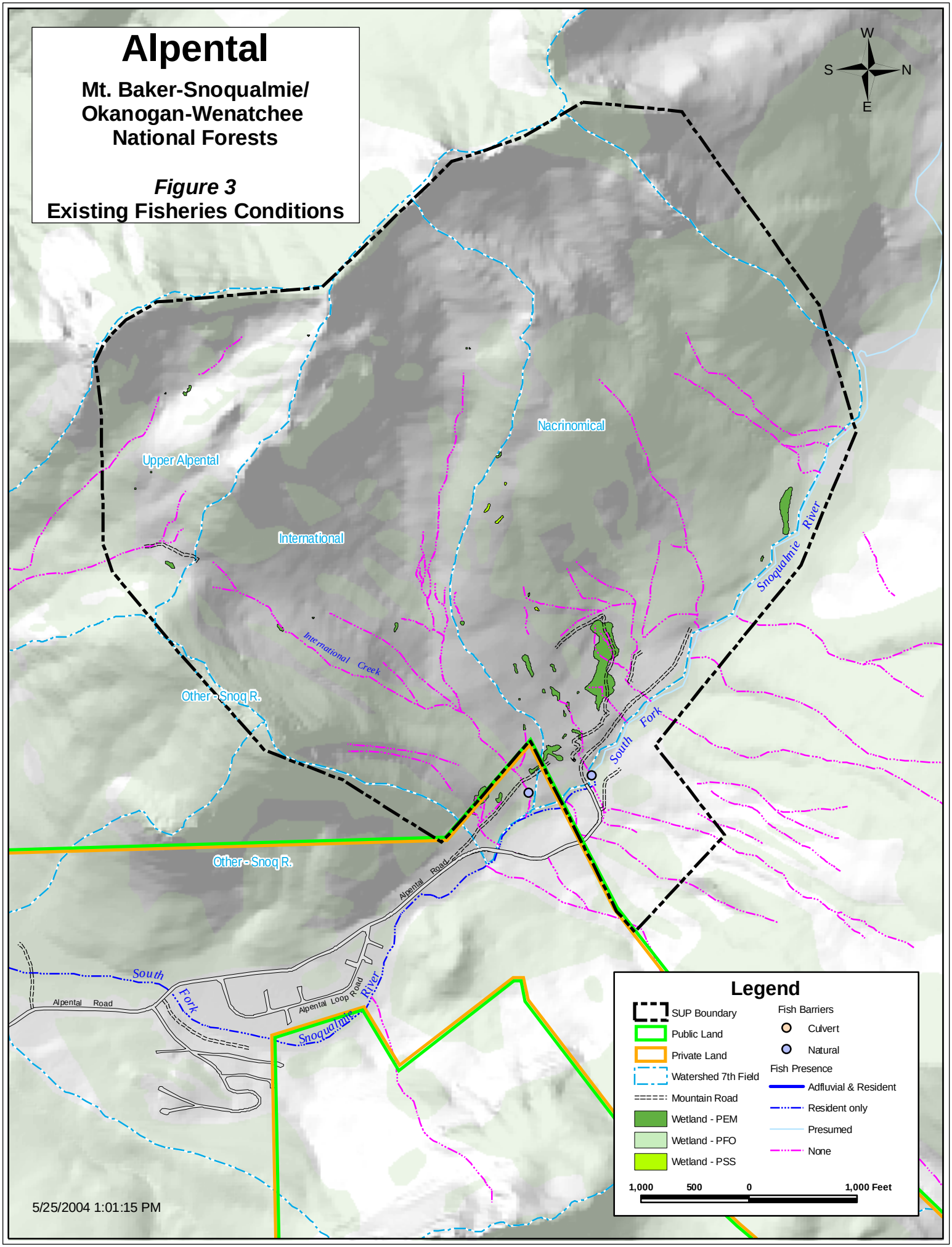
The Summit

Mt. Baker-Snoqualmie/ Okanogan-Wenatchee National Forests

Figure 2
Existing Fisheries Conditions




Alpental
Mt. Baker-Snoqualmie/
Okanogan-Wenatchee
National Forests
Figure 3
Existing Fisheries Conditions
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International
Nacrinomical
Other - Snoq R.
Other - Snoq R.
International Creek
Snoqualmie River
South Fork
Alpental Road
Alpental Loop Road
Alpental Road
South Fork
Snoqualmie River
Legend
SUP Boundary
Public Land
Private Land
Watershed 7th Field
Mountain Road
Wetland - PEM
Wetland - PFO
Wetland - PSS
Fish Barriers
Culvert
Natural
Fish Presence
Adfluvial & Resident
Resident only
Presumed
None
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Appendix A

