BIOLOGICAL ASSESSMENT
LAKE CREEK BRIDGE REPLACEMENT
(KN 12499)

Santiam Highway 20 (MP 9.66)
Jefferson County, Oregon

Bull Trout

Prepared for:

OREGON DEPARTMENT OF TRANSPORTATION

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April 9, 2003

Project Team Leader/District Manager Authorization of Conservation and Mitigation Measures

For

Lake Creek Bridge Replacement

I have reviewed the project description for accuracy. I have also reviewed the conservation and mitigation measures for this project. I agree that the conservation and mitigation measures should be incorporated into this project's contract documents or implementation plans (in the case of use of in-house forces) so that ODOT will be in compliance with the Endangered Species Act and other applicable environmental laws and regulations.

____	__________________________
ODOT Project Team Leader or District Manager	**Date**
____	__________________________
ODOT Construction Manager	**Date**

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APPENDICES

1.0 INTRODUCTION

1.1 BACKGROUND

The purpose of this Biological Assessment (BA) is to address the effects of the Lake Creek Bridge Replacement Project on fish species listed or proposed as threatened or endangered under the Federal Endangered Species Act (ESA) of 1973. This document also addresses the potential effects of the project on Essential Fish Habitat (EFH) as designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1996. Federal Highway Administration (FHWA) funds will partially finance this project and constitute the Federal nexus. The Oregon Department of Transportation (ODOT) is responsible for the project design and management.

This project will involve replacing the existing Highway 20 bridge over Lake Creek (Figure 1). The project has the potential to impact bull trout (*Salvelinus confluentus*) and their proposed critical habitat because the project will require removal of 2.5 hectares (6.0 acres) of vegetation at the construction site.

This BA, prepared by Mason, Bruce & Girard, Inc. (MB&G) for ODOT, addresses the proposed action in compliance with Section 7(c) of the ESA, as amended, and Section 305(b)(2) of the MSA, as amended by Public Law 104-267 (See Section 12.0 of this document for EFH Consultation). Section 7 of the ESA assures that, through consultation (or conferencing for proposed species) with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NOAA Fisheries) Federal actions do not jeopardize the continued existence of any threatened, endangered or proposed species, or result in the destruction or adverse modification of designated or proposed critical habitat.

Section 7 consultation and conferencing is accomplished, in part, through this BA, which evaluates the potential effects that the proposed transportation project will have on fish species that are listed or proposed as threatened or endangered under the Federal and State ESA and their critical habitat. Conservation measures are identified in this BA to avoid or minimize any adverse effects of the proposed project on listed species and their habitat.

1.2 LOCATION

The bridge is commonly known as the Lake Creek Bridge and it is located over Lake Creek along Highway 20 in Jefferson County, Oregon (Figure 1). The Highway 20 corridor is an important freight route and is the primary east-west route between the mid-Willamette Valley and Central Oregon. Lake Creek Bridge is near Suttle Lake at milepoint 78.42 and is in the southeast corner of Section 24, Township 13 South, Range 8 East at longitude 44.4284°N and latitude -121.7242°W (USGS 1988).

Figure 1

1.3 PURPOSE AND NEED

The purpose of this project is to maintain safe and efficient traffic through the highway corridor. Highway 20 is a major freight corridor from Interstate 5 in Albany to Central Oregon and Highway 97. Lake Creek Bridge was identified by ODOT Bridge section as being structurally deficient and in need of truck weight restrictions. ODOT proposes to replace this bridge with a bridge that will accommodate legal and special permit loads, to meet current seismic standards, and to meet American Association of State Highways and Transportation Officials (AASHTO) standards for lane width and bridge rail safety. In addition, the bridge replacement and improvements will continue to serve and improve the Central Oregon economy as well as the flow of commerce between Central Oregon and the Willamette Valley.

2.0 EVALUATION METHODS

Factors considered in evaluating project impacts included the species' dependence on specific habitat components that will be removed or modified, the abundance and distribution of habitat, habitat components in the project vicinity, distribution and population levels of the species (if known), the possibility of direct impact to fish, the degree of impact to habitat, and the potential to mitigate the adverse effect. The methods outlined in *A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale* (USFWS 1998A) were used to analyze the potential for project impacts on water quality and in-stream and riparian habitat quality. The method of analysis used in this BA is to determine the environmental baseline for the watershed, discuss how the proposed action will affect the environmental baseline, and then use that information in a dichotomous key to arrive at a determination of effect.

Information pertaining to the project and potential impacts was collected through a series of communications, including meetings, site visits, telephone calls, electronic mailings, and facsimiles. The information contained in this document was produced predominately from these communications.

A project team meeting was held on February 6, 2003 to discuss conservation measures and constructability. In attendance were Bill Warncke (ODOT Biologist), Kendel Emmerson (MB&G Biologist), Randy Reeve (Oregon Department of Fish and Wildlife), Ted Stewart (ODOT Roadway Designer), Jerry Rosenblad (ODOT Roadway Designers), Jane Lee (ODOT Project Leader) Susan Whitney (ODOT Environmental Project Manager), Shane Ottoson (ODOT Assistant Construction Project Manager), Joe Charbonneau (ODOT Bridge Engineer), Steve Starkey (ODOT Bridge Engineer), Mats Halvardson (ODOT Bridge Engineer), Mark Kittel (ODOT Bridge Engineer), and Patti Caswell (ODOT Permit Specialist).

