United States Department of the Interior

FISH AND WILDLIFE SERVICE

Western Washington Fish and Wildlife Office
510 Desmond Dr. SE, Suite 102
Lacey, Washington 98503

In Reply Refer To:
1-3-06-F-0177

SEP 15 2006

Magalie R. Salas, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington D.C. 20426
Attention: Ann Ariel Vecchio

Dear Secretary Salas:

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion on the effects to bull trout (*Salvelinus confluentus*), northern spotted owls (*Strix occidentalis caurina*) and bald eagles (*Haliaeetus leucocephalus*) from the relicensing of the Lewis River Hydroelectric Projects: Merwin (FERC No. 935), Yale (FERC No. 2071), Swift No. 1 (FERC No. 2111), and Swift No. 2 (FERC No. 2213). The action that comprises this consultation under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) is the relicensing of the Lewis River Hydroelectric Projects by the Federal Energy Regulatory Commission and the interdependent actions contained in the Settlement Agreement (PacifiCorp et al. 2004a), dated November 30, 2004, and Washington Department of Ecology's 401 Certifications.

Consultation for the relicensing of the Lewis River Projects was initiated by the Commission's letter to the Service which was received in our office on October 11, 2005. Based on our letter dated March 15, 2006, the deadline for completing this consultation was extended by mutual agreement until May 5, 2006. On June 12, 2006, with concurrence by the Licensees, we submitted another request for an extension to September 1, 2006, to complete the detailed and complex analyses associated with the proposed action. This revised completion date was supported by PacifiCorp and Cowlitz Public Utility District. Because the Service was receiving critical information regarding components of the Settlement Agreement up to the end of August, we were not able to meet the September 1, 2006, completion date. There has been regular contact between PacifiCorp, Cowlitz Public Utility District, and the Service during the drafting of this document and agreement between all parties on the timing of completion of the Biological Opinion.

TAKE PRIDE IN AMERICA

The final Biological evaluation, dated January 15, 2005, proposed a "may affect, not likely to adversely affect" determination for the northern spotted owl. The FWS does not concur with this determination because the Wildlife Habitat Management Plans will allow the removal of suitable spotted owl habitat which would adversely affect this species. The Final Biological Evaluation also proposed a "may affect, not likely to adversely affect" determination for the bald eagle. The FWS does not concur with this effect determination because of the indirect effects associated with increased recreational use of the action area which is likely to disturb foraging bald eagles on the reservoirs and in salmon spawning grounds. We therefore conducted a formal consultation on the spotted owl and bald eagle. The enclosed Biological Opinion contains the Service's concurrence with your determination that the proposed action "may affect, but is not likely to adversely affect" designated bull trout critical habitat.

Because the Licensees are uncertain where instream habitat enhancement projects will occur, the Service was unable to conduct an analysis of effects to spotted owls from this activity. Therefore, this aspect of the proposed action in relation to effects to spotted owls must be addressed, as appropriate, in a separate future section 7 consultation when site-specific conditions are known. This Biological Opinion, therefore, does not include an analysis of effects of instream habitat enhancement projects on spotted owls.

We wish to commend Frank Shrier of PacifiCorp and Diana Gritten-MacDonald of Cowlitz PUD for their invaluable assistance in preparing this Biological Opinion. They were critical to our understanding of the proposed action and provided valuable assistance in their review of draft documents for accuracy and completeness. Their professional commitment to completing the Biological Opinion on time and in a legally sufficient manner was tremendously helpful and appreciated by my staff.

A complete administrative record of this consultation is on file in the Service's Western Washington Fish and Wildlife Office, in Lacey, Washington. If you have any questions regarding this Biological Opinion please contact Pam Repp at (360) 753-6037 or Jim Michaels at (360) 753-7767, of my staff.

Sincerely,

Pamela Repp

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

cc:
PacifiCorp (F. Shrier)
Cowlitz PUD (D. Gritten-MacDonald)

Biological Opinion
for the
Federal Energy Regulatory Commission Relicensing of the Lewis River Hydroelectric Projects: Merwin (No. 935), Yale (No. 2071), Swift No. 1 (No. 2111), and Swift No. 2 (No. 2213)

FWS Reference Number: 1-3-06-F-0177

U.S. Department of the Interior
U.S. Fish and Wildlife Service
Western Washington Fish and Wildlife Office
Lacey, Washington

September 15, 2006

for Pamela Repp
Ken S. Berg, Manager

GLOSSARY

ACC—Aquatic Coordination Committee, representing the Settlement Parties.

Action Area—The Lewis River Subbasin.

AR—At risk; refers to environmental baseline indicators.

BE—Biological Evaluation

Bypass Reach—The old natural Lewis River channel bypassed by the Swift No. 2 Power Canal.

Canal Drain—The existing adjustable valve in the Power Canal which supplies water to the Constructed Channel.

Canal Spillway—Also referred to as "side channel spillway" and "wasteway"—The existing spillway on the Power Canal which allows flow from the surface of the power canal to enter the bypass reach when flows exceed the hydraulic capacity of Swift No. 2.

cfs—Cubic feet per second

Constructed Channel—The existing wetted channel from the Canal Drain to the Bypass Reach.

Cowlitz PUD—Public Utility District No. 1 of Cowlitz County, Washington

DEIS—Draft Environmental Impact Statement

FEIS—Final Environmental Impact Statement

FERC—Federal Energy Regulatory Commission

FWS—United States Fish and Wildlife Service, referred to as USFWS in citations.

Lewis River Hydroelectric Projects—Merwin (P-0935), Yale (P-2071), Swift No. 2 (P-2213), and Swift No. 1 (P-2111)

Lewis River Subbasin—The U.S. Geological Survey (USGS) fourth-field watershed extending from the Columbia River to the headwaters of the Lewis River.

Licensees—PacifiCorp and Cowlitz PUD, also known as "the Utilities."

Lower Lewis River Watershed—The USGS fifth-field watershed extending from Lake Merwin to Pine Creek and consisting almost entirely of those tributaries which originate on U.S. Forest Service land and flow into to the North Fork Lewis River or its reservoirs.

LWD—Large woody debris

Middle Lewis River Watershed—The USGS fifth-field watershed extending from Swift Creek Reservoir to the Lower Falls of the Lewis River.

NMFS—National Marine Fisheries Service

NPF—Not properly functioning; applies to baseline environmental indicators.

Pine Creek Subwatershed—The three USGS subwatersheds encompassing Pine Creek and its tributaries.

PCE—Primary constituent element of designated critical habitat.

PF—Properly functioning; applies to environmental baseline indicators.

Power Canal—The earthen and concrete channel connecting the tailrace of the Swift No. 1 powerhouse to the Swift No. 2 Powerhouse.

SA—Settlement Agreement Concerning the Relicensing of the Lewis River Hydroelectric Projects, dated November 30, 2004.

Settlement Parties—Parties that entered the SA.

Services—FWS and NMFS considered together.

Swift Projects—Swift No. 1 and Swift No. 2 together.

TCC—Terrestrial Coordination Committee, representing the Settlement Parties.

Turbine Intake—The point on the upstream face of a dam where the penstock or flow line leading to the powerhouse and turbines begins.

Upper Constructed Channel—The 240-foot long channel to be constructed from the Upper Release Point to the upper end of the Bypass Reach.

Upper Lewis River Watershed—The USGS fifth-field watershed extending from Lower Falls to the headwaters of the Lewis River.

Upper Release Point—That point on the Power Canal just downstream of the Swift No. 1 Powerhouse where the Licensees plan to build a structure to release water to the Bypass Reach.

WDOE—Washington Department of Ecology

WDFW—Washington Department of Fish and Wildlife

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INTRODUCTION

The action that comprises this consultation under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (ESA) is the relicensing of the Lewis River Hydroelectric Projects by the Federal Energy Regulatory Commission (FERC) and the interdependent actions contained in the Settlement Agreement (SA) (PacifiCorp et al. 2004a), dated November 30, 2004. The SA was signed by 26 stakeholders representing PacifiCorp and Cowlitz PUD; Federal, State, and local governments; Tribes; and non-profit organizations that participated in the relicensing of the projects. The Final Biological Evaluation (BE) (PacifiCorp et al. 2005), dated January 15, 2005, and additional information provided by the Licensees was used for completion of this consultation. We refer to scientific publications and published agency documents as literature cited. We refer to unpublished written communications, e-mails, and meeting notes from other offices as *In Litteris*. A complete administrative record of this consultation is on file in the U.S. Fish and Wildlife Service's (FWS) Western Washington Fish and Wildlife Office in Lacey, Washington.

CONSULTATION HISTORY

The FWS has been working with PacifiCorp since 1995 on the relicensing of the Yale Hydroelectric Project. In 1998 PacifiCorp, Cowlitz PUD, and other participants in the relicensing decided to expand the studies and scope of the analysis to include the remaining three hydroelectric projects on the North Fork Lewis River. The FWS has participated in the relicensing of the remaining three projects. The Licensees, agencies, and other interested parties agreed to use the FERCs Alternative Licensing Process for relicensing all of the Lewis River Hydroelectric Projects. This process is a more collaborative approach than the traditional relicensing process and allows for a thorough discussion of the issues before the FERC completes its environmental analysis.

In July 1999, PacifiCorp and Cowlitz PUD began a series of meetings with the FWS, National Marine Fisheries Service (NMFS), and FERC to discuss a proposal for habitat protection measures designed to conserve salmon and steelhead (*Oncorhynchus* spp.), as well as bull trout (*Salvelinus confluentus*).

In 2000, PacifiCorp and Cowlitz PUD filed applications with the FERC to amend their existing licenses for the Lewis River Hydroelectric Projects to incorporate measures for protecting, enhancing or mitigating impacts to endangered, threatened, proposed, and candidate fish species under the ESA. On October 4, 2000, the FERC sent a letter to NMFS and the FWS requesting formal consultation for the amended licenses. The FWS responded that more information was required to initiate formal consultation. On December 15, 2000, the FERC sent the FWS a letter responding to the information requested. On June 28, 2002, the NMFS and FWS (2002a) issued to the FERC a joint Biological Opinion (FWS: 1-3-02-F-0839), referred to here as the Interim Biological Opinion (BO), on the effects to listed fish species from continued operation of each of the Lewis River Hydroelectric Projects and from conservation measures included in the license amendment applications. The Interim BO included an Incidental Take Statement (ITS) which stated the following:

> "This biological opinion has been framed in terms of the period of time from the present through 2006, the date identified in the ALP [Alternative Licensing Process] for completion of the studies and development of a long-term settlement package. At that time, the Services expect that a subsequent consultation on the new licenses would supersede this opinion. This biological opinion assumes that to the extent that studies required in that biological opinion identify additional mitigation measures, such mitigation will be included in the biological opinion for the new license[s] and implemented during the new license term[s]. Starting annually April 2006, if FERC has not issued new licenses, the Services shall analyze PacifiCorp and Cowlitz PUD's annual report to determine if re-initiation of consultation is required....If the Services determine that re-initiation is warranted, PacifiCorp and Cowlitz PUD consent to the consultation and shall remain in compliance under the current ITS until consultation is completed. If the Services determine that re-initiation is not required, PacifiCorp and Cowlitz PUD shall remain in compliance under the current ITS."

On May 12, 2003, the FERC amended the Merwin, Yale, Swift No. 1 and Swift No. 2 licenses to bring them into compliance with the Interim BO.

On April 21, 2002, the Swift No. 2 power canal embankment failed, dewatering the canal, and resulting in the mortality of at least six bull trout. In a joint effort, the Licensees, agencies and volunteers salvaged bull trout remaining in the canal after the failure. The Interim BO included a description of the power canal failure and impacts to bull trout associated with this event.

Cowlitz PUD requested informal consultation for the reconstruction and repair of the Swift No. 2 Project, resulting in a letter from the FWS (2004) stating our concurrence that these activities "may affect, but are not likely to adversely affect" bull trout. On July 28, 2004, the Cowlitz PUD sent supplemental documentation to the FWS regarding the Swift No. 2 repair and reconstruction, describing modifications that were necessary in the design, including construction and operation of a surge arresting structure. The FWS responded by e-mail on August 9, 2004, that the effect of these modifications to the repair and reconstruction project were not likely to adversely affect bull trout. Cowlitz PUD later formalized this understanding by a letter to the FWS dated February 7, 2006. On February 23, 2006, the FWS concurred with these findings under the ESA.

On January 15, 2005, the Licensees submitted to FERC a Final BE (PacifiCorp et al. 2005). On October 11, 2005, the FWS received a letter, dated September 30, 2005, from the FERC requesting formal consultation under section 7 of the ESA for the relicensing of the Lewis River Hydroelectric Projects. The FWS received the Draft Environmental Impact Statement (FERC 2005) in the same mailing. The request proposed the following determinations:

- "May affect, likely to adversely affect" the Columbia River Distinct Population Segment (DPS) of bull trout. The FWS agrees with this effect determination.

- "May affect, not likely to adversely affect" the northern spotted owl (spotted owl) (*Strix occidentalis caurina*). The FWS does not concur with this effect determination because the Wildlife Habitat Management Plans allows for the removal of suitable spotted owl habitat which would result in adverse effects to the spotted owl.

- "May affect, not likely to adversely affect" the bald eagle (*Haliaeetus leucocephalus*). The FWS does not concur with this effect determination because of the anticipated indirect effects of increased recreationists associated with the recreational facilities upgrades/expansions and increased fisheries associated with the reintroduction of salmon and steelhead which are likely to disturb bald eagles.

- "May affect, not likely to adversely affect" designated bull trout critical habitat. The Final BE stated a "may affect, not likely to destroy or adversely modify" determination for bull trout designated critical habitat. On May 17, 2006, the FWS received a revised BE statement for bull trout critical habitat from the Utilities which stated "the proposed action will not adversely affect designated bull trout critical habitat in the lower Lewis River." The FWS concurs with this determination; see section in BO entitled *Analysis of the Species and Critical Habitat Likely to be Affected* for our rationale for concurrence.

- "No effect" for the following species:
    - Golden paintbrush (*Castilleja levisecta*)
    - Water howellia (*Howellia aquatilis*)
    - Bradshaw's lomatium (*Lomatium bradshawii*)
    - Nelson's checker-mallow (*Sidalcea nelsoniana*)
    - Columbia white-tailed deer (*Odocoileus virginianus leucurus*)
    - Grizzly bear (*Ursus arctos*)
    - Canada lynx (*Lynx canadensis*)
    - Marbled murrelet (*Brachyramphus marmoratus*)
    - Gray wolf (*Canis lupus*); although Table 6.0-1 in the Final BE stated the proposed action was "not likely to adversely affect" the gray wolf, it was clarified by the Utilities on May 17, 2006, that the effect determination should have been a "no effect" for the gray wolf to be consistent with the statement on page 58 that "we do not anticipate any project effects on the gray wolf."

There is no requirement for FWS concurrence with "no effect" determinations. The determination that the proposed action will have no effect on the above listed species rests with the action agency; therefore, consultation on the above "no effect" species is not necessary. The FWS does not concur with the BE's "not likely to adversely affect" determinations for the bald eagle and spotted owl. The FWS concurs with the determination that the action is not likely to adversely affect designated bull trout critical habitat. Finally, the FWS agrees that the proposed action may adversely affect bull trout. Therefore, pursuant to section 7(a)(2) of the ESA, 16 U.S.C. § 1536(a)(2), the FWS has prepared this Biological Opinion regarding bull trout, bald eagle, and northern spotted owl.

BIOLOGICAL OPINION

ACTION AREA

The action area for the relicensing includes the Lewis River subbasin, which is U.S. Geological Survey (USGS) Hydrologic Unit Code 17080002, from the Columbia River upstream to the headwaters.

DESCRIPTION OF THE PROPOSED ACTION

Description of the Lewis River Hydroelectric Projects

The following section describes all four hydroelectric projects in the North Fork Lewis River basin. The projects begin approximately 10 miles east of Woodland, Washington. The upstream sequence of the projects from the confluence of the Lewis and Columbia rivers is as follows: Merwin, Yale, Swift No. 2, and Swift No.1. The Merwin, Yale, and Swift No. 1 projects represent a linked reservoir/powerhouse system covering over 30 miles of the Lewis River. The Swift No. 2 project does not include a dam and reservoir. It utilizes water directly from the tailrace of Swift No. 1, which flows into a 3-mile-long canal that discharges through the Swift No. 2 powerhouse into Yale Lake.

The three-reservoir four-project system is operated in a coordinated fashion to achieve optimum benefits for power production, flood management, and to provide for natural resources in the basin such as fish, wildlife and recreation. The four projects utilize the water resources within the North Fork Lewis River basin from elevation 50 ft mean sea level (msl) (Merwin Project tailwater) to 1,000 ft msl (Swift No. 1 normal pool). The total usable storage in the reservoirs is 814,000 acre-ft. The total installed capacity for the four projects is 580 megaWatts (MW).

Merwin Dam and Reservoir

The Merwin Hydroelectric Project is a 136 MW plant owned and operated by PacifiCorp. It is the furthermost downstream project of the four operating on the North Fork Lewis River. Construction of the Merwin Project began in 1929 and was completed with a single unit in 1931. Two additional units were added in 1949 and 1958.

Merwin Dam spans the North Fork Lewis River 21 miles upstream from the confluence with the Columbia River. It is a concrete arch structure with a total crest length of 1,300 ft and a maximum height above its lowest foundation of 314 ft. The dam consists of an arch section 752 ft in crest length, a 75-foot-long gravity thrust block, a 206-foot-long spillway section, a non-overflow gravity section 242 ft long, followed by a concrete core wall section 20 ft high and extending 25 ft into the bank. The spillway is equipped with four taintor gates 39 ft wide and 30 ft high, and one taintor gate 10 ft wide and 30 ft high. The taintor gates have been extended to an elevation of 240 ft above msl by the addition of 5-foot flashboards.

The reservoir formed by Merwin Dam is about 14.5 miles long with a surface area of approximately 4,000 acres at elevation 239.6 ft msl (full pool). At full pool, the reservoir has a gross storage capacity of approximately 422,800 acre-ft. Of this amount, 182,600 acre-ft of usable storage is available between elevation 190 and 239.6 ft msl, with an additional 81,100 acre-ft of usable storage available if the reservoir is lowered to its allowable minimum level of 165 ft msl.

Penstocks and Powerhouse

Three penstocks lead from Merwin Dam to the powerhouse, via separate intakes. The Merwin intakes are relatively deep (approx. 203 ft. below full pool), high-head intakes with design velocities ranging from between 10 and 20 feet per second (fps). The intakes are protected from large debris by steel trash racks on approximately 4-inch spacing. The capacity of the three penstocks is different, with Unit Nos. 1 and 2 capable of carrying 3,790 cubic feet per second (cfs), and Unit No. 3 carrying of 3,890 cfs. The penstock inlet diameters and the minimum water surface elevation in Merwin Lake allow the intake system to pass more than 150 percent of the existing plant hydraulic capacity. A fourth penstock was originally constructed but is currently not utilized by the project.

The powerhouse contains 3 semi-outdoor-type Francis turbine generator units, each with an installed capacity of 45,000 kilowatts (kW), and one 1,000 kW house unit, for a total installed capacity of 136,000 kW.

Transmission and Auxiliary Equipment

Power is transported from the Merwin Project by two 115 kV transmission lines. One of these extends in a westerly direction a distance of approximately 15.9 miles from the project to the Bonneville Power Administration (BPA) Cardwell substation near Kalama, Washington. The other line runs in a southerly direction for 26.7 miles to the Clark County PUD View substation near Battleground, Washington and then into Portland, Oregon.

Yale Dam and Reservoir

The Yale Hydroelectric Project is a 134 MW plant owned and operated by PacifiCorp that lies directly upstream of the Merwin Project. Construction of the Yale Project began in 1951 and was complete by 1953. The project consists of a main embankment dam, saddle dam, reservoir, penstocks, powerhouse, and transmission line. The project is operated in coordination with the other three hydroelectric facilities on the North Fork Lewis River.

Yale Dam is located on the North Fork Lewis River approximately 30 miles upstream from the confluence with the Columbia River. Yale Dam is a rolled earthen fill embankment type dam with a crest length of 1,305 ft and a height of 323 ft above its lowest foundation point. Its crest elevation is 503-ft msl. The saddle dam is located 0.25 mile west of the main dam and is approximately 1,600 ft long and 40 ft high with a crest elevation of 503 ft msl. The main dam has a chute-type spillway, located in the right abutment, with a capacity of 120,000 cfs through five 30-foot by 39-foot taintor gates at reservoir elevation 490 ft msl.

Yale Lake is approximately 10.5 miles long with a surface area of approximately 3,800 acres at elevation 490-ft msl (full pool). At full pool, the reservoir has a gross storage capacity of approximately 401,000 acre-ft. At the minimum pool elevation of 430-ft msl, the reservoir has a capacity of approximately 190,000 acre-ft.

Tunnels/Penstocks and Powerhouse

The Yale Project consists of two tunnels/penstocks leading from Yale Dam to the powerhouse. Water is delivered to the tunnels/penstocks via a common intake. The Yale intake is a relatively deep (approximately 90 ft. below full pool), high-head intake with design velocities ranging from between 10 and 20 fps. The intakes are protected from large debris by steel trash racks on approximately 4-inch spacing. The maximum diameter of each of the Yale tunnels/penstocks is 18.5 ft; the minimum diameter is 16 ft. Penstock velocities range from 18.2 fps in the tunnel to 24.3 fps in the penstocks' smallest sections. The Yale penstocks are each capable of passing a maximum of 4,880 cfs.

The Yale powerhouse contains 2 Francis-type generator units with a total installed capacity of 108,000 kW (nameplate). The powerhouse is located at the base of the earth embankment on the left side (facing downstream) of the old river channel. The generator units were originally installed in 1952. The turbines were rehabilitated coincident with generator rewinds in 1987 and 1988, respectively. In 1995, PacifiCorp installed a new runner in Yale Unit No. 2. A similar runner was installed in Unit No. 1 in 1996. The new runners increased Yale capacity to 134 MW.

Transmission and Auxiliary Equipment

Power generated at the Yale Project is transmitted 11.5 miles over a 115 kilovolt (kV)-transmission line (Lake Line) to a substation adjacent to the Merwin Project.

Swift Dam and Reservoir

The Swift No. 1 Hydroelectric Project is a 240 MW plant owned and operated by PacifiCorp. The project is the furthermost upstream hydroelectric facility on the North Fork Lewis River, lying directly upstream of the Swift No 2 Hydroelectric Project. Construction of the Swift No. 1 Project began in 1956 and was completed in 1958. It consists of a main embankment dam, reservoir, penstocks, powerhouse, and transmission line, and is operated in coordination with the other three hydroelectric facilities on the North Fork Lewis River.