Species Lists

Federally listed species identified by NMFS and USFWS as potentially occupying the project area

Summit

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Western Washington Fish and Wildlife Office
510 Desmond Drive SE, Suite 102
Lacey, Washington 98503
Phone: (360) 753-9440 Fax: (360) 534-9331

OCT 29 2002

OCT 25 2002

Dear Species List Requester:

We (U.S. Fish and Wildlife Service) are providing the information you requested to assist your determination of possible impacts of a proposed project to species of Federal concern. Attachment A includes the listed threatened and endangered species, species proposed for listing, candidate species, and/or species of concern that may be within the area of your proposed project.

Any Federal agency, currently or in the future, that provides funding, permitting, licensing, or other authorization for this project must assure that its responsibilities under section 7(a)(2) of the Endangered Species Act of 1973, as amended (Act), are met. Attachment B outlines the responsibilities of Federal agencies for consulting or conferencing with us.

If both listed and proposed species occur in the vicinity of a project that meets the requirements of a major Federal action (i.e., "major construction activity"), impacts to both listed and proposed species must be considered in a biological assessment (BA) (section 7(c); see Attachment B). Although the Federal agency is not required, under section 7(c), to address impacts to proposed species if listed species are not known to occur in the project area, it may be in the Federal agency's best interest to address impacts to proposed species. The listing process may be completed within a year, and information gathered on a proposed species could be used to address consultation needs should the species be listed. However, if the proposed action is likely to jeopardize the continued existence of a proposed species, or result in the destruction or adverse modification of proposed critical habitat, a formal conference with us is required by the Act (section 7(a)(4)). The results of the BA will determine if conferencing is required.

The Federal agency is responsible for making a determination of the effects of the project on listed species and/or critical habitat. For a Federal agency determination that a listed species or critical habitat is likely to be affected (adversely or beneficially) by the project, you should request section 7 consultation through this office. For a "not likely to adversely affect" determination, you should request our concurrence through the informal consultation process.

Candidate species and species of concern are those species whose conservation status is of concern to us, but for which additional information is needed. Candidate species are included as an advance notice to Federal agencies of species that may be proposed and listed in the future. Conservation measures for candidate species and species of concern are voluntary but recommended. Protection provided to these species now may preclude possible listing in the future.

For other federally listed species that may occur in the vicinity of your project, contact the National Marine Fisheries Service (NOAA Fisheries) at (360) 753-9530 to request a list of species under their jurisdiction. For wetland permit requirements, contact the Seattle District of the U.S. Army Corps of Engineers for Federal permit requirements and the Washington State Department of Ecology for State permit requirements.

Thank you for your assistance in protecting listed threatened and endangered species and other species of Federal concern. If you have additional questions, please contact Yvonne Dettlaff (360) 753-9582.

Sincerely,

L. Karolee Owens

for Ken S. Berg, Manager
Western Washington Fish and Wildlife Office

Enclosure(s)

ATTACHMENT A **October 21, 2002**

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES, CRITICAL HABITAT, CANDIDATE SPECIES, AND SPECIES OF CONCERN THAT MAY OCCUR IN THE VICINITY OF THE PROPOSED SKI AREA FACILITIES EXPANSION PROJECT IN KING AND KITTITAS COUNTIES, WASHINGTON

(T22N R11E S4-5,8-9,15-17,20-22; T23N R11E S28-29,32-33)

FWS REF: 1-3-03-SP-0042

LISTED

Wintering bald eagles (*Haliaeetus leucocephalus*) may occur in the vicinity of the project. Wintering activities occur from October 31 through March 31.

Bull trout (*Salvelinus confluentus*) occur in the vicinity of the project.

Marbled murrelets (*Brachyramphus marmoratus*) occur in the vicinity of the project. Nesting activities occur from April 1 through September 15.

Northern spotted owls (*Strix occidentalis caurina*) occur in the vicinity of the project. Nesting activities occur from March 1 through September 30.