A site visit was conducted on February 28, 2003. In attendance were Bill Warncke (ODOT Biologist), Kendel Emmerson (MB&G Biologist), Diana Hwang (USFWS Biologist), Cameron Lee (USFWS Biologist), Ted Stewart (ODOT Roadway Designer), Simon Wray (ODOT/ODFW Liaison), Mike Reihle (Deschutes National Forest Fish Biologist), Dennis McIntosh (ODOT Transportation Maintenance Manager), Willie Stevens (ODOT Transportation Maintenance Coordinator), Jane Lee (Project Leader), Susan Whitney (Environmental Project Manager), Shane Ottoson (Assistant Construction Project Manager), Lauri Turner (Deschutes National Forest Wildlife Biologist), Jeff Sims (Deschutes National Forest Special Use Permits Coordinator), and Alan Heath (Deschutes National Forest Forester)

3.0 PROJECT DESCRIPTION

Lake Creek Bridge is located along Highway 20 at milepoint 78.42 (Figure 1). The existing bridge is a 2-lane, 3-span bridge that is 23.2 m (76.0 ft) long and 13.0 m (42.7 ft) wide. This bridge presently has truck-weight restrictions. The bridge will be removed and replaced with a single-span bridge that will be 28.0 m (91.9 ft) in length and 12.8 m (42.1 ft) wide. The new bridge will be the on the same alignment as the existing structure; therefore a detour route and bridge will be constructed north and downstream of the existing structure to accommodate traffic during construction (Appendix A – Detour Plan Sheet 4A).

The existing bridge is a three-span bridge that has two interior piers located below the ordinary high water mark (OHWM). The middle span over the channel is 10.6 m (34.8 ft) long and the 2 end spans are 6.3 m (20.7 ft) long each. The replacement bridge will be a single-span bridge with two bents above the OHWM (Appendix A-TSL-Plan and Elevation Sheet 1). Therefore the bridge span over the active channel will increase from 10.6 m (34.8 ft) to 28 m (91.9 ft) improving stream habitat, hydraulic function and wildlife passage. The replacement bridge will be constructed on the existing bridge's alignment to minimize permanent impacts to the creek and the surrounding riparian area

3.1 ACTION AREA

The "action area" of the proposed project, in terms of potential impacts to listed fish species, encompasses the Highway 20 corridor for an area that is 880 m (2,887 ft) in length. It extends from the eastern project terminus at station 20+976 to the western terminus of the project at station 21+856 (Appendix A General Construction Sheet 3, 4, 4A, and 5). The action area includes a segment of Lake Creek that crosses and parallels the highway alignment (Appendix A General Construction Sheet 4). The action area includes Lake Creek for a distance of 50 m (164 ft) upstream of the Lake Creek Bridge. This defines the upper extent of potential ground disturbances along the adjacent roadway. The action area also includes Lake Creek for a distance of 250 m (820 ft) downstream of the existing Lake Creek Bridge. This defines the downstream or lower extent of temporary turbidity. Riparian vegetation removal will occur within 80 m (262.5 ft) downstream of the existing bridge. These impacts will be on both stream banks in the location of the detour bridge and on the south bank parallel to the road further downstream.

The construction limits for Lake Creek Bridge includes streambank, riparian, wetland, and upland areas adjacent to Lake Creek and Highway 20. The construction limits include areas that will be subject to vegetation removal and construction of the detour route. Staging areas will be located within the defined construction limits or within existing cleared areas outside of the construction limits. The total construction footprint is estimated to be less than 2.5 ha (6.2 ac).

East of the bridge the construction limits are as follows and as shown in Appendix A Sheets 3A, 4A, and 5A. The construction limits northeast of the bridge will extend to the east no more than 250 m (820 ft) from the existing bridge's east abutment. The construction limit to the north will extend no more than 25 m (82 ft) from the pavement edge adjacent to the bridge, and then will taper to 3 m (10 ft) from the pavement edge at the eastern terminus. The construction limits southeast of the bridge will extend to no more than 250 m (820 ft) from the existing bridge's east abutment. The construction limit to the south will extend no more than 15 m (50 ft) from the pavement edge adjacent to the bridge, and then will taper off at the eastern terminus.

West of the bridge the construction limits are as follows and as shown in Appendix A Sheets 3A, 4A, and 5A. The construction limits southwest of the bridge will extend to the west no more than 250 m (820 ft) from the existing bridge's west abutment. The construction limit to the south will extend no more than 10 m (33 ft) from the pavement edge adjacent to the bridge, and then will taper to 3 m (10 ft) from the pavement edge at the western terminus. The construction limits northwest of the bridge will extend to no more than 330 m (1,083 ft) from the existing bridge's west abutment and no more then 45 m (148 ft) north of the pavement edge.

3.2 MOBILIZATION

Construction mobilization consists of site preparation in advance of primary construction activities. Mobilization activities include preparation and installation of environmental controls, preparation of equipment and material storage areas, and relocation of utilities. These activities will occur before initiation of primary construction activities.

3.2.1 Environmental Controls

Environmental controls include establishment of limits of clearing, installation of temporary and emergency erosion controls, and preparation of pollution and erosion control plans. Prior to any construction activities or significant earthwork, all clearing limits will be flagged for protection of critical riparian vegetation, wetlands, and other sensitive sites. All temporary erosion controls will be installed according to an Erosion and Sediment Control Plan (ESCP) that will be developed for the project. Temporary erosion controls (e.g., silt fence, straw bales, etc.) will be installed downslope of project activities within riparian areas and activities adjacent to wetlands and waters of the state.

A pollution control plan (PCP) will be developed to prevent project-related pollution. In addition, a Spill Prevention Control and Countermeasures Plan (SPCCP) will be developed to identify all potential spill hazards and prescribe preventive and response measures to avoid and minimize damage to the environment.

3.2.2 Equipment Staging

Staging of equipment and materials actively being used during construction activities will occur within defined construction limits or within pre-existing developed sites greater than 45 m (150 ft) from the regulated work area of Lake Creek.

3.2.3 Utilities Relocation

Replacement of the Lake Creek Bridge will require the temporary relocation of utilities that are attached to the south side of the existing structure. This will involve suspending the utilities from poles at the southeast and southwest corners of the bridge. The poles will be constructed within ODOT right of way in previously disturbed areas. The utilities will be reattached to the south side of the bridge upon completion of the replacement bridge.