Swift Dam spans the North Fork Lewis River approximately 40 miles upstream from the confluence with the Columbia River and 10.5 miles upstream of Yale Dam. It is an earthen fill embankment type dam with a crest length of 2,100 ft and a height of 512 ft. At the time of its construction, Swift Dam was the tallest earthen fill dam in the world. Its overflow spillway, located in the left abutment, has a capacity of 120,000 cfs (at reservoir elevation 1,000 ft msl) through two 50-foot by 51-foot taintor gates. The elevation at the top of the taintor gates is 1,001.6-ft msl.

The reservoir formed by Swift Dam is approximately 11.5 miles long with a surface area of approximately 4,680 acres at elevation 1,000-ft msl (full pool). At maximum pool, the reservoir has a gross storage capacity of approximately 755,000 acre-ft. At the minimum pool elevation of 878-ft msl, the reservoir has a capacity of approximately 447,000 acre-ft.

Tunnels/Penstocks and Powerhouse

Water is delivered from Swift Creek Reservoir to the powerhouse through a system containing a tunnel, a surge tank, and an outlet, which branches into three penstocks. The Swift No. 1 intake is a relatively deep (approximately 135 ft deep at full pool), high-head intake with design velocities ranging from between 10 and 20 fps. The intakes are protected from large debris by steel trash racks on approximately 4-inch spacing. The Swift No. 1 surge tank is located approximately 1,196 ft downstream of the tunnel intake and about 482 ft upstream of the powerhouse. This surge tank is of the restricted orifice, non-overflow style, with a diameter of 55 ft and a top elevation of 1,035-ft msl. Downstream of the tank, individual penstocks for each generating unit branch from the main tunnel. Each of the Swift No. 1 penstocks is 13 ft in diameter. At maximum turbine flows, water in the penstocks reaches velocities of up to 23 fps. The Swift No. 1 penstocks are capable of passing a maximum of 9,120 cfs, combined.

The Swift No. 1 Powerhouse contains 3 Francis-type generator units with a total installed capacity of 240,000 kW (nameplate). The turbines were rewound in 1987 (unit No. 12), 1990 (unit No. 11) and 1991 (unit No. 13) resulting in a capacity upgrade from 204 MW to 240 MW. The powerhouse is located at the base of the dam on the left side (facing downstream) of the old river channel. The powerhouse is operated by remote control from the Hydro Control Center at Merwin Headquarters.

Transmission and Auxiliary Equipment

The project is served by the 230kV Speelyai transmission line which extends from Swift No. 1 to the Swift No. 2 switchyard and then to a Bonneville Power Administration (BPA) switching station near Woodland, Washington.

Swift No. 2 Hydroelectric Project

The Swift No. 2 Hydroelectric Project is a 70 MW development owned by Cowlitz PUD. The project lies between the Swift No. 1 and Yale hydroelectric projects on the North Fork Lewis River. The Swift No. 2 Project consists of a power canal, intake structure, penstocks, powerhouse, tailrace discharge channel, substation, and transmission line. The powerhouse is located 3 miles downstream from Swift No. 1. Construction of the Swift No. 2 Project began in 1956 and was completed in 1958. It is operated in coordination with the other three hydroelectric facilities on the North Fork Lewis River.

Power Canal

The Swift No. 2 Power Canal begins at the tailrace of the Swift No. 1 Powerhouse and consists of an earthen-lined upper section (approximately 11,000 ft long) and a concrete-lined lower section (approximately 5,900 ft long). Water released from the Swift No. 1 Powerhouse immediately enters the 3-mile power canal and is conveyed to the Swift No. 2 Powerhouse. A gated check structure and ungated side-channel spillway/wasteway exist as part of the canal facilities. The purpose of the check structure is to allow isolation of the canal for operation of Swift No. 1 when Swift No. 2 is out of service. The gates in the check structure immediately downstream of the wasteway can be closed, to block flow, if, for example, the downstream section of the canal needs to be dewatered for maintenance activities including inspection.

During normal operations, the wasteway prevents canal flows from exceeding the Swift No. 2 hydraulic capacity and maintains the maximum level in the canal. Water may be released to the bypass reach over the wasteway if flows in the canal exceed the Swift No. 2 hydraulic capacity or if the check structure gates are closed. A drain on the downstream side of the check structure may also be used to release water from the canal if needed. As a FERC Part 12 safety requirement for the project, a surge arresting structure (SAS) is located adjacent to the intake structure to release water from the canal in the event there is a surge from a turbine generator trip at Swift No. 2 and excess flow must be released from the canal. The release valve at the terminus of the SAS consists of two cone valves. Under normal operating conditions, the elevation of the canal waters at the Swift No. 2 intake structure range from 601 to 604 ft msl. The canal surface area is approximately 56 acres, and the canal holds approximately 922 acre-ft of water. The operating capacity of the power canal is 9,000 cfs.

Penstocks and Powerhouse

Water is delivered from the Swift No. 2 intake structure to the powerhouse via two penstocks, one for each of two turbine generator units. The intakes to the penstocks are protected from large debris by steel trash racks with approximately 4-inch spacing. The Swift No. 2 Powerhouse has two Francis-type turbines; each rated at 40,950 kW. Under contract with Cowlitz PUD, PacifiCorp currently operates the powerhouse via remote control from the Hydro Control Center at Merwin headquarters.

Transmission

The project is served by the same 230 kV Speelyai transmission line that serves Swift No. 1 and that extends from the Swift No. 2 switchyard to a BPA switching station near Woodland, Washington.

Description of the Proposed Action

The proposed action is the continued operation of the Lewis River Hydroelectric Projects to be operated under four new licenses with proposed terms of 50 years. As specified in the letter requesting consultation under section 7 of the Endangered Species Act for the relicensing of the Lewis River Hydroelectric Projects dated September 30, 2005, the preferred action is the Lewis River SA as modified by FERC staff in its final EIS. Specifically, FERC issued a Final EIS in March 2006 that included additional measures recommended by FERC staff and also included measures from WDOEs draft Clean Water Act Section 401 Certifications. In the final EIS, FERC staff recommends that all the measures in the SA be included as conditions of any licenses issued for the Lewis River Projects except for the following measures:

- The In Lieu Fund, because it is a contingency fund that may or may not occur, will depend on the decisions made by other agencies.

- Funding law enforcement and emergency services at existing levels and providing additional funds to the appropriate agency to support fire services and three additional marine and land based FTE law enforcement officers; law enforcement and fire services in the project area are the responsibility of county and federal agencies.

- Improvements of five river access sites outside of the Merwin Project boundary along the lower Lewis River, because there is no physical nexus between the lower-river sites and the Merwin Project, located 5 miles upstream.

- Providing funding to the Forest Service for managing dispersed camping sites outside of the project boundaries, because other proposed measures in the SA would be sufficient to address camping use during peak-use periods.

- Providing funding to the Forest Service for maintenance of Forest Road 90.

However, FERC has stated in its Final EIS that PacifiCorp and Cowlitz PUD may elect to provide these measures as terms of the SA even though FERC does not recommend them as license conditions. Section 7 regulations provide that the FWS must consider the direct and indirect effects of an action, as well as the effect of any interrelated and interdependent actions (50 CFR Sec. 402.02). The remaining SA terms that were not been adopted by FERC as a condition of any license are interrelated and interdependent because they would not be implemented but for FERCs issuance of the licenses. The Service therefore will analyze in this BO the effects of FERCs action, which is the SA as modified above by FERC staff in its EIS, as well as the remainder of the SA and the requirements in the 401 Water Quality Certifications as interrelated and interdependent actions.

Due to the complexities and specific meaning of the SA, the FWS has chosen to incorporate verbatim the following description of the proposed action from the January 15, 2005, BE to avoid misinterpreting or inadvertently changing the meaning of the SA.

1.4 Proposed Action

"The proposed action for this consultation is the continued operation of the Lewis River Hydroelectric Projects (Yale Project FERC No. 2071, Swift No. 1 Project FERC No. 2111, Merwin Project FERC No. 935 and Swift No. 2 Project FERC No. 2213), operated under four new licenses with proposed terms of 50 years. The proposed action is described in the Lewis River Settlement Agreement.

The proposed action includes a comprehensive suite of bull trout, steelhead, and salmon protection and restoration measures and actions that will be implemented in a phased approach over the terms of the licenses to primarily benefit bull trout, winter steelhead, spring Chinook and coho. The fish passage elements of the program will be subject to rigorous performance standards. These include overall quantitative survival standards, specific salmonid life stage standards and facility design standards. These will assist in gauging program success and whether there is need for potential facility adjustments or ultimately, modifications.

The overarching goal of the comprehensive program is to achieve genetically viable, self-sustaining naturally reproducing, harvestable anadromous fish populations above Merwin Dam at greater than minimum viable populations. For bull trout, the primary goal is to provide habitat continuity between spawning, rearing, foraging, migration, and overwintering habitats by providing upstream and downstream passage at all project dams. There is recognition that commercial and tribal harvest, and ocean conditions may dramatically affect program results for salmon, but are not within the Licensees' control. Status checks are built into the program over time to monitor progress and adaptively manage the program as needed to maximize the expected benefits.

A central, significant feature of the comprehensive program involves reintroduction of extirpated salmon species into their historical range. The program takes a comprehensive approach to salmon protection and reintroduction given the experimental nature of reintroducing extirpated anadromous species into their native range after many decades have passed. A key premise of the program is that it will provide an estimated 174 miles of potential anadromous fish habitat above Merwin Dam. Of this, 117 miles of habitat above Swift No. 1 Dam will become available in the fourth year of the reintroduction program as anadromous fish are trapped at Merwin Dam and transported upstream to above Swift Creek Reservoir. Over the next seventeen years, unless otherwise directed by NOAA Fisheries and the United States Fish and Wildlife Service (the "Services"), each anadromous fish species will be reintroduced to Lake Merwin and Yale Lake via newly constructed upstream fish passage facilities at the Merwin, Yale and Swift Projects and downstream passage at all three facilities. Ultimately, this program will result in upstream fish passage through each of the reservoirs associated with the Lewis River Projects for bull trout, steelhead, and salmon.

The Lewis Projects are high-head projects that pose technological challenges with respect to fish passage. As a result, the program includes many other important and complementary measures to underpin and strengthen the reintroduction effort. These include habitat preparation activities in tributaries to the project reservoirs prior to species reintroduction, funding for habitat protection and restoration projects on key tributary streams to the reservoirs, and supplementation using hatchery fish over a period of years both to launch the reintroduction effort and provide support over time. The trap and transport effort will include the best available technology and designs to address the specific characteristics of the Lewis projects as high-head, high flow projects. Project operational changes also will be implemented to address impacts on species downstream.

Under the proposed action, it will likely take many years to reap the benefits of all the measures and activities that will be undertaken and for the program to fully succeed:

- Habitat restoration activities need to occur over a period of several years to make the habitat fully functioning and productive;

- It will take several life cycles of salmon to determine whether the program is delivering anticipated benefits and to better understand potential outside impacts on the program such as harvest;

- The program contemplates phasing in reintroduction into the various reservoirs so that experience and knowledge gained from reintroduction above Swift No. 1 Dam can be applied to reintroduction into Yale Lake and Lake Merwin;

- It will take time to construct fish passage facilities and time to determine what is working or what needs to be modified based on established performance standards;

- An aggressive monitoring and evaluation program, overseen by a multi-party committee, will be undertaken over many years to collect new information and scientific data to implement an adaptive management approach to species restoration and protection.

As noted, the proposed action includes rigorous facility and fish survival performance standards and a monitoring and evaluation program to track progress. The program also includes built-in, major "status checks" in years 27 and 37 to provide for a detailed review of program measures and activities and to track progress. As part of these reviews, a "limiting factors analysis" will be undertaken to more precisely determine whether performance and species goals have been met, whether other factors are undermining program performance, and whether other actions could be undertaken to provide biological benefits equivalent to any project-related limiting factor.

In addition to the phased reintroduction of extirpated anadromous species and construction of fish passage facilities, the proposed action also includes hatchery and supplementation programs; flows in the bypass reach; construction of an aquatic habitat channel; funding for aquatic habitat improvement; minimum flows below the Merwin Dam, flow plateau operation and ramping procedures; wildlife habitat acquisition, protection, and management; recreation upgrades and maintenance; cultural and historic resources protection measures; funding of law enforcement; and a visitor's center. Appendix A and the discussion below in this Section 1.4 provide additional details regarding the proposed action analyzed in this BE. All of these may provide indirect benefits to aquatic species. The discussion below in this Section 1.4 provides additional details regarding the proposed action to assist in the reader's understanding of its analysis in this BE; however, the Settlement Agreement is considered the best and most accurate description of the proposed action, and has been relied upon by PacifiCorp and Cowlitz PUD in preparing this BE."

Lewis River Settlement Agreement Terms

A summary of the measures included in the Lewis River Settlement Agreement is presented in Table 1.4-1, as excerpted from the Final BE. More detailed information describing these measures is provided in the Final BE. The section numbers referred to in Table 1.4-1 correspond to sections of the Lewis River Settlement Agreement.

Table 1.4-1 Measures proposed under the Lewis River Settlement Agreement with the Potential to Affect ESA Listed Species (Source: Final BE dated January 15, 2005).

Resource Area and Section	Resource Component	Proposed Measure	Timing
Section 3	Anadromous Fish Reintroduction Outcome Goals	3.1 Work to achieve genetically viable, naturally spawning, harvestable populations of Chinook, steelhead and coho above Merwin Dam. Check status of goals in Years 27 and 37 of new licenses.	Terms of the New Licenses
Aquatics Section 4	Upstream Fish Passage	4.2 Merwin Trap. Repair the fyke net. Reduce generation when personnel are working the trap. Improve efficiency and human safety of existing Merwin trap and add a new sorting and truck loading facility. Truck spring Chinook, coho & steelhead from the Merwin sorting facility to Swift Creek Reservoir or Yale Lake, per Upstream Transport Plan. Truck bull trout to Yale Lake.	By Year 2, modify trap By Year 4, operate new collection and transport facility
		4.7 Upstream Passage at Yale Dam. Construct an upstream adult trap and sorting/trucking facility.	By Year 17
		4.8 Upstream Passage at the Swift Projects. Construct an upstream adult trap and sorting/trucking facility.	By Year 17
		4.9.1 Collect-and-Haul Programs. Net bull trout in Yale and Swift No. 2 tailraces and transport to Yale Lake or as directed by USFWS. Investigate alternative trapping methods.	Ongoing
		4.10.2 Bull Trout Passage in the Absence of Anadromous Fish Facilities. If 4.7 and/or 4.8 are not constructed, develop facility to collect bull trout at Yale and at Swift.	By Year 17 at Swift and Yale
	Downstream Fish Passage	4.4 Downstream Transport at Swift No. 1Dam. Install a floating surface collector system with guide walls and nets at Swift Dam. Collect anadromous fish, sort, mark a sub-sample, and truck to release pond below Lake Merwin. Release bull trout in Yale Lake or below Merwin, depending on developmental stage.	By Year 4.5
		4.4.2 Spring Chinook Satellite Collection Facility. If directed by NOAA-Fisheries, evaluate, design and install a satellite passage facility in Swift Creek Reservoir.	If Required
		4.4.3 Release Pond. Construct release pond below Merwin Dam for downstream migrants.	By Year 4.5

Resource Area and Section	Resource Component	Proposed Measure	Timing
		4.5 Downstream Passage at Yale Dam. Install a floating surface similar to Swift. Collect fish, sort, mark a sub-sample, and truck to release pond below Lake Merwin. Bull trout will be returned to Yale Lake or transported to the downstream release pond, depending on development stage.	By Year 13
		4.6 Downstream Passage at Merwin Dam. Install a floating surface collector similar to Swift. Collect fish, sort, mark a sub-sample, and truck to a release site below Lake Merwin. Release bull trout in Lake Merwin or as directed by USFWS.	By Year 17
		4.9.3 Yale and Merwin Bull Trout Entrainment Reduction. Evaluate and implement measures to reduce entrainment up to and until downstream floating collector is constructed.	By Year 1 at Yale, when directed by USFWS at Merwin
		4.10.1 Bull Trout Passage in the Absence of Anadromous Fish Facilities. If 4.5 and/or 4.6 not built, develop downstream facility to collect/transport bull trout.	By Year 13 at Yale; after Year 17 at Merwin
Aquatics Section 5	Additional Aquatic Measures	5.1 Yale Spillway modifications. Modify Yale spillway to improve downstream resident fish survival (including bull trout) during spill events.	By Year 4.5 of the Yale License
		5.2 Bull Trout Habitat Enhancement Measures. Manage existing conservation covenants to protect bull trout habitat in perpetuity.	Complete
		5.5 Bull Trout Limiting Factors Analysis. Conduct LFA on Merwin and Swift Creek Reservoir tributaries.	By 2nd anniversary of Effective Date
		5.6 Public Information Program to Protect Listed Anadromous Species. Provide signage and educational materials to inform the public of efforts to reintroduce and protect listed anadromous fish to the Lewis River above Merwin Dam.	When Requested
		5.7 Public Information Program to Protect Bull trout. Install signage and distribute flyers to inform public about bull trout in the project area.	Within 6 months
Aquatics Section 6	Bypass Flow	6.1 Bypass Reach. Release flows to the reach of the Lewis River downstream of Swift No. 1 ending at Yale Lake.	Year 1
		6.1.1 Flow releases from canal drain. Release up to 47 cfs.	Upon completion of Swift No. 2 reconstruction

Resource Area and Section	Resource Component	Proposed Measure	Timing
		6.1.2 Construct upper release point. Design and construct upper water release point.	Year 1
		6.1.3 Determine feasibility of constructed channel in bypass reach and fund construction. Interim flow schedule: 60 cfs, July 1 through Oct. 31; 100 cfs, Nov. 1 through Jan, 31; 75 cfs, Feb. 1 through June 30.	Upon completion of upper release structure
		6.1.4 Flow Schedule. Develop an interim and final flow release schedule for the bypass reach.	Start Year 1
	Merwin Flow	6.2.1. Ramping Rates Below Merwin Dam. Up ramping rates limited to 1.5 ft per hour, down ramping limited to 2 inches per hour, with critical flow set at 8,000 cfs; no ramping from February 16 through June 15, one hour before/after sunrise or one hour before/after sunset.	Start Year 1
		6.2.2 Plateau Operations at Merwin Dam. Follow Plateau Operation procedures between February 16 and August 15. Changes in flow will be consistent with ramping restriction of 6.2.1 at or below flows of 8,000 cfs, and flow changes will be limited to no more than one change in any 24-hour period, and 4 times in any 7-day period, or 6 times/month.	Start Year 1
		6.2.3 Stranding Study and Habitat Evaluation. Conduct stranding study and habitat evaluation below Merwin Dam to evaluate operation effects on anadromous salmonids and their habitats.	Complete by Year 3
		6.2.4 Minimum Flows Below Merwin Dam. Minimum flows range from a high of 4,200 cfs (Nov 1 to Dec 15) to 1,200 cfs (July 31 to Oct 12)	Start Year 1
		6.2.5 Low Flow Procedures. During dry years convene Flow Coordination Committee to implement adaptive management; focused on fish needs, flood management, and reservoir recreational pool levels.	As Needed
Aquatic Habitat Section 7	Habitat Enhancement Actions	7.1 Large Woody Debris Program. Stockpile Large Woody Debris under direction of ACC for use by other entities for habitat projects.	Start Year 1 of Merwin License
		7.1.1 Funding. Provide $2,000 annually for qualified entities to use for LWD projects and $10,000 annually for the Aquatics Fund earmarked for habitat projects.	Within 6 months of Merwin License
		7.1.2 LWD Study. Conduct a LWD study to identify issues and opportunities for LWD projects below Merwin Dam.	Within 1st year of Merwin License

Resource Area and Section	Resource Component	Proposed Measure	Timing
		7.2 Spawning Gravel Program. Develop spawning gravel monitoring and augmentation program below Merwin.	Start within 6 months of Effective Date
		7.3 Predator Study. Conduct one-time study of whether predation in Merwin is a limiting factor to anadromous salmonid survival.	Complete by Year 10
		7.4 Habitat Preparation Plan. Release adult salmon for five years into the reservoirs prior to passage to begin preparing the spawning habitat and to enhance nutrients.	Within 6 months of Effective Date
		7.5 Aquatic Enhancement Fund. Provide funding for aquatic enhancement projects; PacifiCorp to provide $5.2 million over 14 years, and Cowlitz PUD to provide $520,000 over 20 years.	PacifiCorp starts in 2005; Cowlitz PUD starts at end of Year 1
		7.6 In Lieu Fund. Establish In Lieu Fund if the Services determine salmonid introduction to Yale or Merwin is not required and passage facilities not built; PacifiCorp to provide up to a total of $30 million; funds to be spent on aquatic enhancement measures.	Contributions in Years 11-13 and 14-17 of Yale; Years 14-17 of Merwin; Years 14-17 of Swift No. 1
Hatchery Program and Supplementation Section 8	Hatcheries	8.2 Anadromous Fish Hatchery Adult Ocean Recruit Target by Species. Anadromous Fish Hatchery Production. Licensees will produce 86,000 adult ocean recruits according to allocation in Section 8.2.1.	Start in Year 1
		8.3 Anadromous Fish Hatchery Juvenile Production. Juvenile production targets are defined in Table 8.3 for Years 1-3, 4-5, and 6-60.	Start in Year 1
		8.4 Supplementation Program. Licensees will supplement adult and juvenile salmon and steelhead according to allocation in sections 8.4.1, 8.4.2, and 8.4.3.	Varies by species and reservoir
		8.5 Resident Fish Production. Stock 20,000 lbs. of rainbow annually in Swift Creek Reservoir. Stock 12,500 lbs. of kokanee annually in Lake Merwin.	Start in Year 1
		8.6 Hatchery and Supplementation Plan. Develop a plan for hatchery production and supplementation according to Section 8.6.1 and 8.6.2.	Start between Years 1 and 3
		8.7 Hatchery and Supplementation Facilities, Upgrades, and Maintenances. Fund or undertake upgrades to existing hatcheries in collaboration with WDFW and the ACC.	Per Schedule 8.7
		8.8.1 Locate and install juvenile acclimation sites (if feasible) above Swift Creek Reservoir.	By Year 4