Major concerns that should be addressed in your biological assessment of the project impacts to listed species include:

1. Level of use of the project area by listed species;

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project; and

3. Impacts from project construction (i.e., habitat loss, increased noise levels, increased human activity) that may result in disturbance to listed species and/or their avoidance of the project area.

PROPOSED

None

CANDIDATE

None

CRITICAL HABITAT

Critical habitat for the marbled murrelet has been designated in the vicinity of the project.

Critical habitat for the northern spotted owl has been designated in the vicinity of the project.

SPECIES OF CONCERN

The following species of concern have been documented in the county where the project is located. These species or their habitat could be located on or near the project site. Species in **bold** were specific occurrences located on the database within a 1-mile radius of the project site.

Beller's ground beetle (*Agonum belleri*)
California wolverine (*Gulo gulo luteus*)
Cascades frog (*Rana cascadae*)
Hatch's click beetle (*Eanus hatchi*)
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Northern goshawk (*Accipiter gentilis*)
Northwestern pond turtle (*Clemmys marmorata marmorata*)
Olive-sided flycatcher (*Contopus cooperi*)
Pacific fisher (*Martes pennanti pacifica*)
Pacific Townsend's big-eared bat (*Corynorhinus townsendii townsendii*)
Pacific lamprey (*Lampetra tridentata*)
Peregrine falcon (*Falco peregrinus*)
River lamprey (*Lampetra ayresi*)
Tailed frog (*Ascaphus truei*)
Valley silverspot (*Speyeria zerene bremeri*)
Western toad (*Bufo boreas*)
Aster curtus (white-top aster)

ATTACHMENT B

FEDERAL AGENCIES' RESPONSIBILITIES UNDER SECTIONS 7(a) AND 7(c) OF THE ENDANGERED SPECIES ACT OF 1973, AS AMENDED

SECTION 7(a) - Consultation/Conference

Requires:

1. Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species;

2. Consultation with the U.S. Fish and Wildlife Service (FWS) when a Federal action may affect a listed endangered or threatened species to ensure that any action authorized, funded, or carried out by a Federal agency is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. The process is initiated by the Federal agency after it has determined if its action may affect (adversely or beneficially) a listed species; and

3. Conference with the FWS when a Federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or an adverse modification of proposed critical habitat.

SECTION 7(c) - Biological Assessment for Construction Projects *

Requires Federal agencies or their designees to prepare a Biological Assessment (BA) for construction projects only. The purpose of the BA is to identify any proposed and/or listed species that is/are likely to be affected by a construction project. The process is initiated by a Federal agency in requesting a list of proposed and listed threatened and endangered species (list attached). The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 days of receipt of the species list, please verify the accuracy of the list with the Service. No irreversible commitment of resources is to be made during the BA process which would result in violation of the requirements under Section 7(a) of the Act. Planning, design, and administrative actions may be taken; however, no construction may begin.

To complete the BA, your agency or its designee should (1) conduct an onsite inspection of the area to be affected by the proposal, which may include a detailed survey of the area to determine if the species is present and whether suitable habitat exists for either expanding the existing population or potential reintroduction of the species; (2) review literature and scientific data to determine species distribution, habitat needs, and other biological requirements; (3) interview experts including those within the FWS, National Marine Fisheries Service, state conservation department, universities, and others who may have data not yet published in scientific literature; (4) review and analyze the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat; (5) analyze alternative actions that may provide conservation measures; and (6) prepare a report documenting the results, including a discussion of study methods used, any problems encountered, and other relevant information. Upon completion, the report should be forwarded to our Endangered Species Division, 510 Desmond Drive SE, Suite 102, Lacey, WA 98503-1273.

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* "Construction project" means any major Federal action which significantly affects the quality of the human environment (requiring an EIS), designed primarily to result in the building or erection of human-made structures such as dams, buildings, roads, pipelines, channels, and the like. This includes Federal action such as permits, grants, licenses, or other forms of Federal authorization or approval which may result in construction.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Central Washington Ecological Services Office
215 Melody Lane, Suite 119
Wenatchee, Washington 98801
Phone: (509) 665-3508 Fax: (509) 665-3509

NOV 8 2002

November 4, 2002

Judith Hillis
Plant and Wetland Ecologist
Jones & Stokes
11820 Northup Way, Suite E300
Bellevue, Washington 98005