3.3 CONSTRUCTION SEQUENCE AND METHODS

Lake Creek Bridge is at an elevation of 1,050 m (3,500 ft); therefore the project area is prone to harsh winter conditions which restrict the construction season to occur between May and September during an typical year. The project is scheduled to begin in the fall of 2003 and continue through the 2005 construction season. The project will begin with vegetation removal within the project area, which will occur between October 1, 2003 and February 28, 2004. The detour construction will begin in the spring of 2004, likely in May. Construction for the detour bridge will begin June 1. Once the detour bridge is completed traffic will be directed to the detour route and the existing bridge will be removed. The existing bridge bent removal will require in-water work and will be accomplished within the ODFW in-water work window for Lake Creek (July 1 – September 30). The construction of the new bridge structure will proceed after the existing structure is removed. The new structure will support traffic in the fall of 2004, but construction will continue into the 2005 construction season, including the removal of the detour bridge and roadway.

3.3.1 Vegetation Removal and Cinder Input Control

The harsh winter conditions require ODOT to frequently plow and sand the highway. Due to Highway 20’s proximity to Lake Creek, the sanding material (cinder gravel) is currently entering the stream at the southwest corner or the bridge, where the creek is just below the road slope, and northeast of the bridge, where the highway parallels the creek (Appendix B Photo 1). The cinder input is impacting the creek by increasing sedimentation and substrate embeddedness; thus deteriorating bull trout habitat quality. To control this cinder input, permanent catch basins will be constructed within the construction limits on each side of the highway on the west side of the bridge. These catch basins will intercept cinders moving downslope toward the creek from the highway and be designed to be cleaned out periodically.

Vegetation removal will occur within the construction limits, as defined in Section 3.1. The total construction footprint is estimated to be less than 2.5 ha (6.2 ac). Tree removal within the construction limits will be conducted by the USFS or their designated contractor between October 1, 2003 and February 28, 2004. ODOT's construction contractor will conduct the necessary grubbing to remove stumps and other vegetation debris within the construction limits during the spring of 2004. Vegetation within the construction limits consists primarily of upland forested areas but also includes streambank, riparian, and wetland areas associated with Lake Creek.

All streambanks, soils, and vegetation disturbed by the project will be restored. The restored streambanks will be reshaped to a natural slope, pattern, and profile. Disturbed areas will be stabilized and replanted with a diverse assemblage of native shrubs and trees. The highway fill slope that parallels Lake Creek northeast of the existing bridge will be replanted with species and at density that will minimize the existing erosion and cinder input. No application of pesticides or herbicides will be allowed within 90 m (295 ft) of Lake Creek. In addition, no fertilizer will occur within 15 m (50 ft) of Lake Creek.

3.3.2 Detour Bridge and Roadway

Traffic will be detoured north of the existing bridge during the removal of the existing structure and the construction of the new structure. The detour will include a temporary roadway and bridge, which will be as close to the existing bridge and roadway alignment as site conditions and safety allow (Appendix A – Detour Plan Sheet 3, 4, 4A, and 5). Once the new structure is able to support traffic the bridge and roadway will be removed. The detour alignment has been designed to minimize impacts to listed species and their habitat while providing for safe travel through the construction zone.

Detour route options were limited due the proximity of Lake Creek to the above (south) and below (north) of the highway. The detour roadway has been included in the construction limits as described in Section 3.1, and vegetation removal for the detour roadway has been addressed in Section 3.3.1 (Appendix B Photo 2 and 3). In addition to vegetation removal the detour roadway alignment may require rock removal, which depending on the size, type, and position of the rock may require the use a rock drill or hoeram.

The detour bridge width has been minimized to reduce impacts to the riparian and streambank areas. Because of harsh winter conditions, limited site distance due to the steep grades, and high traffic volume with frequently speeding vehicles, it is imperative for public safety that traffic be routed from the detour alignment to the permanent alignment prior to the winter of 2004/2005. In order to construct the detour bridge and replacement bridge in one construction season, it will be necessary to begin construction as early as possible in 2004.

The detour bridge will be a precast, prestressed slab superstructure supported by driven pile. Pile driving is expected to occur after June 1 of the 2004 construction season and last for 6 days, 8 hours per day. Shoring for the new bridge bents will require that temporary sheet pile be driven by either an impact driver or, if soil conditions permit, a vibratory pile driver. This is expected to require no more than 8 hours per day over the course of 5 days during the 2004 construction season.

The detour bridge will be a single-span that is 8 m (32.0 ft) wide and 23.0 m (75.5 ft) long. The structure will consist of precast, prestressed bulb-I girders supported by two bents (Appendix A – TSL Plan and Elevation Sheet 1). The bridge bents will be above the ordinary high water mark and supported with driven pile. The bridge will have an out-out (overall) width of 9.8 m (32.0 ft) and a 8.5-m (28.0-ft) roadway width. The roadway will consist of two 4.3 m (14.0 ft) travel lanes and two 610-mm (24.0 in) rails (Appendix A – TSL Plan and Elevation Sheet 2). The bridge rails will be concrete median barrier rails.

3.3.3 Bridge Removal

The existing bridge will be removed to construct the proposed bridge on the existing alignment. The bridge rails and asphalt-concrete wearing surface will be removed from the structure using containment measures and in a manner that prevents debris from entering the stream. The existing bents are within the OHWM and will be removed to 0.6 m (2.0 ft) below groundline (Appendix B Photo 4). The concrete footings will be isolated from the actively flowing stream using inflatable bags, sandbags, or similar materials.

The contractor will prepare a Bridge Removal Plan (BRP) that gives complete and detailed plans for removing the existing bridge. The BRP shall be submitted for ODOT approval prior to construction. The BRP will outline specific containment measures necessary to keep all bridge removal and construction debris out of the channel during the life of the contract. A diagram will be prepared to show the method and sequence of construction and removal; this diagram will be submitted as part of the BRP.