Resource Area and Section	Resource Component	Proposed Measure	Timing
		8.8.2 Install juvenile acclimation sites in Yale Lake and Lake Merwin. Temporary sites in tributary streams.	By Year 13
Monitoring Section 9	Aquatic Monitoring and Evaluation	9.1 Monitoring and Evaluation Plans. Develop monitoring and evaluation plans to evaluate the effectiveness of various aquatic measures. Prepare annual monitoring reports.	By 2nd anniversary of licenses
		9.2 Monitoring and Evaluation Related to Fish Passage. Monitor performance of upstream and downstream passage facilities according to performance criteria.	As Needed
		9.3 Wild Fall Chinook and Chum. Monitor spawners below Merwin.	Annually
		9.4 Water Quality Monitoring. Monitor water quality and fund NPDES compliance monitoring.	As Required
		9.5 Monitor Hatchery and Supplementation Program. Assess effects of supplementation efforts.	Report as Directed
		9.6 Bull Trout Monitoring. Monitor bull trout collection and test alternate passage facilities.	Start in Year 1
		9.7 Resident Fish Assessment. Monitor kokanee population in Yale annually and impacts of anadromous fish introduction on resident fish species.	As Required
		9.8 Monitoring of Flows. PacifiCorp to fund monitoring of Merwin flows and flows in the bypass reach.	Report Annually
Terrestrial Section 10	Land Acquisition	10.1 Yale Land Acquisition and Habitat Protection Fund. Provide $2.5 million to purchase wildlife mitigation lands near the Yale Project.	In Years 1 and 2 of Effective Date
		10.2 Swift No. 1 and Swift No. 2 Land Acquisition and Habitat Protection Fund. Provide $7.5 million to purchase wildlife mitigation lands for the Swift No. 1 and Swift No. 2 projects.	Initiated within 18 months of Swift licenses
		10.3 Lewis River Land Acquisition and Habitat Protection Fund. Provide $2.2 million total and matching contributions annually not to exceed $100,000 or $500,000 in any ten consecutive years, to purchase wildlife mitigation lands in the Lewis River basin.	Initiate in Year 4.5 of Yale License
		10.8 Wildlife Habitat Management Plan. Develop the Wildlife Habitat Management Plan to direct habitat conservation funds and provide effectiveness monitoring.	Start in Year 1
		10.8.4 Habitat Evaluation Procedures. Update HEP study of all WHMP lands.	Year 17

Resource Area and Section	Resource Component	Proposed Measure	Timing
Recreation Section 11	RRMP	Implement the RRMP that will include all of PacifiCorp's recreation measures.	In 3 phases beginning in Year 1
PacifiCorp Recreation Measures	Swift Creek Reservoir Measures	11.2.1.1 Swift Dispersed Shoreline Use Sites. Manage and maintain dispersed use sites on PacifiCorp and USFS land and within the FERC project boundary.	Start in Year 1
		11.2.1.2 Eagle Cliff Trail. Develop trail from Eagle Cliff Park to USFS boundary.	Year 4
		11.2.1.3 Control of Swift Forest Camp. Acquire campground from WDNR or negotiate management agreement.	End of Year 1
		11.2.1.4 Swift ADA Accessibility Improvements. Evaluate ADA compliance at developed facilities at Swift Creek Reservoir and renovate as needed.	Years 1 through 7
		11.2.1.5 Swift Day Use Facilities. Provide a new picnic shelter at Swift Forest Camp; toilets, picnic area and day use renovations at Eagle Cliff Park.	Year 5 for Swift Camp; Year 11 for Eagle Cliff Park
		11.2.1.6 Swift Campground and Group Camp Expansion. Expand campground and improve facilities.	When needed
		11.2.1.7 Swift O&M. Operate and maintain Eagle Cliff Park and Swift Forest Camp.	Year 1
	Yale Lake Measures	11.2.2.1 Yale Dispersed Shoreline Use Sites. Maintain and manage dispersed shoreline use sites.	Start in Year 1
		11.2.2.2 Yale/IP Road Phase I. Attempt to secure access to road and bridge.	By Year 4
		11.2.2.3 Yale/IP Road Phase II. Develop trail, parking, reservoir access and day use facilities.	When Phase I is complete.
		11.2.2.4 Yale/IP Road Phase III. Resurface trail.	Year 15 -16
		11.2.2.5 Yale Trails. Develop Saddle Dam trail segment, parking at Saddle Dam Park, management approach for Saddle Dam Park, trail from Cougar Park to Beaver Bay, and loop trail in Cougar.	Year 5
		11.2.2.6 ADA Accessibility Improvements. Evaluate ADA compliance at developed facilities at Yale Lake and renovate as needed.	Year 1 – 7
		11.2.2.7 Yale Park Boat Launch. Extend the ramp and replace the docks.	Year 4
		11.2.2.8 Beaver Bay Boat Launch. Replace the dock and repair bank erosion.	Year 4
		11.2.2.9 Beaver Bay Day Use Parking. Isolate parking area from wetland.	Year 4

Resource Area and Section	Resource Component	Proposed Measure	Timing
		11.2.2.10 Yale Lake Day Use Facilities. Improve facilities at Yale Park, Beaver Bay and Cougar Park.	Year 7
		11.2.2.11 Cougar Day Use Restroom. Replace or renovate to meet ADA standards.	Year 6
		11.2.2.12 Beaver Bay Campground and Group Camps. Redesign campground and replace restrooms.	Year 13
		11.2.2.13 Cougar Campground. Renovate tent only camping area.	Year 14
		11.2.2.14 Cougar Campground and Group Camp. Expand facilities.	When needed
	Lake Merwin Measures	11.2.3.1 Merwin Dispersed Shoreline Use Areas. Maintain dispersed shoreline use sites.	Year 1
		11.2.3.2 Merwin Trails. Provide information about area trails.	Year 5
		11.2.3.3 Marble Creek Trail. Improve trail and ADA accessibility.	Year 4
		11.2.3.4 South Shore Merwin Trail Access. Evaluate potential trail easement from County land to lake.	When needed
		11.2.3.5 Merwin ADA Accessibility Improvements. Renovate Lake Merwin facilities.	Years 1-7
		11.2.3.6 Boat Launches. Extend ramp at Speelyai Bay Park.	11/30/04
		11.2.3.7 Yale Bridge Boating Access. Develop access for launching non-motorized watercraft.	Year 6
		11.2.3.8 Merwin Park Day Use Facilities. Provide new day use features.	Year 4
		11.2.3.9 Merwin Park Picnic Shelters. Construct new shelters and move tables.	Year 4
		11.2.3.10 Speelyai Park Restroom. Upgrade to meet ADA requirements.	Year 6
		11.2.3.11 Day Use Parking. Improve parking at Speelyai Bay Park.	Year 12
		11.2.3.12 Merwin O & M. Keep Cresap Bay Campground open through September. Maintain existing sites and shoreline day use sites.	Year 1
	Lower River Measures	11.2.4.1 Lower Lewis River Vault Toilets. Provide new toilets at Cedar Creek, Merwin Hatchery, Johnson Creek, Lewis River Hatchery, and Island River access points.	Year 1 and by 2007 for Island River.
		11.2.4.2 Lower Lewis River Day Use Improvements. Provide picnic tables at 5 sites.	Year 11

Resource Area and Section	Resource Component	Proposed Measure	Timing
	Project Area Measures	11.2.5 I & E Program. Utilities to collaborate on a single project-wide I&E program.	Years 1-4
		11.2.6 Visitor Management Controls. PacifiCorp to implement controls to enhance safety and visitor enjoyment.	Year 1
		11.2.7 Communications on Recreation Facility Availability. PacifiCorp will inform public when recreation sites are at capacity.	Year 1
		11.2.8 Recreation Access to Project Lands. Non-motorized day use allowed on PacifiCorp lands.	Year 1
		11.2.9 Land Ownership Retention for Recreation. PacifiCorp retains Switchback property for future recreation development when needed.	Year 1
		11.2.10 Parking and Dispersed Shoreline Use at Yale and Swift Creek reservoirs. Overnight parking allowed at boat launches.	Year 1
		11.2.11 Campground Gate Access and Schedule. Close but not lock gates at campgrounds at night.	Year 1
		11.2.12 Dispersed Camping Funds to USFS. PacifiCorp provides $5,220 annually to USFS to manage dispersed camping on USFS land.	Year 1
		11.2.13 Vehicle Access and Use. Work to restrict dispersed upland camping and motorized use.	Year 1
		11.2.14 ADA-Accessible Fishing Sites. Assess feasibility of ADA-accessible bank fishing sites.	Year 7: Study Year 10: Implement
		11.2.15 Public Use of RV Dump Sites. Use of PacifiCorp's RV dump sites to be allowed.	Year 1
Cowlitz PUD Recreation Measures		11.3.1 Swift No. 2 Power Canal Bank Fishing Facility. Construct ADA-compliant bank fishing facility at canal bridge, with parking and portable toilets.	9/30/05
		11.3.3 I & E Program. Collaborate with PacifiCorp on a single project-wide I&E program.	Years 1 – 4
		11.3.4 Recreation Access to Project Lands. Non-motorized day use allowed on lands within the Swift No. 2 project boundary.	Year 1
		11.3.5 Dispersed Camping Funds to USFS. Cowlitz PUD provides $780 annually to USFS to manage dispersed camping on USFS land.	Year 1
Flood Management Section 12	Notification	12.4 Emergency Notification. PacifiCorp will contribute to County-developed installation and maintenance of emergency phone system for flood notification.	When installed

Resource Area and Section	Resource Component	Proposed Measure	Timing
	Communications	12.6 NOAA Communications Transmitter. Fund NOAA weather radio transmitter installation and maintenance.	8/23/03
	High Runoff	12.8 High Runoff Procedure. Implement revised high runoff procedures for all 3 project reservoirs.	Year 1
Cultural Section 13.1	Resource Management	13.1 Cultural Resources. Finalize and Implement Historic Properties Management Plan for Merwin, Yale and Swift No. 1.	Year 1
		13.1(1) Curate artifacts in a secure location in the basin.	As defined in HPMP
		13.1 (2) Protect integrity of properties listed in the National Register of Historic Places (NRHP).	Year 1
		13.1 (3) Preserve tribal access for traditional uses.	Year 1
		13.1 (4) Monitor and protect cultural resources	Year 1
		13.1.2 Cowlitz PUD Obligation for Cultural Resources. PUD will follow Unanticipated Discovery Plan and consult as needed for Section 106 compliance.	Year 1
Socioeconomics Section 13.2		13.2.1 Fund 2 full time law enforcement officers and one full-time fish and wildlife officer to patrol in the North Fork Lewis River basin.	Within 1.5 years
		13.2.2 Provide annual funding for the maintenance of Forest Road 90.	Begin in April 2005
		13.2.3 Pine Creek Work Center Communication Link. Continue funding support.	Ongoing
		13.2.4 Partially fund development of the Visitor Information Center or perform maintenance for the term of the new licenses.	As determined by USFS
Coordination and Decision Making Section 14		14.2 Technical Coordination Committees. Form one technical committee for terrestrial implementation and one for aquatic implementation.	Within 60 days

As was clarified at a meeting with the FWS and the Licensees on May 10, 2006, it is the intent that this BO would analyze and provide for the direct take of bull trout for those activities that would continue into the future that had previously been authorized under a 10(a)(1)(A) Permit and the Interim BO Incidental Take Statement for actions such as the collection, handling, marking, transporting, and releasing of bull trout at the forebays and tailraces of dams, specific habitat improvement sites, and ponds to be constructed in the Action Area over the 50-year term of the licenses.

STATUS OF THE SPECIES: Bull Trout

Listing Status

The coterminous United States population of the bull trout (*Salvelinus confluentus*) was listed as threatened on November 1, 1999 (64 FR 58910). The threatened bull trout generally occurs in the Klamath River Basin of south-central Oregon; the Jarbidge River in Nevada; the Willamette River Basin in Oregon; Pacific Coast drainages of Washington, including Puget Sound; major rivers in Idaho, Oregon, Washington, and Montana, within the Columbia River Basin; and the St. Mary-Belly River, east of the Continental Divide in northwestern Montana (Cavender 1978; Bond 1992; Brewin and Brewin 1997; Leary and Allendorf 1997).

Throughout its range, the bull trout is threatened by the combined effects of habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, grazing, the blockage of migratory corridors by dams or other diversion structures, poor water quality, entrainment (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels, and introduced non-native species (64 FR 58910). Poaching and incidental mortality of bull trout during other targeted fisheries are additional threats.

The bull trout was initially listed as three separate Distinct Population Segments (DPSs) (63 FR 31647; 64 FR 17110). The preamble to the final listing rule for the United States coterminous population of the bull trout discusses the consolidation of these DPSs with the Columbia and Klamath population segments into one listed taxon and the application of the jeopardy standard under section 7 of the ESA relative to this species (64 FR 58910):

> Although this rule consolidates the five bull trout DPSs into one listed taxon, based on conformance with the DPS policy for purposes of consultation under section 7 of the Act, we intend to retain recognition of each DPS in light of available scientific information relating to their uniqueness and significance. Under this approach, these DPSs will be treated as interim recovery units with respect to application of the jeopardy standard until an approved recovery plan is developed. Formal establishment of bull trout recovery units will occur during the recovery planning process.

Current Status and Conservation Needs

In recognition of available scientific information relating to their uniqueness and significance, five segments of the coterminous United States population of the bull trout are considered essential to the survival and recovery of this species and are identified as interim recovery units: 1) Jarbidge River, 2) Klamath River, 3) Columbia River, 4) Coastal-Puget Sound, and 5) St. Mary-Belly River (USFWS 2002; 2004a, b). Each of these interim recovery units is necessary to maintain the bull trout's distribution, as well as its genetic and phenotypic diversity, all of which are important to ensure the species' resilience to changing environmental conditions.

A summary of the current status and conservation needs of the bull trout within these interim recovery units is provided below and a comprehensive discussion is found in the FWSs draft recovery plans for the bull trout (USFWS 2002; 2004a, b).

The conservation needs of bull trout are often generally expressed as the four Cs: cold, clean, complex, and connected habitat. Cold stream temperatures, clean water quality that is relatively free of sediment and contaminants, complex channel characteristics (including abundant large wood and undercut banks), and large patches of such habitat that are well connected by unobstructed migratory pathways are all needed to promote conservation of bull trout at multiple scales ranging from the coterminous to local populations (a local population is a group of bull trout that spawn within a particular stream or portion of a stream system). The recovery planning process for bull trout (USFWS 2002; 2004a, b) has also identified the following conservation needs: 1) maintenance and restoration of multiple, interconnected populations in diverse habitats across the range of each interim recovery unit, 2) preservation of the diversity of life-history strategies, 3) maintenance of genetic and phenotypic diversity across the range of each interim recovery unit, and 4) establishment of a positive population trend. Recently, it has also been recognized that bull trout populations need to be protected from catastrophic fires across the range of each interim recovery unit (Rieman et al. 2003).

Central to the survival and recovery of bull trout is the maintenance of viable core areas (USFWS 2002; 2004a, b). A core area is defined as a geographic area occupied by one or more local bull trout populations that overlap in their use of rearing, foraging, migratory, and overwintering habitat. Each of the interim recovery units listed above consists of one or more core areas. There are 121 core areas recognized across the coterminous range of the bull trout (USFWS 2002; 2004a,b).

Jarbidge River Interim Recovery Unit

This interim recovery unit currently contains a single core area with six local populations. Less than 500 resident and migratory adult bull trout, representing about 50 to 125 spawning adults, are estimated to occur in the core area. The current condition of the bull trout in this interim recovery unit is attributed to the effects of livestock grazing, roads, incidental mortalities of released bull trout from recreational angling, historic angler harvest, timber harvest, and the introduction of non-native fishes (USFWS 2004a). The draft bull trout recovery plan (USFWS 2004a) identifies the following conservation needs for this interim recovery unit: 1) maintain the current distribution of the bull trout within the core area, 2) maintain stable or increasing trends in abundance of both resident and migratory bull trout in the core area, 3) restore and maintain suitable habitat conditions for all life history stages and forms, and 4) conserve genetic diversity and increase natural opportunities for genetic exchange between resident and migratory forms of the bull trout. An estimated 270 to 1,000 spawning bull trout per year are needed to provide for the persistence and viability of the core area and to support both resident and migratory adult bull trout (USFWS 2004a).

Klamath River Interim Recovery Unit

This interim recovery unit currently contains 3 core areas and 7 local populations. The current abundance, distribution, and range of the bull trout in the Klamath River Basin are greatly reduced from historical levels due to habitat loss and degradation caused by reduced water quality, timber harvest, livestock grazing, water diversions, roads, and the introduction of non-native fishes (USFWS 2002). Bull trout populations in this interim recovery unit face a high risk of extirpation (USFWS 2002). The draft Klamath River bull trout recovery plan (USFWS 2002) identifies the following conservation needs for this interim recovery unit: 1) maintain the current distribution of bull trout and restore distribution in previously occupied areas, 2) maintain stable or increasing trends in bull trout abundance, 3) restore and maintain suitable habitat conditions for all life history stages and strategies, 4) conserve genetic diversity and provide the opportunity for genetic exchange among appropriate core area populations. Eight to 15 new local populations and an increase in population size from about 2,400 adults currently to 8,250 adults are needed to provide for the persistence and viability of the 3 core areas (USFWS 2002).

Columbia River Interim Recovery Unit

The Columbia River interim recovery unit includes bull trout residing in portions of Oregon, Washington, Idaho, and Montana. Bull trout are estimated to have occupied about 60 percent of the Columbia River Basin, and presently occur in 45 percent of the estimated historical range (Quigley and Arbelbide 1997). This interim recovery unit currently contains 97 core areas and 527 local populations. About 65 percent of these core areas and local populations occur in central Idaho and northwestern Montana. The Columbia River interim recovery unit has declined in overall range and numbers of fish (63 FR 31647). Although some strongholds still exist with migratory fish present, bull trout generally occur as isolated local populations in headwater lakes or tributaries where the migratory life history form has been lost. Though still widespread, there have been numerous local extirpations reported throughout the Columbia River basin. In Idaho, for example, bull trout have been extirpated from 119 reaches in 28 streams (Idaho Department of Fish and Game in litt. 1995). The draft Columbia River bull trout recovery plan (USFWS 2002) identifies the following conservation needs for this interim recovery unit: 1) maintain or expand the current distribution of the bull trout within core areas, 2) maintain stable or increasing trends in bull trout abundance, 3) restore and maintain suitable habitat conditions for all bull trout life history stages and strategies, and 4) conserve genetic diversity and provide opportunities for genetic exchange.

This interim recovery unit currently contains 97 core areas and 527 local populations. About 65 percent of these core areas and local populations occur in Idaho and northwestern Montana. The condition of the bull trout within these core areas varies from poor to good. All core areas have been subject to the combined effects of habitat degradation and fragmentation caused by the following activities: dewatering; road construction and maintenance; mining; grazing; the blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment into diversion channels; and introduced non-native species. The Service completed a core area conservation assessment for the 5-year status review and determined that, of the 97 core areas in this interim recovery unit, 38 are at high risk of extirpation, 35 are at risk, 20 are at potential risk, two are at low risk, and two are at unknown risk (USFWS 2005).

Coastal-Puget Sound Interim Recovery Unit

Bull trout in the Coastal-Puget Sound interim recovery unit exhibit anadromous, adfluvial, fluvial, and resident life history patterns. The anadromous life history form is unique to this interim recovery unit. This interim recovery unit currently contains 14 core areas and 67 local populations (USFWS 2004b). Bull trout are distributed throughout most of the large rivers and associated tributary systems within this interim recovery unit. Bull trout continue to be present in nearly all major watersheds where they likely occurred historically, although local extirpations have occurred throughout this interim recovery unit. Many remaining populations are isolated or fragmented and abundance has declined, especially in the southeastern portion of the interim recovery unit. The current condition of the bull trout in this interim recovery unit is attributed to the adverse effects of dams, forest management practices (e.g., timber harvest and associated road building activities), agricultural practices (e.g., diking, water control structures, draining of wetlands, channelization, and the removal of riparian vegetation), livestock grazing, roads, mining, urbanization, poaching, incidental mortality from other targeted fisheries, and the introduction of non-native species. The draft Coastal-Puget Sound bull trout recovery plan (USFWS 2004b) identifies the following conservation needs for this interim recovery unit: 1) maintain or expand the current distribution of bull trout within existing core areas, 2) increase bull trout abundance to about 16,500 adults across all core areas, and 3) maintain or increase connectivity between local populations within each core area.

St. Mary-Belly River Interim Recovery Unit

This interim recovery unit currently contains six core areas and nine local populations (USFWS 2002). Currently, bull trout are widely distributed in the St. Mary River drainage and occur in nearly all of the waters that it inhabited historically. Bull trout are found only in a 1.2-mile reach of the North Fork Belly River within the United States. Redd count surveys of the North Fork Belly River documented an increase from 27 redds in 1995 to 119 redds in 1999. This increase was attributed primarily to protection from angler harvest (USFWS 2002). The current condition of the bull trout in this interim recovery unit is primarily attributed to the effects of dams, water diversions, roads, mining, and the introduction of non-native fishes (USFWS 2002). The draft St Mary Belly bull trout recovery plan (USFWS 2002) identifies the following conservation needs for this interim recovery unit: 1) maintain the current distribution of the bull trout and restore distribution in previously occupied areas, 2) maintain stable or increasing trends in bull trout abundance, 3) restore and maintain suitable habitat conditions for all life history stages and forms, 4) conserve genetic diversity and provide the opportunity for genetic exchange, and 5) establish good working relations with Canadian interests because local bull trout populations in this interim recovery unit are comprised mostly of migratory fish, whose habitat is mostly in Canada.

Life History

Bull trout exhibit both resident and migratory life history strategies. Both resident and migratory forms may be found together, and either form may produce offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. The resident form tends to be smaller than the migratory form at maturity and also produces fewer eggs (Fraley and Shepard 1989; Goetz 1989). Migratory bull trout spawn in tributary streams where juvenile fish rear 1 to 4 years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and Shepard 1989; Goetz 1989), or saltwater (anadromous form) to rear as subadults and to live as adults (Cavender 1978; McPhail and Baxter 1996; WDFW et al. 1997). Bull trout normally reach sexual maturity in 4 to 7 years and may live longer than 12 years. They are iteroparous (they spawn more than once in a lifetime). Repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented (Leathe and Graham 1982; Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1996).