RE: Species List Request
FWS Reference: 03-SP-W0012

Thank you for your request of October 7, 2002. The following threatened and endangered species, and candidate species may be present near the proposed resort expansion project on Snoqualmie Pass in Kittitas County, Washington:

LISTED

Endangered

Gray wolf *(Canis lupus)*

Threatened

Bald eagle *(Haliaeetus leucocephalus)*
Bull trout *(Salvelinus confluentus)*
Canada lynx *(Lynx canadensis)*
Grizzly bear *(Ursus arctos = U.a. horribilis)*
Marbled murrelet *(Brachyramphus marmoratus marmoratus)*
Northern spotted owl *(Strix occidentalis caurina)*
Ute ladies'-tresses *(Spiranthes diluvialis)*, plant

Designated

Critical habitat for the northern spotted owl

PROPOSED

None

CANDIDATE

Western yellow-billed cuckoo (*Coccyzus americanus*)

SPECIES OF CONCERN

Animals

Black tern *(Chlidonias niger)*
California bighorn sheep *(Ovis canadensis californiana)*
Cascades frog *(Rana cascadae)*
Columbia spotted frog *(Rana luteiventris)* (= *Rana pretiosa*, eastern population)
Ferruginous hawk *(Buteo regalis)*
Fringed myotis (bat) *(Myotis thysanodes)*
Harlequin duck *(Histrionicus histrionicus)*
Interior redband trout *(Oncorhynchus mykiss gairdneri)*
Larch Mountain salamander *(Plethodon larselli)*
Little willow flycatcher *(Empidonax traillii brewsteri)*
Loggerhead shrike *(Lanius ludovicianus)*
Long-eared myotis (bat) *(Myotis evotis)*
Long-legged myotis (bat) *(Myotis volans)*
Northern goshawk *(Accipiter gentilis)*
Olive-sided flycatcher *(Contopus borealis)*
Pacific fisher *(Martes pennanti pacifica)*
Pacific lamprey *(Lampetra tridentata)*
Pale Townsend's (= western) big-eared bat *(Corynorhinus (=Plecotus) townsendii pallescens)*
Red-legged frog *(Rana aurora)*
Small-footed myotis (bat) *(Myotis ciliolabrum)*
Tailed frog *(Ascaphus truei)*
Western burrowing owl *(Athene cunicularia hypugea)*
Western gray squirrel *(Sciurus griseus griseus)*
Westslope cutthroat trout *(Oncorhynchus clarki lewisi)*
Wolverine *(Gulo gulo luscus)*
Yuma myotis (bat) *(Myotis yumanensis)*

Plants

Columbia milk-vetch *(Astragalus columbianus)*
Clustered lady's-slipper *(Cypripedium fasciculatum)*
Dwarf or least phacelia *(Phacelia minutissima)*
Hoover's desert-parsley *(Lomatium tuberosum)*
Hoover's tauschia *(Tauschia hooveri)*
Seely's silene *(Silene seelyi)*
Wenatchee larkspur *(Delphinium viridescens)*

This list fulfills the requirements of the U. S. Fish and Wildlife Service (Service) under Section 7(c) of the Endangered Species Act of 1973, as amended (Act).

If there is federal agency involvement in this project (funding, authorization, or other action), the involved federal agency must meet its responsibilities under section 7 of the Endangered Species Act of 1973, as amended (Act), as outlined in Enclosure A. Enclosure A includes a discussion of the contents of a Biological Assessment (BA), which provides an analysis of the impacts of the project on listed and proposed species, and designated and proposed critical habitat. Preparation of a BA is required for all major construction projects. Even if a BA is not prepared, potential project effects on listed and proposed species should be addressed in the environmental review for this project. Federal agencies may designate, in writing, a non-federal representative to prepare a BA. However, the involved federal agency retains responsibility for the BA, its adequacy, and ultimate compliance with section 7 of the Act.

Preparation of a BA would be prudent when listed or proposed species, or designated or

proposed critical habitat, occur within the project area. Should the BA determine that a listed species is likely to be affected by the project, the involved federal agency should request section 7 consultation with the U. S. Fish and Wildlife Service (Service). If a proposed species is likely to be jeopardized by the project, regulations require conferencing between the involved federal agency and the Service. If the BA concludes that the project will have no effect on any listed or proposed species, we would appreciate receiving a copy for our information.