3.3.4 Lake Creek Bridge Construction

The proposed Lake Creek Bridge will be single-span that is 12.8 m (42.1 ft) wide and 28.0 m (91.9 ft) long. The structure will consist of prestressed bulb-I girders with a cast-in-place deck supported by two bents (Appendix A – TSL Plan and Elevation Sheet 1 and 2). The replacement bridge deck will be 1.9 m (6.2 ft) above the OHWM, which is 0.3 m (1.0 ft) higher than the existing bridge. The bridge bents will be above the OHWM and will be supported with driven pile. The bridge will have an out-out (overall) width of 12.8 m (42.0 ft) and a 12.0 m (39.4 ft) roadway width. The bridge will consist of two 3.6 m (12 ft) travel lanes, two 2.4 m (8.0 ft) shoulders, and two 410 mm (16 in) rails (Appendix A – TSL Plan and Elevation Sheet 2). Cast-in-place concrete bridge rails with decorative inset niches to simulate windows will be constructed on both sides of the bridge to maintain visual continuity with other bridges within the Highway 20 scenic route (Appendix A – TSL Plan and Elevation Sheet 2). The new structure will result in a 377 m^2 (4,058 ft^2) increase in impervious surface.

Stormwater on the bridge is currently routed directly off the bridge into Lake Creek. The proposed project will convey stormwater runoff over at least 10 m (33 ft) of natural medium (through ditches or sheet flow) prior to entering the waterway.

New guardrail will be installed on the approaches of the new structure and in areas where the creek parallels the highway in close proximity to prevent errant vehicles from reaching the creek. Due to noise restrictions to address wildlife concerns, guardrail posts installed between March 1 and July 15 will be augured or punched, rather than driven. Guardrail posts installed with a vibratory and/or pounding installation method that occur between July 16 and September 30 will be restricted to a period beginning 2 hours after official sunrise and ending 2 hours before official sunset.

4.0 SPECIES PRESENCE AND STATUS

A variety of fish including native rainbow trout, bull trout, mountain whitefish, and several species of sculpin are present in the Metolius River watershed (USFS 1996). Anadromous forms of native sockeye were probably eliminated from the watershed in the 1930's by small dams on Lake Creek (USFS 1996). Spring chinook were eliminated from the watershed by 1968 due to inadequate juvenile passage at Round Butte Dam (USFS 1996). Brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), and kokanee (*Oncorhynchus nerka*) have been introduced to the system, and hatchery rainbow trout (*Oncorhynchus mykiss*) are stocked each year in the upper Metolius River (USFS 1996). Brown trout have become established in the Metolius River and Lake Creek, but do not use the other tributaries to the Metolius River (USFS 1996).

4.1 BULL TROUT

Species:	Bull Trout
DPS:	Columbia River
Federal Status:	Threatened
Critical Habitat:	Proposed

The Columbia River Bull Trout Distinct Population Segment (DPS) was listed as threatened under the ESA on June 10, 1998 (63 FR 31647). The Columbia River population segment is represented by widespread subpopulations that have declined in overall range and numbers of fish. A majority of Columbia River bull trout occur in isolated, fragmented habitats that support low numbers of fish and are inaccessible to migratory bull trout (63 FR 31647). A few remaining bull trout "strongholds" still remain in the Columbia River basin. These populations are found in large areas of contiguous habitats in the Snake River basin of the central Idaho mountains, upper Clark Fork and Flathead Rivers in Montana, and several streams in the Blue Mountains in Washington and Oregon (63 FR 31647). The USFWS considers this DPS threatened because of habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, and the introduction of non-native species (63 FR 31647).

Critical habitat was proposed for the Columbia River Bull Trout DPS on November 29, 2002 (67 FR 71235). Proposed critical habitat includes approximately 576 km (358 mi) of streams in the Lower Deschutes River basin. The proposed critical habitat sub-unit (CHSU) includes the entire Lake Creek stream system. Lake Creek subwatershed is comprised of the North Fork, Middle Fork, and South Fork Lake Creeks (Figure 1). Lake Creek from its confluence with North, Middle, and South Fork Lake Creeks upstream to Suttle Lake, as well at Suttle Lake itself, contains foraging, migratory, and overwinter (FMO) habitat of unknown occupancy according to the listing information in the federal register (67 FR 71235). However, data from the USFS indicates that the closest occurrence of bull trout to the project area is approximately 2 miles downstream of the project area in Metolius Meadows (M. Riehle pers. comm. 2003). Together these streams and lakes are identified as habitat essential to supporting an expanded bull trout population necessary for the recovery of the species (67 FR 71235).

Critical habitat for the Lake Creek stream system is defined as the bankfull elevation. Bankfull elevation is the level at which the water begins to leave the channel and move into the floodplain (Rosgen 1996) and is reached at a discharge that generally has a recurrence interval of 1 to 2 years on the annual flood series (Leopold et al. 1992). Critical habitat extends from the bankfull elevation on one side of the stream channel to the bankfull elevation on the opposite side. If bankfull elevation is not evident on either bank, the ordinary high-water line, as defined by the U.S. Army Corps of Engineers (Corps) in 33 CFR 329.11, shall be used to determine the lateral extent of critical habitat. Adjacent floodplains are not proposed as critical habitat. However, it should be recognized that the quality of aquatic habitat within stream channels is intrinsically related to the character of the floodplains and associated riparian zones, and that human activities that occur outside the river channels can have demonstrable effects on physical and biological features of the aquatic environment (67 FR 71235).

Bull trout are members of the char subgroup of the salmon family and are native to the Pacific Northwest and western Canada (USFWS 1998B). Like all char, bull trout have multiple life history forms, and complex age structures, behavior, and maturation schedules. Bull trout populations may consist of both migratory and non-migratory individuals (Pratt 1992). Resident bull trout are often found in small headwater streams where they spend their entire lives (Pratt 1992). Migratory forms rear in natal, tributary streams for one to four years before migrating to either a larger river (fluvial form), lake (adfluvial form), or salt water (anadromous) in the case of coastal populations (Pratt 1992). Migratory bull trout spend several years in one of these three habitats before returning to tributaries to spawn (Pratt 1992). Bull trout reach sexual maturity in 4 to 7 years, and adults may reach 12 years of age (Rieman and McIntyre 1993).