The iteroparous reproductive strategy of bull trout has important repercussions for the management of this species. Bull trout require passage both upstream and downstream, not only for repeat spawning but also for foraging. Most fish ladders, however, were designed specifically for anadromous semelparous salmonids (fishes that spawn once and then die, and require only one-way passage upstream). Therefore, even dams or other barriers with fish passage facilities may be a factor in isolating bull trout populations if they do not provide a downstream passage route. Additionally, in some core areas, bull trout that migrate to marine waters must pass both upstream and downstream through areas with net fisheries at river mouths. This can increase the likelihood of mortality to bull trout during these spawning and foraging migrations.

Growth varies depending upon life-history strategy. Resident adults range from 6 to 12 inches total length, and migratory adults commonly reach 24 inches or more (Pratt 1985; Goetz 1989). The largest verified bull trout is a 32-pound specimen caught in Lake Pend Oreille, Idaho, in 1949 (Simpson and Wallace 1982).

Habitat Characteristics

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993). Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrate, and migratory corridors (Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Howell and Buchanan 1992; Pratt 1992; Rieman and McIntyre 1993, 1995; Rich 1996; Watson and Hillman 1997). Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993), bull trout should not be expected to simultaneously occupy all available habitats (Rieman et al. 1997).

Migratory corridors link seasonal habitats for all bull trout life histories. The ability to migrate is important to the persistence of bull trout (Rieman and McIntyre 1993; Gilpin, *in litt.* 1997; Rieman et al. 1997). Migrations facilitate gene flow among local populations when individuals from different local populations interbreed or stray to nonnatal streams. Local populations that are extirpated by catastrophic events may also become reestablished by bull trout migrants. However, it is important to note that the genetic structuring of bull trout indicates there is limited gene flow among bull trout populations, which may encourage local adaptation within individual populations, and that reestablishment of extirpated populations may take a long time (Spruell et al. 1999; Rieman and McIntyre 1993). Migration also allows bull trout to access more abundant or larger prey, which facilitates growth and reproduction. Additional benefits of migration and its relationship to foraging are discussed below under "Diet."

Cold water temperatures play an important role in determining bull trout habitat, as these fish are primarily found in colder streams (below 15 °C or 59 °F), and spawning habitats are generally characterized by temperatures that drop below 9 °C (48 °F) in the fall (Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1993).

Thermal requirements for bull trout appear to differ at different life stages. Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992; Rieman and McIntyre 1993; Baxter et al. 1997; Rieman et al. 1997). Optimum incubation temperatures for bull trout eggs range from 2 °C to 6 °C (35 °F to 39 °F) whereas optimum water temperatures for rearing range from about 6 °C to 10 °C (46 °F to 50 °F) (McPhail and Murray 1979; Goetz 1989; Buchanan and Gregory 1997). In Granite Creek, Idaho, Bonneau and Scarnecchia (1996) observed that juvenile bull trout selected the coldest water available in a plunge pool, 8 °C to 9 °C (46 °F to 48 °F), within a temperature gradient of 8 °C to 15 °C (4 °F to 60 °F). In a landscape study relating bull trout distribution to maximum water temperatures, (Dunham et al. 2003) found that the probability of juvenile bull trout occurrence does not become high (i.e., greater than 0.75) until maximum temperatures decline to 11 °C to 12 °C (52 °F to 54 °F).

Although bull trout are found primarily in cold streams, occasionally these fish are found in larger, warmer river systems throughout the Columbia River basin (Fraley and Shepard 1989; Rieman and McIntyre 1993, 1995; Buchanan and Gregory 1997; Rieman et al. 1997). Availability and proximity of cold water patches and food productivity can influence bull trout ability to survive in warmer rivers (Myrick et al. 2002). For example, in a study in the Little Lost River of Idaho where bull trout were found at temperatures ranging from 8 °C to 20 °C (46 °F to 68 °F), most sites that had high densities of bull trout were in areas where primary productivity in streams had increased following a fire (B. Gamett, pers. comm. June 20, 2002).

All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Pratt 1992; Thomas 1992; Rich 1996; Sexauer and James 1997; Watson and Hillman 1997). Maintaining bull trout habitat requires stability of stream channels and maintenance of natural flow patterns (Rieman and McIntyre 1993). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997). These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period, and channel instability may decrease survival of eggs and young juveniles in the gravel from winter through spring (Fraley and Shepard 1989; Pratt 1992; Pratt and Huston 1993). Pratt (1992) indicated that increases in fine sediment reduce egg survival and emergence.

Bull trout typically spawn from August through November during periods of increasing flows and decreasing water temperatures. Preferred spawning habitat consists of low-gradient stream reaches with loose, clean gravel (Fraley and Shepard 1989). Redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989; Pratt 1992; Rieman and McIntyre 1996). Depending on water temperature, incubation is normally 100 to 145 days (Pratt 1992). After hatching, fry remain in the substrate, and time from egg deposition to emergence may surpass 200 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Pratt 1992; Ratliff and Howell 1992).

Migratory forms of bull trout may develop when habitat conditions allow movement between spawning and rearing streams and larger rivers, lakes or nearshore marine habitat where foraging opportunities may be enhanced (Frissell 1993; Goetz et al. 2004; Brenkman and Corbett 2005). For example, multiple life history forms (e.g., resident and fluvial) and multiple migration patterns have been noted in the Grande Ronde River (Baxter 2002). Parts of this river system have retained habitat conditions that allow free movement between spawning and rearing areas and the mainstem Snake River. Such multiple life history strategies help to maintain the stability and persistence of bull trout populations to environmental changes. Benefits to migratory bull trout include greater growth in the more productive waters of larger streams, lakes, and marine waters; greater fecundity resulting in increased reproductive potential; and dispersing the population across space and time so that spawning streams may be recolonized should local populations suffer a catastrophic loss (Rieman and McIntyre 1993; MBTSG 1998; Frissell 1999). In the absence of the migratory bull trout life form, isolated populations cannot be replenished when disturbances make local habitats temporarily unsuitable. Therefore, the range of the species is diminished, and the potential for a greater reproductive contribution from larger size fish with higher fecundity is lost (Rieman and McIntyre 1993).

Diet

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. A single optimal foraging strategy is not necessarily a consistent feature in the life of a fish, because this strategy can change as the fish progresses from one life stage to another (i.e., juvenile to subadult). Fish growth depends on the quantity and quality of food that is eaten (Gerking 1994), and as fish grow, their foraging strategy changes as their food changes, in quantity, size, or other characteristics. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987; Goetz 1989; Donald and Alger 1993). Subadult and adult migratory bull trout feed on various fish species (Leathe and Graham 1982; Fraley and Shepard 1989; Brown 1994; Donald and Alger 1993). Bull trout of all sizes other than fry have been found to eat fish half their length (Beauchamp and Van Tassell 2001). In nearshore marine areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasi*), Pacific sand lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*) (WDFW et al. 1997; Goetz et al. 2004).

Bull trout migration and life history strategies are closely related to their feeding and foraging strategies. Migration allows bull trout to access optimal foraging areas and exploit a wider variety of prey resources. Optimal foraging theory can be used to describe strategies fish use to choose between alternative sources of food by weighing the benefits and costs of capturing one source of food over another. For example, prey often occur in concentrated patches of abundance ("patch model;" Gerking 1994). As the predator feeds in one patch, the prey population is reduced, and it becomes more profitable for the predator to seek a new patch rather than continue feeding on the original one. This can be explained in terms of balancing energy acquired versus energy expended. For example, in the Skagit River system, anadromous bull trout make migrations as long as 121 miles between marine foraging areas in Puget Sound and headwater spawning grounds, foraging on salmon eggs and juvenile salmon along their migration route (WDFW et al. 1997). Anadromous bull trout also use marine waters as migration corridors to reach seasonal habitats in non-natal watersheds to forage and possibly overwinter (Brenkman and Corbett 2005; Goetz et al. 2004).

Changes in Status of the Coastal-Puget Sound Interim Recovery Unit

Although the status of bull trout in Coastal-Puget Sound interim recovery unit has been improved by certain actions, it continues to be degraded by other actions, and it is likely that the overall status of the bull trout in this population segment has not improved since its listing on November 1, 1999. Improvement has occurred largely through changes in fishing regulations and habitat-restoration projects. Fishing regulations enacted in 1994 either eliminated harvest of bull trout or restricted the amount of harvest allowed, and this likely has had a positive influence on the abundance of bull trout. Improvement in habitat has occurred following restoration projects intended to benefit either bull trout or salmon, although monitoring the effectiveness of these projects seldom occurs. On the other hand, the status of this population segment has been adversely affected by a number of Federal and non-Federal actions, some of which were addressed under section 7 of the ESA. Most of these actions degraded the environmental baseline; all of those addressed through formal consultation under section 7 of the ESA permitted the incidental take of bull trout.

Section 10(a)(1)(B) permits have been issued for Habitat Conservation Plans (HCPs) completed in the Coastal-Puget Sound population segment. These include: 1) the City of Seattle's Cedar River Watershed HCP, 2) Simpson Timber HCP, 3) Tacoma Public Utilities Green River HCP, 4) Plum Creek Cascades HCP, 5) Washington State Department of Natural Resources HCP, 6) West Fork Timber HCP (Nisqually River), and 7) Forest Practices HCP. These HCPs provide landscape-scale conservation for fish, including bull trout. Many of the covered activities associated with these HCPs will contribute to conserving bull trout over the long-term; however, some covered activities will result in short-term degradation of the baseline. All HCPs permit the incidental take of bull trout.

Changes in Status of the Columbia River Interim Recovery Unit

The overall status of the Columbia River interim recovery unit has not changed appreciably since its listing on June 10, 1998. Populations of bull trout and their habitat in this area have been affected by a number of actions addressed under section 7 of the ESA. Most of these actions resulted in degradation of the environmental baseline of bull trout habitat, and all permitted or analyzed the potential for incidental take of bull trout. The Plum Creek Cascades HCP, Plum Creek Native Fish HCP, and Forest Practices HCP addressed portions of the Columbia River population segment of bull trout.

Changes in Status of the Klamath River Interim Recovery Unit

Improvements in the Threemile, Sun, and Long Creek local populations have occurred through efforts to remove or reduce competition and hybridization with non-native salmonids, changes in fishing regulations, and habitat-restoration projects. Population status in the remaining local populations (Boulder-dixon, Deming, Brownsworth, and Leonard Creeks) remains relatively unchanged. Grazing within bull trout watersheds throughout the recovery unit has been curtailed. Efforts at removal of non-native species of salmonids appear to have stabilized the Threemile and positively influenced the Sun Creek local populations. The results of similar efforts in Long Creek are inconclusive. Mark and recapture studies of bull trout in Long Creek indicate a larger migratory component than previously expected.

Although the status of specific local populations has been slightly improved by recovery actions, the overall status of Klamath River bull trout continues to be depressed. Factors considered threats to bull trout in the Klamath Basin at the time of listing – habitat loss and degradation caused by reduced water quality, past and present land use management practices, water diversions, roads, and non-native fishes – continue to be threats today.

STATUS OF THE NORTHERN SPOTTED OWL

Legal Status

The spotted owl was listed as federally threatened on June 26, 1990, under the ESA. It was listed due to widespread habitat loss across its entire range and the inadequacy of existing regulatory mechanisms to provide for its conservation (55 FR 26114-26194).

Life History

Detailed accounts of the taxonomy, ecology, and reproductive characteristics of the northern spotted owl are found in the 1987 and 1990 U.S. Fish and Wildlife Service Status Reviews (U.S. Fish and Wildlife Service 1987, 1990), the 1989 Status Review Supplement (U.S. Fish and Wildlife Service 1989), the Interagency Scientific Committee (ISC) Report (Thomas et al. 1990), the Forest Ecosystem Management Assessment Team (FEMAT) Report (Thomas and Raphael 1993), the final rule designating the northern spotted owl as a threatened species (55 FR 26114-26194), and the Scientific Evaluation of the Status of the Northern Spotted Owl (Courtney et al. 2004).

Taxonomy

The northern spotted owl is one of three subspecies of spotted owls currently recognized by the American Ornithologists' Union and is typically associated with old-growth forest habitats throughout the Pacific Northwest. The taxonomic separation of these three subspecies is supported by genetic (Barrowclough and Gutiérrez 1990), morphological (Gutiérrez et al. 1995) and biogeographic information (Barrowclough and Gutiérrez 1990).

Physical Description

The northern spotted owl is a medium-sized owl, approximately 18-19 in (46-48 cm) in length and approximately 1.1-1.9 lbs (490-850 gm) in weight (Gutiérrez et al. 1995), and is the largest of the three subspecies (Gutiérrez et al. 1995). It is dark brown with a barred tail and white spots on the head and breast, and has dark brown eyes that are surrounded by prominent facial disks. Three age classes can be distinguished on the basis of plumage characteristics (Forsman 1981; Moen et al. 1991). The northern spotted owl superficially resembles the barred owl (*Strix varia*), a species with which it occasionally hybridizes (Kelly et al. 2003). Hybrids exhibit characteristics of both species (Hamer et al. 1994).

Current and Historical Range

The current range and distribution of the northern spotted owl extends from southern British Columbia through western Washington, Oregon, and California as far south as Marin County (U.S. Fish and Wildlife Service 1990). The southeastern boundary of its range is the Pit River area of Shasta County, California. The range of the northern spotted owl is partitioned into 12 physiographic provinces (provinces), based upon recognized landscape subdivisions exhibiting different physical and environmental features (Thomas et al. 1993). These provinces are distributed across the range as follows: four provinces in Washington (Washington Cascades East, Olympic Peninsula, Washington Cascades West, Western Lowlands); five provinces in Oregon (Oregon Coast Range, Willamette Valley, Oregon Cascades West, Oregon Cascades East, Klamath Mountains); and three provinces in California (California Coast, California Klamath, California Cascades). The current range of the northern spotted owl is similar to its historical range where forested habitat still exists. The distribution of habitat is influenced by the natural and human-caused fragmentation of vegetation and natural topography. The northern spotted owl has been extirpated or is uncommon in certain areas. For instance, there have only been a few nesting pairs in southwestern Washington for a number of years, although they have persisted there for the past decade. Timber harvest activities have eliminated, reduced, or fragmented northern spotted owl habitat and decreased overall population densities across its range, particularly within the coastal provinces where habitat reduction has been concentrated (Thomas and Raphael 1993).

Behavior

Northern spotted owls are territorial. However, home ranges of adjacent pairs overlap (Forsman et al. 1984; Solis and Gutiérrez 1990) suggesting that the area defended by an owl pair is smaller than the area they use for foraging. Territorial defense is primarily done through hooting, barking and whistle type calls.

Northern spotted owls are monogamous and usually form long-term pair bonds, although separations of pairs do occur. There are no known examples of northern spotted owl polygyny, although associations of three or more birds have been reported (Gutiérrez et al. 1995).

Habitat Relationships

Home Range

Northern spotted owl home range size varies by province. Home range size generally increases from south to north, which is likely in response to decreasing habitat quality (U.S. Fish and Wildlife Service 1990). Home range size has been linked to habitat type, availability, and abundance of prey (Zabel et al. 1995).

Based on available radio-telemetry data (Thomas et al. 1990), the FWS estimated median annual home range size for the northern spotted owl by province throughout its range. Because the actual configuration of the home range is rarely known, the estimated home range of a northern spotted owl pair is represented by a circle centered upon a northern spotted owl activity center, with an area approximating the provincial median annual home range. For example, estimated home range area varies from 3,340 acres (based on a 1.3-mile radius area) in California to 14,271 acres (based on a 2.7-mile radius circle) in Washington. The FWS uses a 0.7-mile radius circle (984 acres) to delineate the area most heavily used (core area) by northern spotted owls during the nesting season. Variation in the size of the actual core area also varies geographically. For example, northern spotted owls in northern California focused their activities in core areas that ranged from about 167 to 454 acres, with a mean of about 409 acres; approximately half the area of the 0.7-mile radius circle (Bingham and Noon 1997). Northern spotted owls maintain smaller home ranges during the breeding season and often dramatically increase their home range size during fall and winter (Forsman et al. 1984; Sisco 1990).

Although differences exist in natural stand characteristics that influence provincial home range size, habitat loss and forest fragmentation effectively reduce habitat quality in the home range. A reduction in the amount of suitable habitat reduces northern spotted owl abundance and nesting success (Bart and Forsman 1992; Bart 1995).

Habitat Use

Forsman et al. (1984) reported that northern spotted owls have been observed in the following forest types: Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), grand fir (*Abies grandis*), white fir (*Abies concolor*), ponderosa pine (*Pinus ponderosa*), Shasta red fir (*Abies magnifica shastensis*), mixed evergreen, mixed conifer hardwood (Klamath montane), and redwood (*Sequoia sempervirens*). In parts of the Oregon Coast Range, northern spotted owls have been recorded in pure hardwood stands (Glenn et al. 2004). In California, northern spotted owls are found from near sea level in coastal forests to approximately 6,988 ft (2,130 m) in the Cascades (Gutiérrez 1996). The upper elevation limit at which northern spotted owls occur decreases gradually with increasing latitude in Oregon and Washington (Lint 2005). In all areas, the upper elevation limit at which northern spotted owls occur corresponds to the transition to subalpine forest, which is characterized by relatively simple structure and severe winter weather (Gutiérrez 1996).

Roost sites selected by northern spotted owls have more complex vegetation structure than forests generally available to them (Barrows and Barrows 1978; Forsman et al. 1984; Solis and Gutiérrez 1990). These habitats are usually multi-layered forests having high canopy closure and large diameter trees in the overstory.

Northern spotted owls nest almost exclusively in trees. Like roosts, nest sites are found in forests having complex structure dominated by large diameter trees (Forsman et al. 1984; Hershey et al. 1998). Even in forests that have been previously logged, northern spotted owls select forests having a structure (i.e., larger trees, greater canopy closure) different than forests generally available to them (Folliard 1993; Buchanan et al. 1995; Hershey et al. 1998).

Foraging habitat is the most variable of all habitats used by territorial northern spotted owls (Thomas et al. 1990). Descriptions of foraging habitat have ranged from complex structure (Solis and Gutiérrez 1990) to forests with lower canopy closure and smaller trees than forests containing nests or roosts (Gutiérrez 1996).

Habitat Selection

Northern spotted owls generally rely on older forested habitats because they contain the structures and characteristics required for nesting, roosting, foraging, and dispersal. These characteristics include the following: 1) a multi-layered, multi-species canopy dominated by large overstory trees, 2) moderate to high canopy closure, 3) a high incidence of trees with large cavities and other types of deformities, especially dwarf mistletoe brooms, 4) numerous large snags, 5) an abundance of large, dead wood on the ground, and 6) open space within and below the upper canopy for northern spotted owls to fly (Thomas et al. 1990; U.S. Fish and Wildlife Service 1990). Forested stands with high canopy closure also provide thermal cover (Weathers et al. 2001), as well as protection from predation. Recent landscape-level analyses in portions of the Klamath Province suggest that a mosaic of late-successional habitat interspersed with other vegetation types may benefit northern spotted owls more than large, homogeneous expanses of older forests (Zabel et al. 2003; Franklin et al. 2000; Meyer et al. 1998).

Dugger et al. (2005) found that apparent survival and reproduction was positively associated with the proportion of older forest near the territory center in the Klamath Province. Survival decreased dramatically when the amount of non-habitat exceeded approximately 50 percent (Dugger et al. 2005). Northern spotted owl territories with habitat fitness potentials (i.e., expressed as a lambda estimate for the territory) of less than 1.0 were generally characterized by less than 40 to 50 percent old forest habitat near the territory center (Dugger et al. 2005). The authors concluded that they found no support for either a positive or negative direct effect of intermediate-aged forest on either survival or reproduction.

Olson et al. (2004) found that survival in the Oregon Coast Range had a quadratic relationship with the amount of late- and mid-seral forest near nesting centers. Reproductive rates fluctuated biennially and were positively related to the amount of edge between late- and mid-seral forests and other habitat classes. Olson et al. (2004) conclude that their result indicated that while mid- and late-seral forests are important to northern spotted owls, a mixture of these forest types with younger forest and non-forest may be best for northern spotted owl survival and reproduction in their study area.

In redwood forests along the coast range of California, northern spotted owls may be found in younger forest stands with structural characteristics of older forests (Thomas et al. 1990). However, northern spotted owls do not generally appear to select for stands of intermediate or younger ages (Solis and Gutiérrez 1990; Thomas et al. 1990). Where northern spotted owls have been found nesting in young forest, such occurrences have been attributed to the presence of large residual trees with cavities (Buchanan et al. 1993), climatic conditions conducive to the use of platform nests (Forsman and Giese 1997), and/or alternate sources of prey that do not rely on cavities for reproduction (Zabel et al. 1995). In Washington, foraging occurs in nesting and roosting habitat, as well as in coniferous forest with smaller trees and less structural diversity, if prey such as the northern flying squirrel are present (Hanson et al. 1993).

In mixed conifer forests of the Eastern Cascade Mountains, Washington, 27 percent of nest sites were in old-growth forests, 57 percent in the understory reinitiation phase of forest stand development, and 17 percent in the stem exclusion phase of forest stand development (Buchanan et al. 1995). In the Western Cascade Mountains, Oregon, 50 percent of northern spotted owl nests were in late-seral/old-growth stands (greater than 80-years-old) and none were found in stands less than 40-years-old (Irwin et al. 2000).

Ward (1990) found that northern spotted owls foraged in areas that had lower variance in prey densities (prey were more predictable in occurrence) within older forests and near ecotones of old forest and brush seral stages. Zabel et al. (1995) showed that northern spotted owl home ranges are larger where flying squirrels are the predominant prey and, conversely, are smaller where woodrats (*Neotoma* spp.) are the predominant prey.

In the Western Washington Cascade Mountains, northern spotted owls used mature/old forests dominated by trees greater than 20 in (50 cm) diameter-at-breast height with greater than 60 percent canopy closure more often than expected for roosting during the non-breeding season and used young forest trees 8 to 20 in (20 to 50 cm) diameter at breast height with greater than 60 percent canopy closure) less often than expected based on availability (Herter et al. 2002).

<u>Reproductive Biology</u>

Northern spotted owls exhibit high adult annual survival rates and are relatively long-lived (Anthony et al. 2004). Northern spotted owls do not typically reach sexual maturity until after two years of age (Miller et al. 1985; Thomas et al. 1990). Adult females lay an average of 2 eggs per clutch with a range of 1 to 4 eggs. Northern spotted owl pairs do not typically nest every year, nor are nesting pairs successful every year (U.S. Fish and Wildlife Service 1990). The small clutch size, temporal variability in nesting success, and somewhat delayed maturation all contribute to the relatively low reproductive rate of this species (Gutiérrez 1996).