Candidate species receive no protection under the Act, but are included for your use during planning of the project. Candidate species could be formally proposed and listed during project planning, thereby falling within the scope of section 7 of the Act. Protection provided to these species now may preclude possible listing in the future. If evaluation of the subject project indicates that it is likely to adversely impact a candidate species, we encourage you to modify the project to minimize/avoid these impacts.

If there is no federal agency involvement in your project, and you determine that it may negatively impact a listed or proposed species, you may contact us regarding the potential need for permitting your actions under section 10 of the Act.

Several species of anadromous fishes that have been listed by the National Marine Fisheries Service (NMFS) may occur in the project area. Please contact NMFS in Seattle, Washington, at (206) 526-6150, in Portland, Oregon, at (503) 231-2319, or in Boise, Idaho, at (208) 378-5696 to request a list of these species.

If you would like information concerning state listed species or species of concern, you may contact the Washington Department of Fish and Wildlife, at (360) 902-2543, for fish and wildlife species; or the Washington Department of Natural Resources, at (360) 902-1667, for plant species.

This letter fulfills the requirements of the Service under section 7 of the Act. Should the project plans change significantly, or if the project is delayed more than 90 days, you should request an update to this response.

Thank you for your efforts to protect our nation's species and their habitats. If you have any questions concerning the above information, please contact Gregg Kurz at (509) 665-3524.

Sincerely,

Mark G. Miller

Supervisor

Enclosure

Enclosure A

Responsibility of Federal Agencies under Section 7 of the Endangered Species Act

Section 7(a) - Consultation/Conferencing

Requires: 1) Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species;

2) Consultation with the U.S. Fish and Wildlife Service (Service) when a federal action may affect a listed species to ensure that any action authorized, funded, or carried out by a federal agency will not jeopardize the continued existence of listed species, or result in destruction or adverse modification of critical habitat. The process is initiated by the federal agency after determining that the action may affect a listed species; and

3) Conferencing with the Service when a federal action may jeopardize the continued existence of a proposed species, or result in destruction or adverse modification of proposed critical habitat.

Section 7(c) - Biological Assessment for Major Construction Activities

Requires federal agencies or their designees to prepare a Biological Assessment (BA) for major construction activities[1]. The BA analyzes the effects of the action, including indirect effects and effects of interrelated or interdependent activities, on listed and proposed species, and designated and proposed critical habitat. The process begins with a request to the Service for a species list. If the BA is not initiated within 90 days of receipt of the species list, the accuracy of the list should be verified with the Service. The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable between the Service and the involved federal agency).

We recommend the following for inclusion in a BA: an onsite inspection of the area to be affected by the proposal, which may include a detailed survey of the area to determine if listed or proposed species are present; a review of pertinent literature and scientific data to determine the species' distribution, habitat needs, and other biological requirements; interviews with experts, including those within the Service, state conservation departments, universities, and others who may have data not yet published in scientific literature; an analysis of the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat; and an analysis of alternative actions considered. The BA should document the results of the impacts analysis, including a discussion of study methods used, any problems encountered, and other relevant information. The BA should conclude whether or not any listed species may be affected, proposed species may be jeopardized, or critical habitat may be adversely modified by the project. Upon completion, the BA should be forwarded to the Service.

Major concerns that should be addressed in a BA for listed and proposed animal species include:

1. Level of use of the project area by the species, and amount or location of critical habitat;

2. Effect(s) of the project on the species' primary feeding, breeding, and sheltering areas;

3. Impacts from project construction and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to the species and/or their avoidance of the project area or critical habitat.

Major concerns that should be addressed in a BA for listed or proposed plant species include:

1. Distribution of the taxon in the project area;

2. Disturbance (e.g., trampling, collecting) of individual plants or loss of habitat; and

3. Changes in hydrology where the taxon is found.

Section 7(d) - Irreversible or Irretrievable Commitment of Resources

Requires that, after initiation or reinitiation of consultation required under section 7(a)(2), the Federal agency and any applicant shall make no irreversible or irretrievable commitment of resources with respect to the action which has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternatives which would avoid violating section 7(a)(2). This prohibition is in force during the consultation process and continues until the requirements of section 7(a)(2) are satisfied.

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[1] A major construction activity is a construction project, or other undertaking having similar physical impacts, which is a major action significantly affecting the quality of the human environment as referred to in the National Environmental Policy Act [42 U.S.C. 4332 (2)(c)].