Bull trout have distinct habitat requirements compared to other Pacific salmonids (Rieman and McIntyre 1993). The five habitat characteristics particularly important for bull trout include water temperature, cover, channel form and stability, spawning and rearing substrates, and migratory corridors (Rieman and McIntyre 1993). Bull trout are predominantly associated with the coldest stream reaches within basins (Rieman and McIntyre 1993). Water temperatures above 15°C (59°F) are believed to limit bull trout distribution and may explain why distribution can be patchy within a watershed (Fraley and Shepard 1989; Rieman and McIntyre 1993).

Bull trout require relatively pristine water, low temperatures, clean substrate with loose gravel, and low gradient streams to spawn; hence, spawning areas are often associated with cold water springs, groundwater infiltration, and the coldest reaches of tributary streams in a watershed (Rieman and McIntyre 1993). Temperatures required to initiate spawning in adults vary from 4°C to 11°C (39°F to 52°F) during late August through October (Fraley and Shepard 1989; Buchanan and Gregory 1997). Optimal temperatures for juvenile rearing range from 4°C to 10°C (39°F to 50°F) (Buchanan and Gregory 1997).

The bull trout population in the Metolius River watershed is increasing. Bull trout spawning counts have increased since 1986 and appear to be recovering from over-fishing, predator control programs, and other factors (USFS 1996). Although not present today, bull trout were native to the Suttle Lake and used Lake Creek to move from the Metolius River (USFS 2001). Bull trout are known to rear in the Metolius River near the mouth of Lake Creek and bull trout spawn in the Metolius River 6 km (4 mi) downstream of the mouth of Lake Creek (USFS 2001). Recent surveys in Suttle Lake, Link Creek, and Lake Creek have not found bull trout (USFS 2001).

Lake Creek, in the project area, has been identified as potential winter foraging habitat for bull trout (M. Riehle pers. comm. 2003). Bull trout historically used this area; however, Lake Creek currently is a thermal barrier preventing the migration of bull trout into the project area (M. Riehle pers. comm. 2003). Since the Metolius Basin bull trout population is expanding, there is likelihood that bull trout may occupy Suttle Lake and the project area within the foreseeable future (M. Riehle, pers. comm. 2003).

5.0 BASELINE CONDITIONS

This section describes the baseline conditions within the Metolius River Watershed and focuses on the project action area, which is Lake Creek. Detail is provided for key environmental elements that may be impacted as a result of actions.

5.1 METOLIUS RIVER WATERSHED

The Metolius River watershed is situated on the eastern flank of the Cascade Mountains. The total size of the watershed is 113,400 ha (280,336 ac). The Metolius River is the largest spring-fed river in the region and is a major tributary to the Deschutes River. The Metolius River joins the Deschutes River approximately 161 km (100 mi) above the confluence of the Deschutes and Columbia Rivers (USFS 1996).

The Metolius River watershed is characterized by a major precipitation gradient from west to east (i.e., drier in the east). Temperature within the Metolius River watershed typically ranges from -7°C (19°F) in the winter to 33°C (92°F) in the summer. Freezing temperatures can be expected any month of the year, and the growing season is limited. Precipitation ranges from 25 to 127 cm (10 to 50 in) in the Metolius River watershed. Two-thirds of the annual precipitation falls between October and March, and approximately 12.7 m (42 ft) of snow can accumulate during the winter (USFS 1996).

The Metolius River watershed contains 177 km (110 mi) of permanent streams, 521 km (324 mi) of intermittent streams, 42 lakes, and 221 ponds. The Metolius River originates from springs at the base of Black Butte. The tributaries originate from snow melt in the Cascades or from groundwater springs that rise in the fractured basalt and alluvial gravels. The groundwater contribution of the tributaries is particularly important in maintaining flow stability and water temperature below 10^{o}C (50^{o}F) in the river. The Metolius River is designated a Wild and Scenic River with high water quality as one of its outstanding remarkable values (USFS 1996).

The Metolius River watershed lies in a transition zone, which creates a diversity of habitats and vegetation. Forested lands in the watershed comprise approximately 95 percent of the landscape. A wide variety of coniferous forest types inhabit the area from low elevation ponderosa pine (*Pinus ponderosa*) through high elevation subalpine fir (*Abies lasiocarpa)*. Non-forested areas, including grasslands, lava flows, lakes, and riparian areas are uncommon and collectively comprise approximately 5 percent of the watershed (USFS 1996). Of this amount of non-forested areas, approximately 2 percent is riparian habitats, which are some of the most biologically significant non-forested areas in the watershed. Riparian habitats and associated uplands are important connectivity corridors between late-successional interior habitats and the waterways (USFS 1996).

Fire is a natural process that has shaped the landscape of the Metolius River watershed. Fire suppression and the effects of fire exclusion have also played a role in shaping the current landscape patterns. The average area burned by fire in the Metolius River watershed is 562 ha (1,390 ac). Large fires generally burn from west to east or down the Metolius River. This watershed averages 17 fires per year, including three fires per year in the Suttle Lake subwatershed (USFS 1996).

In addition to fire, the Metolius River watershed has had extensive damage caused by western spruce budworm, particularly in the western portion surrounding the Santiam Highway Corridor (USFS 1996). The USFS has conducted extensive timber harvest activities in recent years to reduce fire potential from bug-killed trees and to reduce live tree densities and canopy coverage so that remaining trees will be better able to withstand budworm attacks.

5.2 LAKE CREEK

The project area is located on Lake Creek along Highway 20 near the Suttle Lake Resort. Lake Creek is a tributary to the Metolius River and is part of the Suttle Lake subwatershed. Lake Creek drains two 6th field subwatersheds: Suttle Lake and Cache Creek. The combined area is nearly 20,243 ha (50,000 ac). These subwatersheds are a part of the Metolius River watershed, which is a key watershed for bull trout and water quality as defined by the Northwest Forest Plan (USDA et al. 1994 cited in USFS 2001).