Nest sites are usually located within stands of old-growth and late-successional forest dominated by Douglas-fir (*Pseudotsuga menziesii*), and they contain structures such as cavities, broken tree tops, or mistletoe (*Arceuthobium* spp.) brooms (Forsman et al. 1984; Blakesley et al. 1992; LaHaye and Gutiérrez 1999). Northern spotted owls do not build their own nests. Most nesting occurs within naturally formed cavities in live trees or snags, but abandoned platform nests of the northern goshawk (*Accipiter gentilis*) and common raven (*Corvus corax*) have also been used (Buchanan et al. 1993). In general, courtship and nesting behavior begins in February to March with nesting occurring from March to June; however, timing of nesting and fledging varies with latitude and elevation (Forsman et al. 1984). After young fledge from the nest, they depend on their parents until they are able to fly and hunt on their own. Parental care continues post-fledging into September, and sometimes into October (Forsman et al. 1984). During this time the adults may not roost with their young during the day, but they respond to begging vocalizations by bringing food to the young (Forsman et al. 1984).

Some northern spotted owls are not territorial but either remain as residents within the territory of a pair or move among territories (Gutiérrez 1996). These birds are referred to as "floaters." Floaters have special significance in northern spotted owl populations because they may buffer the territorial population from decline (Franklin 1992). Little is known about floaters other than that they exist and typically do not respond to calls as vigorously as territorial birds (Gutiérrez 1996).

Dispersal Biology

Natal dispersal of northern spotted owls from Oregon and Washington typically begins from mid- to late-September, and it is remarkably synchronous across broad areas (Forsman et al. 2002). When data from many dispersing northern spotted owls are pooled, the direction of dispersal away from the natal site appears random (Miller 1989; Ganey et al. 1998; Forsman et al. 2002). Dispersal direction from individual territories, however, may be non-random in response to the local distribution of habitat and topography (Forsman et al. 2002). Natal dispersal occurs in stages, with juvenile northern spotted owls settling in temporary home ranges between bouts of dispersal (Forsman et al. 2002). Median natal dispersal distance is about 10 mi for males and 15.5 mi for females (Forsman et al. 2002; Miller 1989; Ganey et al. 1998). Successful dispersal of juvenile northern spotted owls may depend on their ability to locate unoccupied suitable habitat in close proximity to other occupied sites (LaHaye et al. 2001).

Breeding dispersal occurs among a small proportion of adult northern spotted owls; these movements were more frequent among females and unmated individuals (Forsman et al. 2002). Breeding dispersal distances were shorter than natal dispersal distances and also apparently random in direction (Forsman et al. 2002).

Large non-forested valleys are apparent barriers to natal and breeding dispersal. Forested foothills between valleys may provide the only opportunities for dispersal (Forsman et al. 2002). The degree to which water bodies, such as the Columbia River and Puget Sound, function as barriers to dispersal is unclear. Analysis of genetic structure of northern spotted owl populations suggests adequate rates of gene flow may occur across the Puget Trough between the Olympic Mountains and Washington Cascades and across the Columbia River between the Olympic Mountains and the Coast Range of Oregon (Haig et al. 2001). Both telemetry and genetic studies indicate inbreeding is rare.

Dispersing juvenile northern spotted owls experience high mortality rates, exceeding 70 percent in some studies (Miller 1989). Leading known causes of mortality are starvation, predation, and accidents (Miller 1989; Forsman et al. 2002). Parasitic infection may contribute to these causes of mortality (Forsman et al. 2002). In a study on habitat use by dispersing juvenile northern spotted owls in the Oregon Coast Range, Klamath and Western Oregon Cascades Provinces (Miller et al. 1997), mature and old-growth forest were used slightly more than expected based on availability during the transient phase and nearly twice its availability during the colonization phase. Closed pole-sapling-sawtimber habitat was used roughly in proportion to availability in both phases; open sapling and clearcuts were used less than expected based on availability during colonization.

Food Habits

Composition of prey in the northern spotted owl's diet varies regionally, seasonally, annually, and locally, which is likely in response to prey availability (Carey 1993; Forsman et al. 2001; Forsman et al. 2004). Northern spotted owls are mostly nocturnal (Forsman et al. 1984), but they may forage opportunistically during the day (Laymon 1991; Sovern et al. 1994). Northern flying squirrels and woodrats are usually the predominant prey both in biomass and frequency (Barrows 1980; Forsman et al. 1984; Ward 1990; Bevis et al. 1997; Forsman et al. 2001, 2004) with a clear geographic pattern of prey availability, paralleling differences in habitat (Thomas et al. 1990). Northern flying squirrels are generally the dominant prey item in the more mesic Douglas-fir/western hemlock forests characteristic of the northern portion of the range, whereas woodrats are generally the dominant prey item in the drier mixed conifer/mixed evergreen forests typically found in the southern portion of the range (Forsman et al. 1984; Thomas et al. 1990; Ward et al. 1998, as reviewed by Courtney et al. 2004). These prey items were found to be co-dominant in the southwest interior of Oregon (Forsman et al. 2001, 2004).

Other prey species such as the red tree vole (*Arborimus longicaudaus),* red backed voles (*Clethrionomys gapperi),* mice, rabbits and hares, birds, and insects may be seasonally or locally important (as reviewed by Courtney et al. 2004). For example, Rosenberg et al. (2003) showed a strong correlation between annual reproductive success of northern spotted owls (number of young per territory) and abundance of deer mice (*Peromyscus maniculatus*) ($r^2 = 0.68$), despite the fact they only made up 1.6 ± 0.5 percent of the biomass consumed. However, it is unclear if the causative factor behind this correlation was prey abundance or a synergistic response to weather (Rosenberg et al. 2003). Ward (1990) also noted that mice were more abundant in areas selected for foraging by northern spotted owls. Nonetheless, foraging northern spotted owls deliver larger prey to owls on the nest and eat smaller food items themselves to reduce foraging energy costs; therefore, the importance of smaller prey items, like *Peromyscus*, in the northern spotted owl diet should not be underestimated (Forsman et al. 1984, 2001, 2004).

Population Dynamics

The northern spotted owl is a relatively long-lived bird; produces few, but large young; invests significantly in parental care; experiences later or delayed maturity; and exhibits high adult survivorship. The northern spotted owl's long reproductive life span allows for some eventual recruitment of offspring, even if recruitment does not occur each year (Franklin et al. 2000).

Annual variation in population parameters for northern spotted owls has been linked to environmental influences at various life history stages (Franklin et al. 2000). In coniferous forests, mean fledgling production of the California spotted owl (*Strix occidentalis occidentalis*), a closely related subspecies, was higher when minimum spring temperatures were higher (North et al. 2000), indicating a relationship that may be a function of increased prey availability. Across their range, northern spotted owls have previously shown an unexplained pattern of alternating years of high and low reproduction, with highest reproduction occurring during even-numbered years (e.g., Franklin et al. 1999). Annual variation in breeding may be related to weather (i.e., temperature and precipitation) (Wagner et al. 1996 and Zabel et al. 1996 *In*: Forsman et al. 1996) and fluctuation in prey abundance (Zabel et al. 1996).

A variety of factors may regulate northern spotted owl population levels. These factors may be density-dependent (e.g., territorial behavior, habitat quality, habitat abundance) or density-independent (e.g., climate). Interactions may occur among factors. For example, as habitat quality decreases, density-independent factors may have more influence on variation in rate of population growth (Franklin et al. 2000). For example, weather could have increased negative effects on northern spotted owl fitness for those owls occurring in relatively lower quality habitat (Franklin et al. 2000). At some point, lower habitat quality may also cause the population to decline (Franklin et al. 2000).

Olson et al. (2005) used population modeling of site occupancy that incorporated imperfect and variable detectability of northern spotted owls and allowed modeling of temporal variation in site occupancy, extinction, and colonization probabilities (at the site scale). The authors found that visit detection probabilities averaged less than 0.70 and were highly variable among study years and among their three study areas in Oregon. Pair site occupancy probabilities declined greatly at one study area and slightly at the other two areas. However, for all northern spotted owls, including singles and pairs, site occupancy was mostly stable through time. Barred owl presence had a negative effect on these parameters (see barred owl discussion in the New Threats section below).

Threats

Reasons for Listing
The northern spotted owl was listed as threatened throughout its range "due to loss and adverse modification of suitable habitat as a result of timber harvesting and exacerbated by catastrophic events such as fire, volcanic eruption, and wind storms" (55 FR 26114-26194). More

specifically, significant threats to the northern spotted owl included the following: 1) low populations, 2) declining populations, 3) limited habitat, 4) declining habitat, 5) distribution of habitat or populations, 6) isolation of provinces, 7) predation and competition, 8) lack of coordinated conservation measures, and (9) vulnerability to natural disturbance (57 FR 1796-1838). These threats were characterized for each province as severe, moderate, low, or unknown. Declining habitat was recognized as a severe or moderate threat to the northern spotted owl in all 12 provinces, isolation of provinces within 11 provinces, and declining populations in 10 provinces. Consequently, these three factors represented the greatest concern range-wide to the conservation of the northern spotted owl. Limited habitat was considered a severe or moderate threat in nine provinces, and low populations a severe or moderate concern in eight provinces, suggesting that these factors are a concern throughout the majority of the range. Vulnerability to natural disturbances was rated as low in five provinces.

The degree to which predation and competition might pose a threat to the northern spotted owl was unknown in more provinces than any of the other threats, indicating a need for additional information. Few empirical studies exist to confirm that habitat fragmentation contributes to increased levels of predation on northern spotted owls (Courtney et al. 2004). However, great horned owls (*Bubo virginianus*), an effective predator on northern spotted owls, are closely associated with fragmented forests, openings, and clearcuts (Johnson 1992; Laidig and Dobkin 1995). As mature forests are harvested, great horned owls may colonize fragmented forests, thereby increasing northern spotted owl vulnerability to predation.

<u>New Threats</u>

Barred Owls

Since the listing of the northern spotted owl under the ESA, new information suggests that hybridization with the barred owl is less of a threat (Kelly and Forsman 2004) and competition with the barred owl is a greater threat than previously anticipated (Courtney et al. 2004). Since 1990, the barred owl has expanded its range south into Marin County, California, and the central Sierra Nevada Mountains, such that it is now roughly coincident with the range of the northern spotted owl (Courtney et al. 2004). Further, barred owl populations appear to be increasing throughout the Pacific Northwest, particularly in Washington and Oregon (Zabel et al. 1996; Dark et al. 1998; Wiedemeier and Horton 2000; Kelly et al. 2003; Pearson and Livezey 2003; Anthony et al. 2004), notwithstanding the likely bias in survey methods towards underestimating actual barred owl numbers (Courtney et al. 2004). Barred owl numbers now may exceed northern spotted owl numbers in the northern Washington Cascades (Kuntz and Christopherson 1996) and in British Columbia (Dunbar et al. 1991) and appear to be approaching northern spotted owl numbers in several other areas (e.g., Redwood National and State Parks in California [Schmidt 2003]). Barred owl populations in the Pacific Northwest appear to be self-sustaining based on current density estimates and apparent distribution (Courtney et al. 2004).

Barred owls apparently compete with northern spotted owls through a variety of mechanisms: prey overlap (Hamer et al. 2001), habitat overlap (Hamer et al. 1989; Dunbar et al. 1991; Herter and Hicks 2000; Pearson and Livezey 2003), and agonistic encounters (Leskiw and Gutiérrez 1998; Pearson and Livezey 2003). New information on encounters between barred owls and northern spotted owls comes primarily from anecdotal reports which corroborate initial observations that barred owls react more aggressively towards northern spotted owls than the reverse (Courtney et al. 2004). There is also limited circumstantial evidence of barred owl predation on northern spotted owls (Leskiw and Gutiérrez 1998; Johnston 2002). Information collected to date indicates that encounters between these two species tend to be agonistic in nature, and that the outcome is unlikely to favor the northern spotted owl (Courtney et al. 2004).

Although barred owls were initially thought to be more closely associated with early successional forests than northern spotted owls from studies conducted on the west slope of the Cascade Mountains in Washington (Hamer 1988), recent studies conducted elsewhere in the Pacific Northwest indicate that barred owls utilize a broader range of habitat types than do northern spotted owls (Courtney et al. 2004). For example, a telemetry study conducted on barred owls in the fire prone forests of eastern Washington showed that barred owl home ranges were located on lower slopes or valley bottoms, in closed canopy, mature, Douglas-fir forest (Singleton et al. 2005). In contrast, northern spotted owl sites were characterized by closed canopy, mature, ponderosa pine or Douglas-fir forests, on southern or western exposure, mid-elevation areas (Singleton et al. 2005).

The only study comparing northern spotted owl and barred owl food habits in the Pacific Northwest indicated that barred owl diets overlapped strongly (greater than 75 percent) with northern spotted owl diets (Hamer et al. 2001). However, barred owl diets were also more diverse than northern spotted owl diets, including species associated with riparian and other moist habitats, and more terrestrial and diurnal species.

Evidence that barred owls are causing the displacement of northern spotted owls is largely indirect, based primarily on retrospective examination of long-term data collected on northern spotted owls. Correlations between local northern spotted owl declines and barred owl increases have been noted in the northern Washington Cascades (Kuntz and Christopherson 1996; Herter and Hicks 2000; Pearson and Livezey 2003), on the Olympic peninsula (Wiedemeier and Horton 2000; Gremel 2000, 2003), in the southern Oregon Cascade Mountains (e.g., Crater Lake National Park [Johnston 2002]), and in the coastal redwood zone in California (e.g., Redwood National and State Parks [Schmidt 2003]). Northern spotted owl occupancy was significantly lower in northern spotted owl territories where barred owls were detected within 0.5 mi (0.8 km) of the northern spotted owl territory center than in northern spotted owl territories where no barred owls were detected (Kelly et al. 2003). Kelly et al. (2003) also found that in northern spotted owl territories where barred owls were detected, northern spotted owl occupancy was significantly lower ($P < 0.001$) after barred owls were detected within 0.5 mi (0.8 km) of the territory center. Occupancy was "only marginally lower" ($P = 0.06$) if barred owls were located more than 0.5 mi (0.8 km) from northern spotted owl territory centers. In a Roseburg, Oregon study area, 46 percent of northern spotted owls moved more than 0.5 mi (0.8 km), and 39 percent of northern spotted owls were not relocated again in at least two years after barred owls were detected within 0.5 mi (0.8 km) of the territory center. Observations provided by Gremel (2000) from the Olympic National Park are consistent with those of Kelly et al. (2003); he documented significant displacement of northern spotted owls following barred owl detections "coupled with elevational changes of northern spotted owl sites on the east side of the Park" (Courtney et al. 2004). Pearson and Livezey (2003) reported similar findings on the Gifford Pinchot National Forest where unoccupied northern spotted owl sites were characterized by significantly more barred owl sites within 0.5 mi (0.8 km), 1 mi (1.6 km), and 1.8 mi (2.9 km) from the territory center than in occupied northern spotted owl sites. Because barred owl presence is increasing within the range of the northern spotted owls, Olson et al. (2005) suggest that further declines in the proportion of sites occupied by northern spotted owls are likely.

At two study areas in Washington, investigators found relatively high numbers of territories previously occupied by northern spotted owls that are now apparently not occupied by either northern spotted or barred owls (e.g., 49 of 107 territories in the Cascade Mountains [Herter and Hicks 2000]; 23 of 33 territories in the Olympic Experimental State Forest [Wiedemeier and Horton 2000]). Given that habitat was still present in these vacant territories, some factor(s) may be reducing habitat suitability or local abundance of both species. For example, weather conditions could cause prolonged declines in abundance of both species (Franklin et al. 2000). Because northern spotted owls have been anecdotally reported to give fewer vocalizations when barred owls are present, it is possible that these supposed vacant territories are still occupied by northern spotted owls that do not respond to surveys. Likewise, survey protocols for northern spotted owls are believed to under-detect barred owls (Courtney et al. 2004). Olson et al. (2005) showed that barred owl presence had a negative effect on northern spotted owl detection probabilities, and it had either a positive effect on local-extinction probabilities (at the territory scale) or a negative effect on colonization probabilities for three study areas in Oregon. Olson et al. (2005) concluded that future analyses of northern spotted owls must account for imperfect and variable detectability, and barred owl presence, to properly interpret results. Thus, some proportion of seemingly vacant territories may be an artifact of reduced detection probability of the survey protocol. Nonetheless, previously occupied territories apparently vacant of both northern spotted and barred owls suggest that factors other than barred owls alone are contributing to declines in northern spotted owl abundance and territorial occupancy (Courtney et al. 2004).

Two studies (Kelly 2001, Anthony et al. 2004) attempted to determine whether barred owls affected fecundity of northern spotted owls in the long-term demographic study areas. Neither study was able to clearly do so, although the Wenatchee and Olympic demographic study areas showed possible effects (Anthony et al. 2004). However, both studies described the shortfalls of their methods to adequately test for this effect. Iverson (2004) reported no effect of barred owl presence on northern spotted owl reproduction, but his results could have been influenced by small sample size (Livezey 2005). Barred owls had a negative effect on northern spotted owl survival on the Wenatchee and Olympic study areas and possibly an effect on the Cle Elum study area (Anthony et al. 2004). Olson et al. (2005) found a significant (but weak) negative effect of barred owl presence on northern spotted owl reproductive output but not on survival at a Roseburg, Oregon study area (Courtney et al. 2004).

Uncertainties associated with methods, analyses, and possible confounding factors such as effects of past habitat loss and weather warrant caution in interpretation of the patterns emerging from the data and information collected to date on interactions between barred and northern spotted owls (Courtney et al. 2004). Further, data are currently lacking that would allow accurate prediction of how barred owls will affect northern spotted owls in the southern, more xeric provinces in California and Oregon Klamath regions. In spite of these uncertainties, the preponderance of the evidence gathered thus far is consistent with the hypothesis that barred owls are playing some role in northern spotted owl population decline, particularly in Washington, portions of Oregon, and the northern coast of California (Courtney et al. 2004).

Although the barred owl currently constitutes a significantly greater threat to the northern spotted owl than originally thought at the time of listing (Courtney et al. 2004), at present it is unclear whether forest management influences the outcome of interactions between barred and northern spotted owls (Courtney et al. 2004 as summarized by Lint 2005). Some of the most recent summaries compiled on the barred owl (Courtney et al. 2004; Lint 2005; U.S. Fish and Wildlife Service 2004a) do not provide recommendations about how to deal with this potential threat. However, Buchanan et al. (2005) offer research and management options to address inter-specific relationships between barred and northern spotted owls. Due to uncertainties surrounding barred owl interactions, the FWSs status review of the northern spotted owl (U.S. Fish and Wildlife Service 2004a) did not consider the risks sufficient to reclassify the northern spotted owl as endangered.

Wildfire

The short-term (i.e., a few years) affects of wildfires on northern spotted owl demography is an important consideration for resources managers. Bond et al. (2002) examined the demography of northern spotted owls post-wildfire, in which wildfire burned through northern spotted owl nest and roost sites in varying degrees of severity. Depending on the severity of the burn, wildfires may have relatively little short-term impact on northern spotted owl demography (i.e., survival, reproduction, and site fidelity). In a preliminary study conducted by Anthony and Andrews (2004) in the Klamath Province of Oregon, their sample of northern spotted owls appeared to be using a variety of habitat types within the Timbered Rock Fire, including areas which had experienced moderate burning. In 1994, the Hatchery Complex wildfires burned 43,498 acres (17,603 hectares) in the Wenatchee National Forest, eastern Cascades, Washington, affecting six northern spotted owl activity centers (Gaines et al. 1997). Northern spotted owl habitat within a 1.8 mi (2.9 km) radius of the activity centers was reduced by 8 to 45 percent (mean equals 31 percent) due to direct effects of the fire and by 10 to 85 percent (mean equals 55 percent) due to delayed mortality of fire-damaged trees and insect caused tree mortality. Northern spotted owl habitat loss was greater on mid- to upper-slopes (especially south-facing) than within riparian areas or on topographical benches (Gaines et al. 1997). Direct mortality of northern spotted owls was assumed to have occurred at one site. Data were too sparse for reliable comparisons of site occupancy or reproductive output between sites affected by the fires and other sites on the Wenatchee National Forest. Two wildfires burned on the Yakama Indian Reservation, eastern Cascades, Washington, in 1994, affecting home ranges of two radio-tagged northern spotted owls (King et al. 1997). Although the amount of home ranges burned was not quantified, northern spotted owls were observed using areas that received low and medium intensity burning. No direct mortality of northern spotted owls was observed even though thick smoke covered several owl site centers for a week.

At the time of the northern spotted owl listing there was recognition that large-scale wildfire posed a threat to the northern spotted owl and its habitat (55 FR 26114-26194). New information suggests that fire may be more of a threat than previously thought (U.S. Fish and Wildlife Service 2004a). In particular, the rate of habitat loss in the relatively dry East Cascades and Klamath provinces has been greater than expected (see "Habitat Trends" below). However, overall, the total amount of habitat affected by wildfires has been relatively small (Lint 2005). It may be possible to influence, through silvicultural management, how fire prone forests will burn and the extent of the fire when it occurs. Silvicultural management of forest fuels are currently being implemented throughout the northern spotted owl's range, in an attempt to reduce the high levels of fuels that have accumulated during nearly 100 years of effective fire suppression. However, our ability to protect northern spotted owl habitat and viable populations of northern spotted owls from large fires through risk-reduction endeavors is uncertain (Courtney et al. 2004). The Northwest Forest Plan (USDA Forest Service and USDI Bureau of Land Management 1994a) recognized wildfire as an inherent part of managing northern spotted owl habitat in certain portions of the range. The distribution and size of reserve blocks as part of the Northwest Forest Plan design may help mitigate the risks associated with large-scale fire (Lint 2005).

West Nile Virus

West Nile Virus (WNV) has killed millions of wild birds in North America since it arrived in 1999 (McLean et al. 2001; Caffrey 2003; Marra et al. 2004). Mosquitoes are the primary carriers (vectors) of the virus that causes encephalitis in humans, horses, and birds. Mammalian prey may also play a role in spreading WNV among predators, like northern spotted owls. Owls and other predators of mice can contract the disease by eating infected prey (Garmendia et al. 2000; Komar et al. 2001). Recent tests of tree squirrels, including flying squirrels, from Los Angeles County, California, found over 70 percent were positive for WNV (R. Carney, Pers. Comm., 2004, as cited in Courtney et al. 2004). One captive northern spotted owl in Ontario, Canada, is known to have contracted WNV and died.

Health officials expect that WNV will eventually spread throughout the range of the northern spotted owl (Courtney et al. 2004), but it is unknown how WNV will ultimately affect owl populations. Susceptibility to infection and mortality rates of infected individuals vary among bird species, even within groups (Courtney et al. 2004). Owls appear to be quite susceptible. For example, breeding screech owls (*Megascops asio*) in Ohio experienced 100 percent mortality (T. Grubb, Personal Communication, as cited in Courtney et al. 2004). Barred owls, in contrast, showed lower susceptibility (B. Hunter, Personal Communication, as cited in Courtney et al. 2004). Some level of innate resistance may occur (Fitzgerald et al. 2003), which could explain observations in several species of markedly lower mortality in the second year of exposure to WNV (Caffrey and Peterson 2003). Wild birds also develop resistance to WNV through immune responses (Deubel et al. 2001). The effects of WNV on bird populations at a regional scale have not been large, even for susceptible species (Caffrey and Peterson 2003), perhaps due to the short-term (a few years) and patchy distribution of mortality (K. McGowan, pers. comm., cited in Courtney et al. 2004) or annual changes in vector abundance and distribution.

Courtney et al. (2004) offer competing propositions for the likely outcome of northern spotted owl populations being infected by WNV. One proposition is that northern spotted owls can tolerate severe, short-term population reductions due to WNV, because northern spotted owl populations are widely distributed and number in the several hundreds to thousands. An alternative proposition is that WNV will cause unsustainable mortality, due to the frequency and/or magnitude of infection, thereby resulting in long-term population declines and extirpation from parts of the northern spotted owl's current range.

Habitat restoration for northern spotted owls will take decades to be realized. As such, it is too early to evaluate the long-term effectiveness of conservation efforts under the Northwest Forest Plan (U.S. Fish and Wildlife Service 2004a). Thus far, no mortality in wild, northern spotted owls has been recorded from west nile virus (Courtney et al. 2004). However, the potential threats to the northern spotted owl, like WNV, may not respond to or be affected by habitat management or improvement (U.S. Fish and Wildlife Service 2004a) including conservation efforts under the Northwest Forest Plan.

Sudden Oak Death

Sudden oak death was recently identified as a potential threat to the northern spotted owl (Courtney et al. 2004). This disease is caused by the fungus-like pathogen, *Phytopthora ramorum*, that was recently introduced from Europe and is rapidly spreading in northern California. At the present time, sudden oak death is found in natural stands from Monterey to Humboldt Counties, California, and has reached epidemic proportions in oak (*Quercus* spp.) and tanoak (*Lithocarpus densiflorus*) forests along approximately 186 mi (300 km) of the central and northern California coast (Rizzo et al. 2002). It has also been found near Brookings, Oregon, killing tanoak and causing dieback of closely associated wild rhododendron (*Rhododendron* spp.) and evergreen huckleberry (*Vaccinium ovatum*) (Goheen et al. 2002). It has been found in several different forest types and at elevations from sea level to over 2625 ft (800 m). Sudden oak death poses a threat of uncertain proportion because of its potential impact on forest dynamics and alteration of key prey and northern spotted owl habitat components (e.g., hardwood trees - canopy closure and nest tree mortality); especially in the southern portion of the northern spotted owl's range (Courtney et al. 2004). However, uncertainty about the likely scale of habitat effects and the potential for management to address the additive effects of sudden oak death on habitat availability mediated against placing too much weight on this factor in the FWSs Five-Year Review Evaluation of the northern spotted owl (U.S. Fish and Wildlife Service 2004a).

Inbreeding Depression, Genetic Isolation, and Reduced Genetic Diversity

Inbreeding and other genetic problems due to small population sizes were not considered an imminent threat to the northern spotted owl at the time of listing. Recent studies show no indication of reduced genetic variation and past bottlenecks in Washington, Oregon, or California (Barrowclough et al. 1999; Haig et al. 2004; Henke et al. 2005). However, in Canada, the breeding population is estimated to be less than 33 pairs and annual population decline may be as high as 35 percent (Harestad et al. 2004). Canadian populations may be more adversely affected by issues related to small population size including inbreeding depression, genetic isolation, and reduced genetic diversity (Courtney et al. 2004). Low and persistently declining populations throughout the northern portion of the species range (see "Population Trends" below) may be at increased risk of losing genetic diversity.

Climate change

Climate change, a potential additional threat to northern spotted owl populations, is not explicitly addressed in the Northwest Forest Plan. Climate change could have direct and indirect impacts on northern spotted owls and their prey. However, the emphasis on maintenance of seral stage complexity and related biological diversity in Matrix Lands under the Northwest Forest Plan should contribute to the resiliency of the Federal forest landscape related to impacts of climate change (Courtney et al. 2004).

Based upon a global meta-analysis of climate change data, Parmesan and Yohe (2003) discussed several potential implications of global climate change to biological systems, including terrestrial plants and animals. Results indicated that 62 percent of species exhibited trends indicative of advancement of spring conditions. In bird species, climate change trends were manifested in earlier nesting activities. Because the northern spotted owl exhibits a limited tolerance to heat relative to other bird species (Weathers et al. 2001), subtle changes in climate have the potential to affect northern spotted owls. However, the specific impacts to the species are unknown.

Conservation Needs of the Northern Spotted Owl

Based on the above assessment of threats, the northern spotted owl has the following habitat-specific and habitat-independent conservation (i.e., survival and recovery) needs (adapted from Courtney et al. 2004):

Habitat-specific Needs

1. Large blocks of suitable habitat to support clusters or local population centers of northern spotted owls (e.g., 15 to 20 breeding pairs) throughout the owl's range;

2. Suitable habitat conditions and spacing between local northern spotted owl populations throughout its range to facilitate survival and movement;

3. Suitable habitat distributed across a variety of ecological conditions within the northern spotted owl's range to reduce risk of local or widespread extirpation;

4. A coordinated, adaptive management effort to reduce the loss of habitat due to catastrophic wildfire throughout the northern spotted owl's range, and a monitoring program to clarify whether these risk reduction methods are effective and to determine how owls use habitat treated to reduce fuels; and

5. In areas of significant population decline, sustain the full range of survival and recovery options for this species in light of significant uncertainty.

Habitat-independent Needs

1. A coordinated, research and adaptive management effort to better understand and manage competitive interactions between northern spotted and barred owls; and

2. Monitoring to better understand the risk that West Nile Virus and sudden oak death pose to northern spotted owls and, for West Nile Virus, research into methods that may reduce the likelihood or severity of outbreaks in northern spotted owl populations.

Conservation Strategy

Since 1990, various efforts have addressed the conservation needs of the northern spotted owl and attempted to formulate conservation strategies based upon these needs. The various efforts began with the Interagency Scientific Committee's Conservation Strategy (Thomas et al. 1990). The efforts continued with the designation of critical habitat (57 FR 1796-1838, the Draft Recovery Plan (U.S. Fish and Wildlife Service 1992)); the Scientific Analysis Team report (Thomas et al. 1993); and the report of the Forest Ecosystem Management Assessment Team (Thomas and Raphael 1993). The efforts culminated with the Northwest Forest Plan (USDA Forest Service and USDI Bureau of Land Management 1994a). Each conservation strategy was based upon the reserve design principles first articulated in the Interagency Scientific Committee's report, which are summarized as follows:

- Species that are well distributed across their range are less prone to extinction than species confined to small portions of their range.

- Large blocks of habitat, containing multiple pairs of the species, are superior to small blocks of habitat with only one to a few pairs.

- Blocks of habitat that are close together are better than blocks far apart. Habitat that occurs in contiguous blocks is better than habitat that is more fragmented.

- Habitat between blocks is more effective as dispersal habitat if it resembles suitable habitat.

Conservation and Recovery Efforts on Federal Lands

The Northwest Forest Plan is the current conservation strategy for the northern spotted owl on Federal lands. It is designed around the conservation needs of the northern spotted owl and based upon the designation of a variety of land-use allocations whose objectives are either to provide for population clusters (i.e., demographic support) or to maintain connectivity between population clusters. Several land-use allocations are intended to contribute primarily to supporting population clusters: Late-Successional Reserves, Managed Late-Successional Areas, Congressionally Reserved Areas, Managed Pair Areas, and Reserve Pair Areas. The remaining land-use allocations (Matrix, Adaptive Management Areas, Riparian Reserves, Connectivity Blocks, and Administratively Withdrawn Areas) provide connectivity between habitat blocks intended for demographic support.

The range-wide system of Late-Successional Reserves set up under the Northwest Forest Plan captures the variety of ecological conditions within the 12 different provinces to which northern spotted owls are adapted. This design reduces the potential for extinction due to large catastrophic events in a single province. Multiple, large Late-Successional Reserves in each province reduce the potential that northern spotted owls will be extirpated in any individual province and reduce the potential that large wildfires or other events will eliminate all habitat within a Late-Successional Reserve. In addition, Late-Successional Reserves are generally arranged and spaced so that northern spotted owls may disperse to two or more adjacent Late-

Successional Reserves. This network of reserves reduces the likelihood that catastrophic events will impact habitat connectivity and population dynamics within and between provinces.

FEMAT scientists predicted that northern spotted owl populations would decline in the Matrix over time, while populations were expected to stabilize and eventually increase within Late-Successional Reserves, as habitat conditions improve over the next 50 to 100 years (Thomas and Raphael 1993; USDA Forest Service and USDI Bureau of Land Management 1994a, 1994b). Based on the results of the first decade of monitoring, the Northwest Forest Plan's authors cannot determine if the declining population trend will be reversed because not enough time has passed to provide the necessary measure of certainty (Lint 2005). However, the results from the first decade of monitoring do not provide any reason to depart from the objective of habitat maintenance and restoration as described under the Northwest Forest Plan (Lint 2005). Other stressors that operate in intact suitable habitat, such as barred owls (already in action) and West Nile virus (yet to occur) may complicate the conservation of the northern spotted owl. Recent reports about the status of the northern spotted owl offer few management recommendations to deal with the emerging threats. The arrangement and distribution and resilience of the Northwest Forest Plan land use allocation system may prove to be the most appropriate strategy in responding to these unexpected challenges (Courtney et al. 2004).

Under the Northwest Forest Plan, the agencies involved (FWS, U.S. Forest Service, Bureau of Land Management, and the National Park Service) anticipated a decline of northern spotted owl populations during the first decade of implementation. Recent reports (Courtney et al. 2004; Anthony et al. 2004) identified greater than expected northern spotted owl declines in Washington and northern portions of Oregon, and more stationary populations in southern Oregon and northern California. The reports did not find a direct correlation between habitat conditions and changes in vital rates of northern spotted owls at the meta-population scale. However, at the territory scale, there is evidence of negative effects to northern spotted owl fitness due to reduced habitat quantity and quality. Also, there is no evidence to suggest that dispersal habitat is currently limiting (Courtney et al. 2004; Lint 2005). Even with the population decline, Courtney et al (2004) noted that there is little reason to doubt the effectiveness of the core principles underpinning the Northwest Forest Plan conservation strategy.

The current scientific information, including information showing northern spotted owl population declines, indicates that the northern spotted owl continues to meet the definition of a threatened species (U.S. Fish and Wildlife Service 2004a). That is, populations are still relatively numerous over most of the northern spotted owl's historic range, which suggests that the threat of extinction is not imminent.

Conservation Efforts on Non-Federal Lands

FEMAT noted that limited Federal ownership in some areas constrained the ability to form an extensive reserve network to meet conservation needs of the northern spotted owl. Thus, non-Federal lands were determined to be an important contribution to the range-wide goal of achieving conservation and recovery of the northern spotted owl. The FWSs main expectations for private lands are for their contributions to demographic support (pair or cluster protection) and/or connectivity with lands. In addition, timber harvest within each state is governed by rules that may provide protection of northern spotted owls and/or their habitat to varying degrees.

There are 16 current or completed Habitat Conservation Plans (HCPs) with incidental take permits issued for northern spotted owls, eight in Washington, four in Oregon, and four in California. They range in size from 40 acres to over 1.6 million acres, though not all acres are included in the mitigation for northern spotted owls. In total, the HCPs cover approximately 2.9 million of the 32 million acres of non-Federal forestlands in the range of the northern spotted owl. Most HCPs are fairly long in duration, though they range from only five years up to 100 years. While each HCP is unique, there are several general approaches to mitigation of incidental take of northern spotted owls, including: 1) reserves of various sizes, some associated with adjacent Federal reserves; 2) forest harvest that maintains or develops suitable habitat; 3) forest management that maintains or develops dispersal habitat; and 4) deferral of harvest near specific sites. Individual HCPs may employ one or more of these mitigation measures. Similarly the conservation objectives of individual HCPs vary from specified numbers of breeding northern spotted owls, with specified levels of reproductive success, to management objectives for nesting/roosting/foraging habitat or dispersal habitat (Courtney et al. 2004).

Washington

In 1996, the Washington Forest Practices Board adopted rules (Washington Forest Practices Board 1996) that would "contribute to conserving the northern spotted owl and its habitat on non-Federal lands" based on recommendations from a Science Advisory Group which identified important non-Federal lands and recommended roles for those lands in northern spotted owl conservation (Hanson et al. 1993; Buchanan et al. 1994). The 1996 rules designated 10 northern spotted owl special emphasis areas (SOSEAs) in Washington that comprise over 1.5 million acres of State and private lands where owl protections on non-Federal lands would be emphasized. At all sites within SOSEAs, any proposed harvest of suitable spotted owl habitat within a territorial owl circle is considered a "Class-IV special" and would trigger State Environmental Policy Act (SEPA) review. Within SOSEAs, all suitable habitat within 0.7 mile of northern spotted owl activity centers, and 40 percent of suitable habitat within the provincial median home range circle surrounding an occupied activity center is generally protected from timber harvest. Proposed harvest that would reduce habitat amounts below these levels are considered to have a significant probable adverse affect on the environment with respect to SEPA. If a determination of significance is made, preparation of a SEPA Environmental Impact Statement is required prior to proceeding. If a determination of non-significance or mitigated determination of non-significance is reached, the action can proceed without further environmental assessment. Until recently, these habitat protections could be lifted if a northern spotted owl activity center was determined to be unoccupied (Buchanan and Swedeen 2005). In 2005, the Forest Practices Board adopted emergency rules to further protect suitable habitat in northern spotted owl circles within SOSEAs (Washington Forest Practices Board 2005). Under the 1996 Washington Forest Practices Rules, suitable northern spotted owl habitat located on non-Federal lands outside of owl management circles or located outside of a SOSEA boundary was not protected from timber harvest, unless the habitat was protected by an approved HCP. Northern spotted owl-related HCPs in Washington cover over 1.92 million acres and generally provide both demographic and connectivity support as recommended in the draft northern spotted owl recovery plan (U.S. Fish and Wildlife Service 1992).

Oregon
The Oregon Forest Practices Act provides for protection of 70-acre core areas around known northern spotted owl nest sites, but does not provide for protection of northern spotted owl habitat beyond these areas (Oregon Dept. of Forestry 2006). In general, no large-scale northern spotted owl habitat protection strategy or mechanism currently exists for non-Federal lands in Oregon. The four northern spotted owl-related HCPs currently in effect in Oregon cover over 300,000 acres of non-Federal lands. These HCPs have provided, and will continue to provide, some nesting habitat and connectivity over the next few decades.

California
In 1990, the California Forest Practice Rules, which govern timber harvest on private lands, were amended to require surveys for northern spotted owls in suitable habitat and to provide protection around activity centers (California Dept. of Forestry 2005). Under the California Forest Practices Rules, no timber harvest plan can be approved if it is likely to result in incidental take of federally listed species, unless authorized by a Federal HCP. The California Department of Fish and Game initially reviewed all timber harvest plans to ensure that take was not likely to occur; the FWS took over that review function in 2000. Several large industrial owners operate under Spotted Owl Management Plans that have been reviewed by the FWS; the plans specify basic measures for northern spotted owl protection. Four HCPs authorizing take of northern spotted owls have been approved covering over 669,000 acres of non-Federal lands. Implementation of these HCPs has provided, and will continue to provide, for northern spotted owl demographic and connectivity support to Northwest Forest Plan lands.

Current Condition of the Northern Spotted Owl

The current condition of a species incorporates the effects of all past human and natural activities or events that have led to the present-day status of the species and its habitat (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998).

<u>Range-wide Habitat Trends</u>

Habitat Trends
The FWS has used information provided by the U.S. Forest Service, Bureau of Land Management, and National Park Service to update the habitat baseline conditions on Federal lands for northern spotted owls on several occasions since the northern spotted owl was listed in 1990. The estimate of 7.4 million acres used for the Northwest Forest Plan in 1994 (USDA Forest Service and USDI Bureau of Land Management 1994a) was determined to be representative of the general amount of northern spotted owl habitat on these lands. This baseline was used to track relative changes over time in subsequent analyses. In 2005, a new map depicting suitable northern spotted owl habitat throughout their range was produced as a result of the Northwest Forest Plan's effectiveness monitoring program (Lint 2005). However, the spatial resolution of this new habitat map currently makes it unsuitable for tracking habitat effects at the scale of individual projects. The FWS is evaluating the map for future use in tracking habitat trends. Additionally, there are no reliable estimates of northern spotted owl habitat on other land ownerships; consequently, acres that have undergone ESA section 7 consultation can be tracked, but not evaluated in the context of change with respect to a reference

condition on non-Federal lands. The production of the Northwest Forest Plan monitoring program habitat map does, however, provide an opportunity for future evaluations of trends in non-Federal habitat. The following analyses indicate changes to the baseline condition established in 1994.

Range-wide Analysis 1994 – 2001
In 2001, the FWS conducted an assessment of habitat baseline conditions, the first since implementation of the Northwest Forest Plan (U.S. Fish and Wildlife Service 2001). This range-wide evaluation of habitat, compared to the Final Supplemental Environmental Impact Statement, was necessary to determine if the rate of potential change to northern spotted owl habitat was consistent with the change anticipated in the Northwest Forest Plan. In particular, the FWS considered habitat effects that were documented through the ESA section 7 consultation process since 1994. In general, the analytical framework of these consultations focused on the reserve and connectivity goals established by the Northwest Forest Plan land-use allocations (USDA Forest Service and USDI Bureau of Land Management 1994a), with effects expressed in terms of changes in suitable northern spotted owl habitat within those land-use allocations. The FWS determined that actions and effects were consistent with the expectations for implementation of the Northwest Forest Plan from 1994 to June, 2001 (U.S. Fish and Wildlife Service 2001).

During the 2001 assessment, the FWS developed an intranet database for compiling and tracking habitat losses anticipated through ESA section 7 consultations and other habitat effects (e.g., wildfire effects, though this data is incomplete). Information in the database is updated with each new consultation across the range of the species. The total acres of habitat loss changes over time as additional consultations are completed. As projects are implemented, Federal agencies report the actual acres implemented, and in some cases, the implemented acres are substantially less than the acres that were analyzed in the consultation. The FWS uses these reports to update the database and add or subtract habitat acres. For each ESA section 7 consultation, the FWS uses the current information in the consultation database to track the effects across the range of the northern spotted owl and update the information on the status of the northern spotted owl. As a result, the acres from ESA section consultation reported in this Opinion may vary from previous consultations due to updated information in the consultation database. Copies of the summary tables from the database used for this Opinion are filed in the administrative record for this Opinion.

Range-wide Analysis 1994 – 2004 (first decade of the Northwest Forest Plan)
This section updates the information considered in U.S. Fish and Wildlife Service (2001), relying particularly on information in documents the FWS produced pursuant to ESA section 7 and information provided by Northwest Forest Plan agencies on habitat loss resulting from natural events (e.g., fires, windthrow, insects, and disease).

In 1994, about 7.4 million acres of suitable northern spotted owl habitat were estimated to exist on Federal lands (USDA Forest Service and USDI Bureau of Land Management 1994a). As of April, 2004, the FWS had consulted (under ESA section 7) on the proposed removal of 571,192 acres of northern spotted owl habitat range-wide, including 165,677 acres on Federal lands managed under the Northwest Forest Plan (Table 1). Federal lands were expected to experience an approximate 2.6 percent decline in suitable northern spotted owl habitat due to all management activities (not just timber harvest) over the past decade, with approximately 2.3 percent being removed by timber harvest. The consulted-on effects for the Northwest Forest Plan area indicated a decadal loss of approximately 2.2 percent. These anticipated changes in suitable northern spotted owl habitat were consistent with the expectations for implementation of the Northwest Forest Plan.

There was little available information regarding northern spotted owl habitat trends on non-Federal lands. Yet, we do know that internal FWS consultations conducted since 1994 have documented the eventual loss of 413,480 acres of habitat on non-Federal lands (Table 2). Most of these losses have yet to be realized because they are part of large-scale, long-term HCPs.

In 2005, the WDFW released the report, *An Assessment of Spotted Owl Habitat on Non-Federal Lands in Washington between 1996 and 2004* (Pierce et al. 2005). This study estimates the amount of northern spotted owl habitat in 2004 on lands affected by State and private forest practices. The study area is a subset of the total Washington forest practice lands, and statistically-based estimates of existing habitat and habitat loss due to fire and timber harvest are reported. In the 3.2-million acre study area, Pierce et al. (2005) estimated there were 816,000 acres of suitable northern spotted owl habitat in 2004, or about 25 percent of their study area. Most of the suitable northern spotted owl habitat in the Pierce et al. (2005) study area in 2004 (56 percent) occurred on Federal lands, and lesser amounts were present on State-local lands (21 percent), private lands (22 percent) and tribal lands (1 percent). A total of 172,000 acres of timber harvest occurred in the 3.2 million-acre study area, including harvest of 56,400 acres of suitable northern spotted owl habitat. This represented a loss of about 6 percent of the northern spotted owl habitat in the study area distributed across all ownerships (Pierce et al. 2005). Approximately 77 percent of the harvested habitat occurred on private lands and about 15 percent occurred on State lands. Pierce et al. (2005) also evaluated suitable northern spotted owl habitat levels in 450 owl management circles (based on the provincial annual median owl home range). Across their study area, they found that northern spotted owl circles averaged about 26 percent suitable habitat in the circle across all landscapes. Values in the study ranged from an average of 7 percent in southwest Washington to an average of 31 percent in the eastern Cascade Mountains, indicating that many northern spotted owl territories in Washington are significantly below the 40 percent suitable habitat threshold used by the State and FWS as a viability indicator for northern spotted owl territories (Pierce et al. 2005).