Lake Creek watershed has a reversed dendritic pattern that develops downstream of the project area and is comprised of the North Fork, Middle Fork, and South Fork Lake Creeks (Figure 1). The North Fork Lake Creek flows directly into the Metolius River at rkm 41.8 (rmi 26.0). The South Fork Lake Creek and Middle Fork Lake Creek flow back together before entering the Metolius River at rkm 42.3 (rmi 26.3). The South Fork Lake Creek is considered to be the mainstem stream channel and the North Fork and Middle Fork could be considered as irrigation diversion ditches (USFS 2002).

The headwaters of these watersheds originate in the Cascade Mountains. The watersheds have been heavily glaciated and small glacial lakes are common at elevations above of 1,372 m (4,500 ft). Below the furthest extent of glaciation, stream morphology changes to lower gradient, meandering stream types associated with glacial outwash plains (USFS 2001).

Past impacts to the Suttle Lake subwatershed have occurred from road construction, timber harvesting, residential development, recreational activities, and wildfire (USFS 2001). Since 1962, approximately 31 percent of the Suttle Lake watershed has been entered for timber harvest activities (USFS 2001). Wildfires have burned approximately 18 percent of the Suttle Lake watershed since 1908 (USFS 1996).

The lands surrounding Lake Creek Bridge are owned entirely by the USFS Deschutes National Forest with a few privately held long-term leases. The lands are forested slopes comprised of mixed conifer second growth dominated by Douglas-fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), and ponderosa pine (*Pinus ponderosa*). The conifers range from 51 cm (20 in) to 152 cm (60 in) in dbh, with most trees averaging 101 cm (40 in) dbh (USFS 1996).

6.0 ANALYSIS OF EFFECT

This section addresses only possible impacts due to the proposed action. Effects are considered for Lake Creek within the action area, which includes the area upstream and adjacent to the existing bridge, downstream of the existing bridge, and parallel to the highway. Section 6.1 discusses Site-Specific Impacts that may result due to the proposed action, Section 6.2 presents Minimization and Avoidance Measures, and Section 6.3 describes the Impacts to Environmental Baseline.

6.1 SITE-SPECIFIC IMPACTS

This subsection addresses site-specific impacts that may result from this project given the conservation measures under which it will occur. These potential impacts include possible temporary reductions in water quality, channel condition and dynamics, and watershed conditions.

6.1.1 Water Quality

Water quality is a major component of salmonid habitat. The condition and quality of the water that the fish encounter during their life cycle is extremely important, and can determine such things as feeding and breeding success rates, disease levels, growth rates, and predation rates. Major elements of water quality critical to salmonids are turbidity/sediment levels, chemical contamination, and temperature. Turbidity and fine sediments can reduce prey detection, alter trophic levels, reduce oxygen along the substrate, smother redds, and damage gills, as well cause other deleterious effects. Chemical contamination can alter fecundity and fertility levels, increase disease, shift biotic communities, and reduce the overall health of salmonids. Temperature affects metabolic rates, resistance to disease, oxygen levels in the water, and other vital factors.

Possible impacts to water quality from the project, though unlikely, could occur from chemical contamination, increased turbidity levels, and changes in stream temperature. In addition to the Erosion and Sediment Control Plan (ESCP) and Pollution Control Plan (PCP) containment measures that would be developed for the project would reduce the probability of adverse impacts to current water quality conditions.

Construction-related debris: Because of the extensive over-water and in-water work, construction-related debris could potentially enter the stream during removal of the existing structure and detour bridge, as well as during the construction of the proposed structure.

Chemical contamination: Possible chemical contamination of Lake Creek could occur from concrete pouring and curing activities, pile driving activities (when equipment operates near the stream), stormwater runoff, and vehicle fluid leaks. If staging occurs on impervious surface within 45 m (150 ft) of Lake Creek potential chemical contamination could occur via fluid leaks and spills.

Turbidity: Increases in turbidity would be limited to activities associated with vegetation removal, structure removal, and bridge construction work. Disturbances proposed below the OHWM include removal of the existing bridge bents, which will occur within the ODFW in-water work window and within in-water work area isolation with the stream flow diverted around the work area.

Stream Temperature: Removal of riparian vegetation can cause elevated stream temperatures. Solar radiation is the principal energy source that causes stream heating (IMST 2000). Shading reduces direct solar radiation loading and stream heating (IMST 2000). An estimated 2.5 ha (6.2 ac) of primarily upland vegetation will be removed for this project. Removal of riparian vegetation will occur adjacent to the existing bridge in the area of the detour bridge and downstream and northeast of the bridge within the area of the detour route between the south bank of Lake Creek and Highway 20.

6.1.2 Channel Conditions and Dynamics

Channel conditions and dynamics are influenced by a number of processes. Changes in impervious surface area and vegetation removal are two common elements of transportation projects that directly affect channel condition and dynamics. Additional impervious surfaces can alter the water quality, hydrology, and habitat complexity of a system. Increased roadway area provides additional opportunities to collect and store chemicals released from automobiles. The reduction in infiltration capacity can steepen the rising limb of a storm hydrograph, resulting in a flashy system, increased erosion, and reduced groundwater storage. The increase in erosion can lead to simplification and channelization of the stream, while the reduced groundwater storage can alter the peak and base flows of the drainage.

ODFW in-water work window is July 1 to September 30. The only in-water work required would be for the existing bridge's bent removal, which would occur after July 1.The Lake Creek Bridge replacement project will require an estimated 14-day period of work area isolation and will occur after July 1. Temporary channelization resulting from in-water work isolation will be more than offset by the permanent improvement of channel dynamics as a result of the removal of the existing bents below the OHWM.

Permanent impervious surface within the project area will increase 377 m^2 (4,058 ft^2). This increase will have a negligible and undetectable, effect on Lake Creek hydrology. The detour bridge and roadway will provide an estimated 5,000 m^2 (53,820 ft^2) of impervious surface, which could impact the stream during peak flow events. Because the detour bridge and roadway will be removed and replanted, this would be a temporary impact.