Table 1. Changes to NRF[1] habitat acres from activities subject to ESA section 7 consultations and other causes range-wide from May 1994 to April 2004 (the first decade of the Northwest Forest Plan).

Northwest Forest Plan Group/Ownership		ESA Section 7 Consultation Habitat Changes[2]		Other Habitat Changes[3]	
		Removed/ Downgraded	Degraded	Removed/ Downgraded	Degraded
Federal - Northwest Forest Plan	Bureau of Land Management	60,944	8,622	760	0
	Forest Service	88,650	414,883	28,492	5,109
	National Park Service	908	2,861	0	0
	Multi-agency[4]	15,175	23,314	0	0
	NWFP Subtotal	165,677	449,680	29,252	5,109
Other Management and Conservation Plans (OMCP)	Bureau of Indian Affairs and Tribes	99,062	27,890	0	0
	Habitat Conservation Plans	295,889	14,430	0	0
	OMCP Subtotal	394,951	42,320	2,309	0
Other Federal Agencies & Lands[5]		241	1	28	70
Other Public & Private Lands[6]		10,323	878	30,240	20,949
TOTAL Changes		571,192	492,879	61,829	26,128

Source: Table A from the FWS Northern Spotted Owl Consultation Effects Tracker (web application and database) Aug. 29, 2006.

[1] Nesting, roosting, foraging habitat. In California, suitable habitat is divided into two components; nesting – roosting (NR) habitat, and foraging (F) habitat. The NR component most closely resembles NRF habitat in Oregon and Washington. Due to differences in reporting methods, effects to suitable habitat compiled in this, and all subsequent tables include effects for nesting, roosting, and foraging (NRF) for 1994-June 26, 2001. After June 26, 2001, suitable habitat includes NRF for Washington and Oregon but only nesting and roosting (NR) for California.

[2] Includes both effects reported by U.S. Fish and Wildlife Service (2001) and subsequent effects compiled in the Northern Spotted Owl Consultation Effects Tracker (web application and database).

[3] Includes effects to NRF habitat (as documented through technical assistance) resulting from wildfires (not from suppression efforts), insect and disease outbreaks, and other natural causes, private timber harvest, and land exchanges not associated with consultation. Information from all fires occurring since 1994 is not yet available for entry into the database and thus is not included here but is compiled in Table 3.

[4] The 'Multi-agency' grouping is used to lump a variety of Northwest Forest Plan mixed agency or admin unit consultations that were reported together prior to June 26, 2001, and cannot be separated out.

[5] Includes lands that are owned or managed by other Federal agencies not included in the Northwest Forest Plan.

[6] Includes lands not covered by Habitat Conservation Plans that are owned or managed by states, counties, municipalities, and private entities. Effects that occurred on private lands from right-of-way permits across U.S. Forest Service and Bureau of Land Management lands are included.

Table 2. Changes to NRF[1] habitat acres from activities subject to ESA section 7 consultations and other causes range-wide from May 1994 to present (August 29, 2006).

Northwest Forest Plan Group/Ownership		ESA Section 7 Consultation Habitat Changes[2]		Other Habitat Changes[3]	
		Removed/ Downgraded	Degraded	Removed/ Downgraded	Degraded
Federal - Northwest Forest Plan	Bureau of Land Management	61,255	8,973	760	0
	Forest Service	90,376	451,368	29,832	5,481
	National Park Service	2,842	3,302	3	0
	Multi-agency[4]	15,175	23,314	0	0
	NWFP Subtotal	169,648	486,957	30,595	5,481
Other Management and Conservation Plans (OMCP)	Bureau of Indian Affairs and Tribes	107,015	28,041	2,309	0
	Habitat Conservation Plans	295,889	14,430	0	0
	OMCP Subtotal	402,904	42,471	2,309	0
Other Federal Agencies & Lands[5]		241	466	28	70
Other Public & Private Lands[6]		10,576	880	30,240	20,949
TOTAL Changes		583,369	530,774	63,172	26,500

Source: Table A from the FWS Northern Spotted Owl Consultation Effects Tracker (web application and database) Aug. 29, 2006.

[1] Nesting, roosting, foraging habitat. In California, suitable habitat is divided into two components; nesting – roosting (NR) habitat, and foraging (F) habitat. The NR component most closely resembles NRF habitat in Oregon and Washington. Due to differences in reporting methods, effects to suitable habitat compiled in this, and all subsequent tables include effects for nesting, roosting, and foraging (NRF) for 1994-June 6, 2001. After June 26, 2001, suitable habitat includes NRF for Washington and Oregon but only nesting and roosting (NR) for California.

[2] Includes both effects reported by U.S. Fish and Wildlife Service (2001) and subsequent effects compiled in the Northern Spotted Owl Consultation Effects Tracker (web application and database).

[3] Includes effects to NRF habitat (as documented through technical assistance) resulting from wildfires (not from suppression efforts), insect and disease outbreaks, and other natural causes, private timber harvest, and land exchanges not associated with consultation. Information from all fires occurring since 1994 is not yet available for entry into the database and thus is not included here but is compiled in Table 3.

[4] The 'Multi-agency' grouping is used to lump a variety of Northwest Forest Plan mixed agency or admin unit consultations that were reported together prior to June 26, 2001, and cannot be separated out.

[5] Includes lands that are owned or managed by other Federal agencies not included in the Northwest Forest Plan.

[6] Includes lands not covered by Habitat Conservation Plans that are owned or managed by states, counties, municipalities, and private entities. Effects that occurred on private lands from right-of-way permits across U.S. Forest Service and Bureau of Land Management lands are included.

The FWS estimated an increase of approximately 600,000 acres of late-successional forest across the range of the northern spotted owl since 1994 (U.S. Fish and Wildlife Service 2004b). This estimate was based on a projection of forest age and size class over time. Because stand age and size class do not necessarily account for the complex forest structure often associated with northern spotted owl habitat, Courtney et al. (2004) believed the FWSs in-growth estimate likely overestimates actual habitat development. Also, without more detailed spatial information, the availability of these additional acres of late-successional forest to northern spotted owls and their significance to northern spotted owl conservation remains unknown.

Range-wide Analysis from 1994 to the Present
As stated previously, in 1994 about 7.4 million acres of suitable habitat were estimated to exist on Federal lands. As of August 2006, the FWS has consulted on the removal of 583,369 acres of northern spotted owl habitat range-wide, of which 169,648 acres occurred on Federal lands managed under the Northwest Forest Plan (Table 2). From April, 2004, to the present, the FWS has consulted on the removal or degradation of 3,971 acres of northern spotted owl habitat range-wide on Federal lands managed under the Northwest Forest Plan (Tables 1 and 2).

Habitat loss from Federal lands has varied by province with most losses concentrated in the Oregon physiographic provinces. Habitat removed from the Oregon Klamath Mountains province and the two Oregon Cascades provinces made up 75 percent of the habitat loss on Northwest Forest Plan lands range-wide since 1994 (Tables 3).

In summary, habitat loss in Washington accounted for 12.08 percent of the range-wide loss, but it only resulted in a loss of 1.06 percent of available habitat on Federal lands in Washington (Table 3). In Oregon, habitat loss accounted for 77.85 percent of the range-wide losses, but only 7.09 percent of available habitat on Federal lands in Oregon (Table 3). Loss of habitat on Federal lands in California accounted for 10.07 percent of the losses range-wide, but only 2.61 percent of habitat on Federal lands in California (Table 3).

The FWS has limited information on the impacts of recent wildfires. From 1994 to present, the FWS estimated that approximately 168,301 acres was lost due to natural events (Table 3). About two-thirds of this loss was attributed to the Biscuit Fire that burned over 500,000 acres in southwest Oregon (Rogue River basin) and northern California in 2002. This fire resulted in a loss of approximately 113,000 acres of northern spotted owl habitat, including habitat within five Late-Successional Reserves.

Northern Spotted Owl Numbers, Distribution, and Reproduction Trends

There are no estimates of the historical population size and distribution of northern spotted owls, although they are believed to have inhabited most old-growth forests throughout the Pacific Northwest prior to modern settlement (mid-1800s), including northwestern California (U.S. Fish and Wildlife Service 1989). According to the final rule listing the northern spotted owl as threatened (55 FR 26114-26194), approximately 90 percent of the roughly 2,000 known northern spotted owl breeding pairs were located on federally managed lands, 1.4 percent on State lands, and 6.2 percent on private lands; the percent

Table 3. Aggregate results of all adjusted, suitable habitat (NRF[1]) acres affected by ESA section 7 consultation for the northern spotted owl; baseline and summary of effects by state, physiographic province, and land use function from 1994 to present for lands managed under the Northwest Forest Plan (August 29, 2006).

	Physiographic Province[4]	Evaluation Baseline[2]			Habitat Removed/Downgraded[3]				% Provincial Baseline Affected	% Range-wide Affected
		Reserves[5]	Non-Reserves[6]	Total	Reserves[5]	Non-Reserves[6]	Habitat Loss to Natural Events[7]	Total		
WA	Olympic Peninsula	548,483	11,734	560,217	867	24	299	1,190	-0.16	0.56
	Eastern Cascades	506,340	200,509	706,849	1,795	4,242	5,754	11,791	-0.85	3.82
	Western Cascades	864,683	247,797	1,112,480	1,181	11,001	0	12,182	-1.10	7.70
	Western Lowlands	0	0	0	0	0	0	0	0	0
OR	Coast Range	422,387	94,190	516,577	399	4,074	66	4,539	-0.87	2.83
	Klamath Mountains	448,509	337,789	786,298	1,318	53,956	117,622	172,896	-7.03	34.95
	Cascades East	247,624	196,035	443,659	1,243	9,352	4,008	14,603	-2.39	6.70
	Cascades West	1,012,426	1,033,337	2,045,763	2,990	49,783	24,583	77,356	-2.58	33.37
	Willamette Valley	593	5,065	5,658	0	0	0	0	0	0
CA	Coast	47,566	3,928	51,494	381	69	100	550	-0.87	0.28
	Cascades	61,852	26,385	88,237	0	4,808	0	4,808	-5.45	3.04
	Klamath	734,103	345,763	1,079,866	1,470	9,198	15,869	26,537	-0.99	6.75
Total		4,894,566	2,502,532	7,397,098	11,644	146,507	168,301	326,452	-2.14	100.00

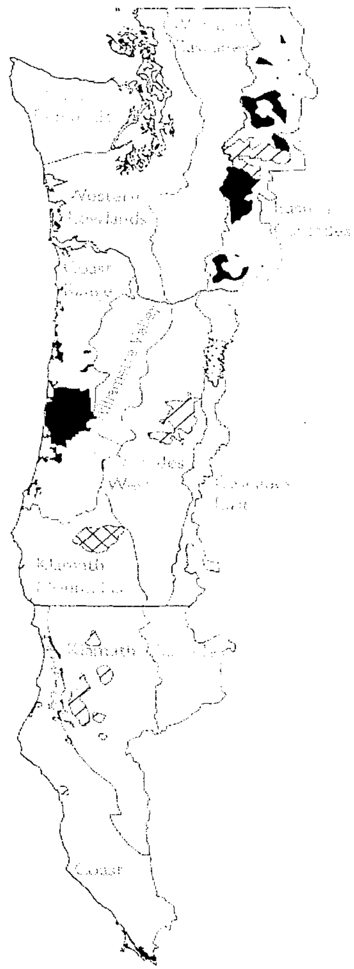
Source: Table B from the FWS Northern Spotted Owl Consultation Effects Tracker (web application and database) Aug. 29, 2006.
[1] Nesting, roosting, foraging habitat. In California, suitable habitat is divided into two components; nesting – roosting (NR) habitat, and foraging (F) habitat. The NR component most closely resembles NRF habitat in Oregon and Washington. Due to differences in reporting methods, effects to suitable habitat compiled in this, and all subsequent tables include effects for nesting, roosting, and foraging (NRF) for 1994-June 26, 2001. After June 26, 2001, suitable habitat includes NRF for Washington and Oregon but only nesting and roosting (NR) for California. [2] 1994 FSEIS baseline (USDA Forest Service and USDI Bureau of Land Management 1994b). [3] Includes both effects reported by USFWS (2001) and subsequent effects compiled in the Northern Spotted Owl Consultation Effects Tracking System (web application and database). [4] Defined by the Northwest Forest Plan as the twelve physiographic provinces, as presented in Figure 3 and 4-1 on page 3 and 4-16 of the Final Supplemental Environmental Impact Statement. [5] Land-use allocations intended to provide large blocks of habitat to support clusters of breeding pairs. [6] Land-use allocations intended to provide habitat to support movement of northern spotted owls among reserves. [7] Acres estimated from various database fields and other GIS databases.

of northern spotted owls on private lands in northern California was slightly higher (Forsman et al. 1984; U.S. Fish and Wildlife Service 1989; Thomas et al. 1990).

Using data from 1986-1992, Gutiérrez (1994) tallied 3,753 known pairs and 980 singles throughout the range of the northern spotted owl. At the time the Northwest Forest Plan was initiated (July 1, 1994), there were 5,431 known locations of, or site centers of northern spotted owl pairs or resident singles: 851 sites (16 percent) in Washington, 2,893 (53 percent) in Oregon, and 1,687 (31 percent) in California (60 FR 9484-9495). The actual population of northern spotted owls across the range was believed to be larger than either of these counts because some areas were, and remain, unsurveyed (57 FR 1796-1838; Thomas et al. 1993).

Because existing survey coverage and effort are insufficient to produce reliable population-size estimates, researchers use other indices, such as demographic data, to evaluate trends in northern spotted owl populations. Analysis of demographic data can provide an estimate of the rate and direction of population growth [i.e., lambda (λ)]. A λ of 1.0 indicates a stationary population (i.e., neither increasing nor decreasing), a λ less than 1.0 indicates a declining population, and a λ greater than 1.0 indicates a growing population. Demographic data are analyzed during workshops that occur at 5-year intervals.

In January 2004, at a meta-analysis workshop northern spotted owl demographic studies, two meta-analyses were conducted on the rate of population change using the re-parameterized Jolly-Seber method (λRJS); 1 meta-analysis for all 13 study areas and 1 meta-analysis for the 8 study areas that are part of the Effectiveness Monitoring Program of the Northwest Forest Plan (Anthony et al. 2004). Data were analyzed separately for individual study areas, as well as simultaneously across all study areas (true meta-analysis). Estimates of λRJS ranged from 0.896-1.005 for the 13 study areas, and all but 1 (Tyee) of the estimates were <1.0 suggesting population declines for most areas (Anthony et al. 2004) (Figure 1). There was strong evidence that populations on the Wenatchee, Cle Elum, Warm Springs, and Simpson study areas declined during the study, and there also was evidence that populations on the Rainier, Olympic, Oregon Coast Range, and HJ Andrews study areas were decreasing (see Figure 1). Precision of the λRJS estimates for the Rainier and Olympic study areas were poor and not sufficient to detect a difference from 1.00. However, the estimate of λRJS for Rainier study area (0.896) was the lowest of all of the areas. Populations on the Tyee, Klamath, South Oregon Cascades, Northwest California, and the Hoopa study areas appeared to be stationary during the study, but there was some evidence that the South Oregon Cascades, Northwest California, and Hoopa study areas were declining (λRJS <1.00). The weighted mean λRJS for all of the study areas was 0.963 (SE = 0.009, 95 percent confidence Interval = 0.945-0.981), suggesting that populations over all of the study areas were declining by about 3.7 percent per year from 1985-2003. The mean λRJS for the 8 demographic monitoring areas on Federal lands was 0.976 (SE = 0.007, 95 percent confidence interval = 0.962-0.990) and 0.942 (SE = 0.016, 95 percent confidence interval = 0.910-0.974) for non-Federal lands, an average of 2.4 versus 5.8 percent decline, respectively, per year. This suggests that northern spotted owl populations on Federal lands had better demographic rates than elsewhere, but interspersion of land ownership on the study areas confounds this analysis.



Demographic Study Area	Land Ownership	# Owls Banded	Fecundity	Apparent Survival	λ_{RJS}	Population Trend Based on $\Delta\lambda$
Washington						
Wenatchee (WEN)	Private	1,200	Stable	Declining	0.917	Declining
Rainer (RAI)	USFS	217	Stable	Declining	0.896	Declining
Olympic (OLY)	NPS & USFS	985	Stable	Declining	0.956	Declining
Cle Elum (CLE)	USFS	724	Declining[1]	Declining?[2]	0.938	Declining
Oregon						
Oregon Coast Range (COA)	USFS & BLM	1,025	Declining?[1]	Stable	0.968	Declining
Tyee (TYE)	BLM & Private	1,032	Increasing	Stable	1.005	Stationary
South Oregon Cascades (CAS)	USFS & BLM	881	Declining	Stable	0.974	Stationary
H.J. Andrews (HJA)	USFS	1,095	Stable?[3]	Stable	0.978	Declining
Klamath (KLA)	BLM & Private	1,147	Stable	Stable	0.997	Stationary
Warm Springs (WSR)	Tribal	381	Stable	Stable	0.908	Declining
California						
Marin (MAR)	NPS	96	Stable	Stable	NA	NA
Simpson (SIM)	Private	1,344	Declining[1]	Stable	0.970	Declining
Hoopa (HUP)	Tribal	279	Increasing	Stable	0.980	Stationary
NW California (NWC)	USFS	1,026	Declining	Declining	0.985	Declining?[4]

[1] Best model included age and even-odd year effects, but a competing model had a negative time effect on productivity.
[2] Variable among years, but with a declining trend.
[3] Decreasing in early years, increase in last 5 years, stable overall.
[4] Gradual declines in fecundity and apparent survival, plus estimates of realized population change suggest a decline in last 8 years.

Figure 1. Physiographic provinces, northern spotted owl demographic study areas, and demographic trends (Anthony et al. 2004).

The number of populations that have declined and the rate at which they have declined are noteworthy, particularly the precipitous declines on the four Washington study areas (Wenatchee, Cle Elum, Rainier, Olympic) (estimated at 30 to 50 percent population decline over 10 years) and the Warm Springs study area in Oregon (Anthony et al. 2004). Declines in adult survival rates may be an important factor contributing to declining population trends. Survival rates declined over time on five of the 14 study areas: four study areas in Washington, which showed the sharpest declines, and one study area in the Klamath province of northwest California (Anthony et al. 2004). In Oregon, there were no time trends in apparent survival for four of six study areas, and remaining areas had weak non-linear trends. In California, two study areas showed no trend, one showed a slight decline, and one showed a significant linear decline (Anthony et al. 2004). Like the trends in annual rate of population change, trends in adult survival rate showed clear declines in some areas, but not in others. Anthony et al. (2004) provide the only range-wide estimate of northern spotted owl demographic rates.

Loehle et al. (2005) sampled a small portion of the range of the northern spotted owl and questioned the accuracy of lambda estimates computed in Anthony et al. (2004), suggesting that the estimates were biased low by 3 to 4 percentage points. Loehle et al. (2005) contends the lambda estimates in Anthony et al. (2004) do not accurately account for northern spotted owl emigration. Therefore, more of the northern spotted owl demography study areas would have a lambda closer to 1.0, a stationary population. The Loehle et al. (2005) statement could be accurate if Anthony et al. (2004) used Leslie matrix models to compute survival and lambda. Instead, Anthony et al. (2004) used the Pradel reparameterized Jolly-Seber method to compute survival and lambda to avoid the biases associated with the Leslie matrix method.

British Columbia has a small population of northern spotted owls. This population is relatively isolated, apparently declining sharply, and absent from large areas of apparently-suitable habitat (Courtney et al. 2004). Breeding populations have been estimated at fewer than 33 pairs and may be declining as much as 35 percent per year (Harestad et al. 2004). The amount of interaction between northern spotted owls in Canada and the U.S. is unknown (Courtney et al. 2004). The Canadian population has reached the point where it is now vulnerable to stochastic demographic events that could cause further declines and perhaps extirpation (Courtney et al. 2004, pgs. 3-26 to 3-27).

STATUS OF THE SPECIES: Bald Eagle – Pacific Population

A detailed account of the taxonomy, ecology, and reproductive characteristics of the bald eagle is presented in the Pacific Bald Eagle Recovery Plan (USDI 1986), the final rule to reclassify the bald eagle from endangered to threatened in all of the lower 48 states (USDI 1994), and the proposed rule to delist the bald eagle (USDI 1999). The most current information regarding bald eagles in Washington State and a detailed description of their biology and conservation can be found in the Washington State Status Report for the Bald Eagle (Stinson et al. 2001). A summary is provided below.

The bald eagle was federally listed in 1978 as an endangered species in all states except Michigan, Minnesota, Wisconsin, Washington, and Oregon, where it was designated as threatened (USDI 1978). The listing was a result of a decline in the bald eagle population throughout the lower 48 States. The decline was largely attributed to the widespread use of dichloro-diphenyl trichloro-ethane (DDT) and other organochlorine compounds, in addition to habitat loss, disturbance, shooting, electrocution from power lines, poisoning, and a decline in the food base.

The bald eagle was reclassified in 1995 from endangered to threatened as a result of a significant increase in the number of nesting pairs, increased productivity, and expanded distribution (USDI 1994). Since 1989 the bald eagle nesting population has increased at an average rate of approximately 8 percent per year (USDI 1999). The national average for fledglings per occupied breeding area is greater than one; therefore, the bald eagle population continues to increase. Certain geographically restricted areas, such as southern California, the Columbia River, the Great Lakes, and parts of Maine still have contaminant threats (USDI 1999). However, bald eagle recovery goals have generally been met or exceeded throughout its range (USDI 1999).

The delisting goals for the Pacific Recovery Area include 1) a minimum of 800 nesting pairs, 2) an average reproductive rate of 1.0 fledged young per occupied breeding area, with an average success rate for occupied breeding areas of not less than 65 percent over a 5-year period, 3) breeding population goals attained in at least 80 percent of management zones, and 4) wintering populations which are stable or increasing (USDI 1986).

In the Pacific Recovery Area population delisting goals have been met since 1995, the productivity objective of an average of 1.0 young per occupied breeding area has been met since 1990, and the average success rate for occupied breeding areas of 65 percent has been exceeded since 1994 (USDI 1999). However, as of 1999, the distribution objective among management zones had not yet been fully achieved.