6.1.3 Watershed Condition

Potential impacts to watershed condition arise from the removal of riparian vegetation. All vegetated areas disturbed during construction will be replanted with appropriate native seed mixes and plant stock following completion of the bridge replacement project.

6.2 Minimization and Avoidance Measures

Conservation measures have been incorporated into the project design (Section 7.0) to minimize and avoid impacts to fish and their habitat. These measures address in-water work, water quality, erosion and sediment control, containment of construction materials, handling of hazardous materials, staging activities, and disturbance of riparian vegetation. In addition, the project design has gone through extensive review and revisions to minimize impacts commonly associated with transportation projects. These design elements include:

- The replacement bridge will be built on the same alignment to reduce permanent impacts to the riparian habitat and streambank areas.
- The replacement bridge will be single-span with both bents outside of the OHWM to improve stream function and wildlife passage.
- The replacement bridge deck span over the active channel will increase from 10.6 m (34.8 ft) to 28 m (91.9 ft) and will be 0.3 m (1.0 ft) higher than the existing bridge,

which will improve stream habitat, hydraulic function, and promote passage for upland wildlife species.

- The detour route was designed on the north side of Highway 20 to avoid impacting wetland areas associated with Lake Creek and the stream itself southeast of the existing bridge.
- In-water work will be isolated and stream flow will be diverted around the work area during the removal of the existing bridge bents.
- A planting plan will be developed to compensate for vegetation loss and augment the native plant community.
- Catch basins will be constructed at each end of the bridge to reduce cinder sanding material entering the creek.

6.3 IMPACTS TO ENVIRONMENTAL BASELINE

Evaluation for potential impacts of this proposed action on the Lake Creek watershed was conducted according to *A Framework* to Assist in *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (USFWS 1998A). Baseline conditions in the Lake Creek watershed and the effects of the proposed project are summarized in Table 1. If effects are not detectable (i.e. considered negligible) for Lake Creek, then it is assumed that they are also not detectable for the Metolius River. Although the project is on USFS lands and within the range of the northern spotted owl, the project is excepted from the Northwest Forest Plan (NWP) because it is a highway project with public safety concerns. Therefore the NWFP Aquatic Conservation Strategy (ACS) are not applicable to this project.

Table 1. Checklist for documenting environmental baseline and effects of the proposed action on relevant indicators (USFWS 1998A) for The Columbia River DPS bull trout.

DIAGNOSTICS/PATHWAYS: INDICATORS	POPULATION AND ENVIRONMENAL BASELINE			EFFECTS OF THE ACTION (S)			
	Functioning Appropriately	Functioning At Risk	Functioning at Unacceptable Risk	Restore	Maintain	Degrade	Compliance with ACS
Subpopulation Characteristics							
Subpopulation Size			X		X		Not Applicable
Growth and Survival			X		X		Not Applicable
Life History Diversity and Isolation			X		X		Not Applicable
Persistence and Genetic Integrity			X		X		Not Applicable
Water Quality							
Temperature			X		X (-)		Not Applicable
Sediment/Turbidity		X			X(+)		Not Applicable
Chemical Contamination	X				X		Not Applicable
Habitat Access:							
Physical Barriers	X				X		Not Applicable
Habitat Elements:							
Substrate Embeddedness		X			X(+)		Not Applicable
Large Woody Debris	X				X		Not Applicable
Pool Frequency and Quality			X		X		Not Applicable
Large Pools			X		X		Not Applicable
Off-Channel Habitat	X				X (-)		Not Applicable
Refugia	X				X (-)		Not Applicable
Channel Condition and Dynamics:							
Wetted Width/Maximum Depth Ratio	X				X		Not Applicable
Streambank Condition		X			X (+)		Not Applicable
Floodplain Connectivity	X				X		Not Applicable
Flow/Hydrology:							
Change in Peak/Base Flows	X				X (-)		Not Applicable
Drainage Network Increase		X			X		Not Applicable
Watershed Conditions:							
Road Density & Location		X			X		Not Applicable
Disturbance History		X			X (-)		Not Applicable
Riparian Conservation Areas		X			X (-)		Not Applicable
Disturbance Regime		X			X (-)		Not Applicable
Species and Habitat							
Integration of Species and Habitat Conditions			X		X		Not Applicable

Watershed: Lake Creek

Note: Impacts at a local level but not sufficient to alter the environmental baseline for the watershed are indicated using a “(-)” for temporary or localized impacts or “(+)” for temporary or localized beneficial alterations.

- **Subpopulation Characteristics**

Subpopulation Size: Bull trout redd counts in the tributaries of the Metolius River Basin indicated that the bull trout population is increasing (USFS 1996). However, bull trout have not been reported in Suttle Lake since the 1950's, which is probably due a thermal barrier within Lake Creek (M. Riehle pers. comm. 2003). Therefore the local population size for Lake Creek is considered to be **functioning at unacceptable risk**. The proposed project would remove riparian vegetation that may adversely effect stream temperatures; however the rise in stream temperature should be undetectable in the Metolius River. In addition, all temporarily disturbed areas would be replanted with natural vegetation that will provide the same or higher canopy cover than present **(maintain)**.

Growth and Survival: The Metolius River subpopulation as a whole is increasing. The population appears to be resilient to short-term disturbances because the recent forest fires and massive bug kill on the forest have not impacted the species. However, because the upper reaches of Lake Creek do not currently support a local population of bull trout this parameter is considered to be **functioning at unacceptable risk.** The proposed project would cause a short-term disturbance, but this will be undetectable to current bull trout population in the Metolius River (**maintain**).

Life History Diversity and Isolation: Historically, bull trout may have used the lower Deschutes River for rearing habitat; however since the construction of Round Butte Dam bull trout have adapted to residing in Lake Billy Chinook. The Upper Metolius River population is considered to be healthy because of the increasing trend in redds and the presence of the three life history forms: resident, fluvial (river), and adfluvial (lake) (USFS 2002). Lake Billy Chinook appears to provide good rearing habitat and holds the state record for a bull trout that weighed over 10 kg (23 lbs.) (USFS 1996). Round Butte Dam, which impounds Lake Billy Chinook, was constructed below the confluence of the Crooked River and Deschutes River and Metolius River and Deschutes River. Therefore, the large reservoir provides an opportunity for subpopulations to mix and it facilitates further genetic interchange.

However, since bull trout do not currently inhabit the upper reaches of Lake Creek the subpopulation within Lake Creek is considered **functioning at unacceptable risk.** The proposed project actions will not isolated existing subpopulations; therefore it will **maintain** this parameter.

Persistence and Genetic Integrity: Currently there are no bull trout above the lower reach of Lake Creek; therefore this parameter is considered to be **functioning at unacceptable risk**. The proposed project actions will not impact connectivity between sub or local populations; therefore it would **maintain** this parameter.

- **Water Quality**

Temperature: Lake Creek has higher stream temperatures as a result of the warmer surface waters of Suttle Lake draining into Lake Creek (USFS 1996). Lake Creek is listed on the Oregon Department of Environmental Quality (ODEQ) 303(d) List of Water Quality Limited

Water Bodies because it exceeds temperature criteria in the summer for salmonid rearing **functioning at unacceptable risk**) (ODEQ 1999). The proposed project will remove riparian vegetation; however, these areas will be replanted with natural vegetation that will have equal to or higher canopy cover than existing conditions **(maintain -)**.

Sediment: Lake Creek turbidity increases in the summer due to the influence of surface water from Suttle Lake (USFS 1996). Based on analysis during the Metolius Watershed Assessment, the Suttle Lake subwatershed is experiencing a moderate to high increase in sediment delivery (USFS 1996), which could be a result of runoff from the highway and resort areas along Suttle Lake (USFS 2001). As a result, moderate levels of fine sediment have been found in spawning habitat and macroinvertebrate habitat in Lake Creek (Riehle 1993, USFS 1996) (**functioning at risk**). Temporary localized impacts are possible through pile driving, bridge removal, bank fill material manipulation, and other construction activities. Work area isolation and the development and implementation of Erosion and Sediment Control Plan will minimize short-term, localized impacts to turbidity. The construction of catch basin to contain and prevent cinder sanding material from entering the creek will significantly decrease sedimentation in Lake Creek in the project area (**maintain +)**.

Chemical Contamination: Lake Creek watershed is not currently listed for chemical contamination on the DEQ 303(d) list; therefore it is considered **Functioning Appropriately**. Chemical contamination of Lake Creek could occur when activities involving hazardous materials occur over or adjacent to the actively flowing stream during construction; however, proper implementation of conservation measures would prevent or minimize the potential for adverse effects **(maintain)**.

- **Habitat Access**

Physical Barriers: Lake Creek Lodge has a dam that could function as a barrier to fish moving up Lake Creek at certain times of the year (USFS 1996). However, this dam is not expected to be a barrier to bull trout (**functioning appropriately**). Construction of the proposed project will **maintain** the current condition.

- **Habitat Elements**

Substrate Embeddedness: Lake Creek substrate within the project area is comprised of boulder, cobble, gravel, and fine sediment compacted between the aggregate. Due to its tendency for higher sediment levels, extent of substrate embeddedness observed at the Lake Creek project area, and large number of roads within the Lake Creek watershed, this parameter is considered to be **functioning at risk.** Construction of the proposed project will cause a temporary increase in sediment; however, proper implementation of conservation measures, including the basins to reduce sanding material input to the stream, would prevent or minimize the potential for adverse effects (**maintain** +).

Large Wood: All Metolius River tributaries, including Lake Creek, exceed PACFISH Riparian Management Objectives (RMO) of greater than 20 pieces of wood, greater than 30 cm (12 in) diameter and 11 m (35 ft) in linear length (USFS 1996). Therefore this parameter is considered to be **functioning appropriately**. Some of the trees that will be cut to construct the project will be retained and strategically placed in the stream upon project completion (**maintain**).

Pool Frequency: The main channel of Lake Creek had 1 pool per 1.6 km (1.0 pool per mile), which is below the standards for pool frequency **(functioning at unacceptable risk)** (USFS 1996). The new bridge bents will be above the 2-year floodplain and would improve the channel morphology of Lake Creek. However no large pools were detected within the project area, so the impacts to the parameter are expected to be negligible **(maintain).**

Large Pools: Due to lack of pools within the Lake Creek watershed this parameter is **functioning at unacceptable risk**. The proposed project actions would not impact any large pools (**maintain).**

Off-Channel Habitat: A USFS study found Lake Creek to have 6 percent side channels (USFS 1996). Backwaters and off-channel habitat with adequate cover exist within the project area (**functioning appropriately).** Proposed vegetation removal and construction activities have the potential to cause a temporary increase in temperature and sediment in these areas (**maintain -**).

Refugia: Fish hiding cover along Lake Creek within the project area exists in areas of overhanging vegetation and within a log jam down stream of the bridge (**functioning appropriately**). Impacted riparian vegetation would be restored upon project completion(**maintain -**).

- **Channel Conditions and Dynamics**

Width/Depth Ratio: The USFS reported the width to depth ratio in the main channel of Lake Creek to be 8:1, which meets the PACFISH RMO of less than 10:1 (USFS 1996). Therefore this parameter is **functioning appropriately**. The proposed project will not affect this parameter (**maintain)**.

Streambank Condition: There is active erosion along the streambank adjacent to Highway 20 within the project area; therefore this parameter is **functioning at risk.** Upon completion of the proposed project, this streambank would be replanted at a higher density (compared to what was removed) and with species that would minimize erosion (**maintain** +).

Floodplain Connectivity: Wetland function is maintained and off-channel hydrologic connectivity is restored by regular flood events (**functioning appropriately**). The proposed project will **maintain** this parameter.

- **Flow/Hydrology**

Peak/Base Flows: Stream gauging at the Suttle Lake outlet on Lake Creek provides little evidence of an altered flow regime when peak flows were assessed **(functioning**