Of the seven states covered in the Pacific Recovery Area, Washington State supports the largest breeding and wintering populations (USDI 1986). In 2001, 684 nest territories were occupied in Washington (WDFW, 2003, unpub. data). Most nesting territories in Washington are located on the San Juan Islands, along the coastline of the Olympic Peninsula, along the Straits of Juan de Fuca, Puget Sound, Hood Canal, and the Columbia River. Wintering concentration areas in Washington are along salmon spawning streams and waterfowl wintering areas (Stinson et al. 2001).

Conservation Needs

Habitat

Nesting and wintering habitats are critical to the continued survival of the bald eagle (USDI 1999). Development-related habitat loss has been a significant threat to bald eagles in the Pacific Recovery Area of Washington, Idaho, Nevada, California, Oregon, Montana, and Wyoming (USDI 1994), although availability of habitat does not appear to be limiting bald eagle populations at this time (USDI 1999). Urban and recreational development, logging, mineral exploration and extraction, and other forms of human activities can adversely affect the suitability of breeding, wintering, and foraging habitat. While individual and small-scale actions may not appear to significantly affect the species as a whole, the cumulative long-term effects throughout the recovery area pose an important threat to the recovery of the species (USDI 1999).

Availability of suitable trees for nesting and perching is critical for maintaining bald eagle populations. The primary objective of the bald eagle recovery process is to provide secure habitat for bald eagles within the recovery area, and to increase population levels in specific geographic areas to the extent that the species can be delisted. Achieving the recovery goal of increasing the number of nesting pairs within the recovery area requires protection of existing habitat for breeding and wintering bald eagles, and restoring habitat that has been lost due to development or habitat modification.

Nesting Habitat

Suitable habitat for bald eagles is characterized by accessible foraging areas and trees that are large enough for nesting and roosting (Stalmaster 1987). Food availability, such as aggregations of waterfowl or salmon runs, is a primary factor attracting bald eagles to wintering areas and influences nest and territory distribution (Stalmaster 1987, Keister et al. 1987).

Bald eagles generally nest in the same territories each year and often use the same nest repeatedly, although alternate nests in the territory may be used as well. Bald eagle nests in the Pacific Recovery Area are usually located in uneven-age stands of coniferous trees with old-growth forest components (USDI 1986) that are located within 1 mile of large bodies of water (Stalmaster 1987). Factors such as relative tree height, diameter, tree species, form, position on the surrounding topography, distance from the water, and distance from disturbance influence nest site selection. Anthony and Isaacs (1989) found that bald eagles construct nests in Douglas-fir (*Pseudotsuga menziesii*) or Sitka spruce *(Picea sitchensis*) trees with an average diameter of 170.7 centimeters (cm) diameter breast height (DBH) and a height of 56.6 meters (m) in Douglas-fir forests, and an average diameter of 106.8 cm DBH and a height of 38.6 m in mixed-conifer forests. Suitable perch trees, which bald eagles use for guarding the nest, loafing, and foraging, are also a component of suitable nesting habitat (Stalmaster 1987, Buehler 2000).

Wintering Habitat

Wintering bald eagles typically congregate in large aggregations where, most importantly, food is abundant (See Foraging). Suitable perch sites adjacent to foraging areas and winter roost habitat are also necessary. In Washington, these criteria are typically met where waterfowl and salmon populations are present, as well as marine areas (Stinson et al. 2001).

When foraging, bald eagles select perches that provide an unobstructed view of the surrounding area, generally the tallest trees in the area. Tree species commonly used in Washington for perching in winter include black cottonwood (*Populus trichocarpa*), bigleaf maple (*Acer macrophyllum*), Douglas-fir, or Sitka spruce (Stalmaster and Newman 1979).

Wintering bald eagles often roost at communal sites which provide shelter during inclement weather. Bald eagles may roost communally in single trees or large forest stands of uneven ages.

Bald eagles may remain at their daytime perches throughout the night as well, but typically gather at large communal roosts in the evening.

Communal night roosting sites are traditionally used year after year. Roost trees are usually the largest and have the most open structure (Keister and Anthony 1983, Watson and Pierce 1998a). They are often located in areas that provide a more favorable microclimate during inclement weather (Keister et al. 1985, Knight et al. 1983, Watson and Pierce 1998a). Prey sources may be available in the general vicinity, but for roosting, close proximity to food is not as critical as the need for shelter. In Washington, 26 roosts studied by Watson and Pierce (1998a) were all within 1,100 m of foraging areas. However, Stalmaster (1987), in reviewing a variety of studies found that only 40 percent were within 1 kilometer of water.

Human Disturbance

Human disturbance is a continuing threat, which may increase with increasing human populations and development (USDI 1999). Bald eagles vary in their sensitivity to disturbance, but generally nest away from human disturbance (Stinson et al. 2001). However, distance, duration, visibility and position of an activity affect eagle response, with distance being the most important factor (Grubb and King 1991, Grubb et al. 1992, Watson 2004). The response of nesting bald eagles to human activity can range from behavioral, such as flushing, or reduced nest attendance, to nest failure (Fraser et al. 1985, McGarigal et al. 1991, Grubb and King 1991, Grubb et al. 1992, Anthony et al. 1995, Steidl and Anthony 1996, Watson and Pierce 1998a). Wintering bald eagles may also be displaced from foraging areas by human activities (Stalmaster and Newman 1978, Stalmaster and Kaiser 1998). The magnitude of response varies inversely with distance, and increases with disturbance duration, the number of vehicles or pedestrians per event, visibility, sound, and position in relation to nest (above, at eye-level, or below the nest) (Grubb and King 1991, Watson 2004). Watson and Pierce (1998a) found that vegetative screening and distance were the two most important factors determining the impact of disturbances. Heavy vegetative screening can dramatically reduce bald eagle response to human activity. Human activities that are distant, of short duration, out of sight, few in number, below the nest, and quiet have the least impact (Grubb and King 1991, Watson 2004).

The effects from disturbance to nesting bald eagles vary, depending on the stage of nesting. In western Washington most bald eagles engage in courtship behavior in January and February, and begin to incubate their eggs by the third week in March. Young hatch by late April, and generally fledge during early to mid-July (Watson and Pierce 1998a). Anderson (1990) found in red-tailed hawks (*Buteo jamaicensis*), as well as in his review of other studies, that adults were more defensive as the parental investment in the young increased (and were therefore less likely to leave the nest unattended or abandon the nest). The natural exposure time from incubation to brooding also naturally increases (Watson and Pierce 1998a), and the bald eaglets began to thermoregulate at the age of 15 days (Bortolotti 1984), indicating that eaglets would be less affected by disruption of adult nest attendance as the nesting season progresses.

Contaminants

Contaminants, in particular organochlorine compounds such as DDT, are recognized as one of the primary causes of the decline of bald eagle populations (USDI 1986, 1999). DDT was banned, and registrations cancelled for other toxic persistent chemicals such as dieldrin, heptachlor and chlordane for all but the most restricted uses. The use of polychlorinated biphenyls has also been phased out. The reduction of these chemicals in the environment has resulted in a reduction of these levels of contaminants in bald eagles and a steady increase in bald eagle numbers (Schmitt and Bunck. 1995). However, residues of PCBs and Dichloro-diphenylethylene continue to depress productivity in certain locations such as the Channel Islands in California, the Great Lakes and the Lower Columbia River (USDI 1999). Bald eagles continue to be affected by accumulated chemicals such as mercury (USDI 1999), as well as poisoning by lead, organophosphorus and carbamate (Franson et al. 1995).

Foraging

An important component of bald eagle nesting and wintering areas is a consistent source of food. Fish and waterfowl are typically the most important food resource (Stalmaster 1987). Coastal and estuarine areas also provide abundant prey resources, including seabirds and marine invertebrates (Watson et al. 1991, Watson and Pierce 1998b). The availability of food resources is critical during brood rearing, when food limits survival of young (Stalmaster 1987).

Food resources govern the distribution of bald eagles in the winter. In Washington, salmon carcasses, particularly those of chum salmon (*Oncorhynchus keta*), are the most important food source (Watson and Pierce 2001). Because survival of bald eagles in their first year is typically low (Stalmaster 1987), winter food availability is important for survival. Stalmaster and Kaiser (1998) and Hansen and Hodges (1985) have also suggested that winter food shortages or disrupted winter foraging may result in reduced reproductive rates.

Summary

The bald eagle population in the Pacific Recovery Area continues to increase and the majority of recovery objectives have been met. The threats to bald eagles have been reduced, particularly impacts from contaminants and shooting. However, the loss of potential nesting and wintering habitat, and disturbance of bald eagles by humans continues. Threats from these factors have been reduced, but they continue to slow increases in bald eagle populations.

ANALYSIS OF THE SPECIES AND CRITICAL HABITAT LIKELY TO BE AFFECTED

Effects to Designated Bull Trout Critical Habitat

The request for consultation proposed an effect determination of "may affect not likely to adversely affect" designated bull trout critical habitat. The FWS concurs with this effect determination for the reasons listed below.

The FWS designated a bull trout Critical Habitat Unit (CHU) along the mainstem Lewis River from Merwin Dam to the Columbia River [70 FR 5212 (September 26, 2005)]. The proposed rule identified this section of the Lewis River as being "important foraging and overwintering habitat, and connectivity to the Columbia River once fish passage at Merwin, Yale, and Swift Dams is restored" [67 FR 71236 (November 29, 2002)]. Although portions of the Lewis River and its tributaries above Merwin Dam had been proposed as critical habitat, during the final designation these areas were removed based on the expected benefits of the SA for the relicensing of the Lewis River Hydrolelectric Projects [70 FR 5212 (September 26, 2005)].

Primary Constituent Elements of Bull Trout Critical Habitat

The primary constituent elements (PCEs) that are essential to the conservation of bull trout [70 FR 5212 (September 26, 2005)] are:

PCE#1 - Water temperatures that support bull trout use.
PCE#2 - Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and instream structures.
PCE#3 - Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival.
PCE#4 - A natural hydrograph, including peak, high, low, and base flows within historic ranges, or if regulated, currently operate under a biological opinion that addresses bull trout, or a hydrograph that demonstrates the ability to support bull trout populations by minimizing daily and day-to-day fluctuations and minimizing departures from the natural cycle of flow levels corresponding to seasonal variation.
PCE#5 - Springs, seeps, groundwater sources, and subsurface water to contribute to water quality and quantity as a cold water source.
PCE#6 - Migratory corridors with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows.
PCE#7 - An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.
PCE#8 - Permanent water of sufficient quantity and quality such that normal reproduction, growth and survival are not inhibited.

Effect of Project Elements on PCEs

- Bull Trout Passage: Provision of two-way bull trout passage at the Lewis River Dams will provide a migratory corridor between the Lewis River bull trout Core Area and potential foraging and overwintering habitat in the CHU and elsewhere in the Lower Columbia River Recovery Unit. In this way, migratory corridors will be restored, resulting in a positive effect on PCE#6.

- Instream Construction: This element may affect critical habitat by adding spawning gravel and large woody debris (LWD) to the streambed below Merwin Dam for fall Chinook spawning if gravel depletion is detected after the date of licensing [SA Section 7.2(d)]. Gravel augmentation may slightly improve the substrate amount, size, and composition, thus slightly improving PCE#3. In-channel work may also include a pump station to be constructed on the river bank and a release pipe from the Release Pond to the Lewis River near the town of Woodland. Although instream construction activities may generate temporary increases in sediment or turbidity, the likelihood of bull trout being present in the CHU is so low as to be discountable, therefore these actions are not likely to adversely affect critical habitat.

- Reintroduction of Anadromous Salmon and Steelhead: Reintroduction of salmon and steelhead will contribute to an abundant food base for bull trout in the CHU. The expectation is that there will be greater use of the reach below Merwin Dam and the CHU by bull trout in the future. This will benefit PCE#7.

- Protect Habitat: The Utilities will manage all interests in land they currently own, or land they purchase or acquire in conservation easements, for protection of fish and wildlife habitat. Land management will include buffering sensitive aquatic habitat from ground-disturbing activities. Thus, any habitat conservation covenants or new parcels of land purchased below Merwin Dam may contribute to improved habitat quality associated with critical habitat. These actions may contribute to lower water temperatures from riparian protection through the application of streamside buffers. This may benefit PCE#1.

- Provide Instream Flows Below Merwin Dam: Below Merwin Dam, the proposed action will guarantee the current minimum flow of 1,200 cfs and reduce the maximum flow to 4,200 cfs during the fall Chinook salmon spawning period for the conservation of that species (SA Section 6.2.4). The currently required highest minimum flow is 5,400 cfs in late fall (FEIS Section 3.3.2.2). During unusual low flows PacifiCorp and resource agencies will conduct "emergency low flow consultation" to keep existing Chinook salmon redds watered, provide sufficient rearing habitat for wild fall Chinook salmon, and release pulsed flows from Merwin Dam if this is shown to be effective in promoting salmon and steelhead smolt outmigration. These measures will apply at the time of licensing (SA Section 6.2). The FEIS (Section 3.3.5.2) provides for "additional downramping restrictions, modifying minimum flows, and establishing flow plateau operations...that would protect...bull trout from stranding or dewatering." The FEIS (Section 5.1.4) recognizes a baseline that includes downramping rates of 2 inches/hr.

  In a relative sense, these FERC minimum flows are generally higher in the summer than what might occur naturally. For instance, low flows in the natural system upstream of the Projects can be as low as 600 cfs while the FERC required minimum is 1,200 cfs. The winter peak flows have been decreased by hydroelectric operations on the Lewis River. The highest recorded flood in the basin was 129,000 cfs which occurred in December 1933. At that time there was only Merwin Dam in place and it was operated primarily as a run-of-the-river facility. With all three dams in place there have been inflows higher than the 1933 flood of record but the storage capability of the Projects has maintained flows below Merwin Dam to much lower levels (e.g. flood of 1996 was 109,000 cfs). The average annual flow for the Lewis River is about 6,000 cfs. The actual amount of water that passes Merwin Dam at any given time (other than the summer months) is much greater than the FERC minimum of 1,200 cfs. These flow requirements are expected to be sufficient to allow bull trout critical habitat to function as a migratory corridor (PCE#6) and to provide sufficient foraging and overwintering habitat. The downramping rates will improve stream flow conditions, decreasing the chance of stranding bull trout, and thus enhancing PCE#4 and #8.

This element is also likely to benefit PCE#1. Although summer and fall temperatures below Merwin Dam in 1999 indicate the CHU is not likely to support bull trout spawning or early rearing, temperatures may support bull trout foraging, migration, and overwintering. Maximum daily temperatures (PacifiCorp and Cowlitz PUD 2002:WQ1) were 15 and 15.5 °C for September and October, respectively. Maximum daily temperatures were between 12.7 and 13.6 °C between July and November. The daily maximum did not exceed 12 °C in the other months. Proposed Merwin Dam operation would at least maintain baseline summer flow, thus having a slight cooling effect on stream temperatures.

PCE#8 requires sufficient water quantity and quality for growth and survival of bull trout. The proposed action will regulate flow to avoid stranding bull trout, thus promoting survival of individuals that may be foraging or migrating through the CHU. Additional proposed regulation of late-summer flows to ensure survival of fall Chinook salmon may incidentally benefit bull trout, and in any case is not likely to impede growth. The water quality in the Lewis River subbasin was not exceeding state standards for any parameter (WQ1) in 1999 and 2000, nor are the proposed changes to dam operations anticipated to degrade any water quality parameter. In particular, operation of the Merwin powerhouse has not been shown to elevate dissolved gases in the tailrace, and the anticipated changes to power generation are not likely to degrade that condition.

The proposed action may affect bull trout critical habitat through bull trout passage provisions, instream habitat enhancement, reintroduction of anadromous salmonids, protection of habitat, and management of instream flows. These effects considered together will likely improve PCEs #1, #3, #4, #6, #7 and #8 as described above, and will have no effect on the other PCEs.

ENVIRONMENTAL BASELINE IN THE ACTION AREA - BULL TROUT

The environmental baseline includes "the past and present impacts of all Federal, State, or private actions and other human activities in the action area, including the anticipated impacts of all proposed Federal projects in the action area that have undergone section 7 consultation and the impacts of State and private actions that are contemporaneous with the consultation in progress" (50 CFR §402.02). The environmental baseline, therefore, encompasses the effects of both human and natural factors leading to the current status of the species in the action area, including the effects of the construction and past operation of the Projects. Impacts resulting from the future operations of the Projects and any interrelated and interdependent activities constitute effects of the action.

Lewis River Subbasin Overview

Forestry, recreation, and agriculture dominate the Lewis River subbasin. Human population densities are generally low. The largest urban center, the City of Woodland, is located near the mouth of the Lewis River. Development in the Woodland area has adversely affected aquatic habitat in the lower part of the Lewis River subbasin. Residential and agricultural land uses have eliminated most of the riparian vegetation in the lower reaches, and extensive diking has almost entirely disconnected the lower 7 miles of the Lewis River floodplain from the river (Wade 2000).

Other towns in the Lewis River subbasin include Cougar, Ariel, Yale, Chelatchie, Amboy, Yacolt, and La Center (Wade 2000). Their economies are primarily dependent upon logging, agriculture, and recreation. The town of Cougar, located along the north shore of Yale Lake, was originally established to serve as a staging point for timber harvest activities. However, after the hydroelectric developments and creation of the Mt. St. Helens National Volcanic Monument, recreation services became the primary industry.

There are three private communities located around Swift Creek Reservoir. The largest of these is the 206-home Northwoods community on the eastern shore. Yale Lake has private developments clustered near Speelyai Canal. Private land ownership is more common around Lake Merwin, where there are several large communities along the shoreline, including a 1,600-lot home and trailer development along the south shore. Scattered private lands occur along the Lewis River adjacent to SR 503, increasing in number as one heads west to the City of Woodland.

Changes in land use have also had significant historical effects on the Lewis River subbasin, resulting in:

- Reduced floodplain and off-channel habitat connectivity from Merwin Dam to the Columbia River, primarily due to extensive diking.
- Degraded riparian habitats throughout the basin, which has likely increased sedimentation and erosion, increased water temperatures, and reduced large woody debris (LWD) recruitment potential.
- Increased road density and drainage networks, which have likely altered hydrology (USFS 1995, 1996, 1997, 1998) and blocked bull trout passage due to impassable culverts.

Fish Culture

The Washington Department of Fish and Wildlife (WDFW) operates three fish hatcheries on the Lewis River:

- The Lewis River hatchery located 3 miles below Merwin Dam, is owned by the WDFW and funded by PacifiCorp. This hatchery rears late-run coho.

- The Speelyai Hatchery located on Lake Merwin at the mouth of Speelyai Creek is owned and funded by PacifiCorp and Cowlitz PUD. This hatchery rears spring Chinook, early-run coho, and kokanee.

- The Merwin Hatchery located just downstream of Merwin Dam is owned and funded by PacifiCorp. This hatchery rears winter and summer steelhead, and rainbow trout.

Federal Forest Management

The Lewis River subbasin upstream of Swift Creek Reservoir is largely on the Gifford Pinchot National Forest. Land management on the Forest follows the Northwest Forest Plan, which overall provides a higher degree of protection to fisheries, riparian zones, and watersheds than regulations off the Forest. The Forest includes a large part of the actual or potential range of bull trout in the subbasin, and the watershed draining into this range, including:

- The Pine Creek subwatershed upstream of bull trout spawning grounds,

- Bull trout waters in the North Fork Lewis River from the Muddy River up to Lower Falls; and the Upper, Middle, and Lower Lewis watersheds that upstream of this reach;

- The Muddy River watershed upstream of River Mile (RM) 1.0 of the Muddy River; and

- The Lower Pine Creek subwatershed and all subwatersheds draining into it.

In 1980 Mt. St. Helens erupted, sending flows of mud, rock, and ash into Pine Creek and the Muddy River system. These flows denuded the valleys of forest, resulting in extreme flow variations, increased turbidity, increased fine sediment in the streambed, decreased channel stability, a scarcity of large wood, and elevated stream temperatures. Natural succession is moving these watersheds toward pre-eruption conditions. This has led to decreasing stream temperatures (Hiss et al. in prep.) and decreasing suspended sediment (USGS online data.). These changes may lead to an increased range of bull trout in the Lower Lewis and Muddy River watersheds.

Hydropower Facilities

Construction

The Merwin Project was completed in 1931, terminating volitional fish access from the Columbia River to the upper basin. The reservoir formed by Merwin Dam is about 14.5 miles long with a surface area of approximately 4,000 acres. Construction of the Yale Project began in 1951 and was complete by 1953. The reservoir formed by Yale Dam is approximately 10.5 miles long with a surface area of approximately 3,800 acres. Construction of the Swift No. 1 Project was completed in 1958. The reservoir formed by Swift Dam is approximately 11.5 miles long with a surface area of approximately 4,680 acres. Construction of the Swift No. 2 Project was completed in 1958. Swift No. 2 consists of a 3-mile canal beginning at the Swift No. 1 tailrace, canal wasteway, canal drain, intake and surge arresting structure, powerhouse, switchyard, and transmission line.

Construction of the four Hydroelectric Projects and the Lewis River Bypass Reach located in the North Fork Lewis River between RM 19 and RM 45 represented major modifications of the river's salmonid habitat and the ecological processes that formed and maintained salmonid habitat. The effects of Project construction included:

- Limiting access of anadromous salmonids from the lower 20 miles of the Lewis River to the upper watershed, affecting 176 miles of potential habitat accessible before construction. Thus, the dams may have eliminated the anadromous component of the Lewis River bull trout.

- Converting 36.5 miles of mainstem river into reservoirs, inundating habitat for salmonids. The development and operations of the Projects have increased the amount of lacustrine foraging habitat available to adfluvial bull trout to the detriment of stream foraging habitat.

- Diverting river flow, except during spill events, from the 2.7 mile-long Bypass Reach of the Lewis River above Yale Lake into the Power Canal. The effect was the removal of any potential rearing area, and perhaps spawning area, from the range of Yale Lake bull trout in the Bypass Reach.

- Reduced habitat connectivity between Cougar Creek and all points upstream of Yale Lake for bull trout. This has probably increased the isolation of the Cougar Creek local population, compared to natural conditions, and could led to reduced resiliency of the population in the future, although recent genetic analysis indicates no introgression which is usually seen in isolated populations (Pratt 2003).

- Altered temperature and flow regimes in the mainstem Lewis River below Merwin Dam. This reduced habitat quality by introducing the risk of stranding due to hydro operations. Bull trout have occurred rarely in this reach after construction of the dam.

- Reduced downstream transport of gravel and LWD.

- Eliminated marine derived nutrients (MDN) from salmon carcasses above Merwin Dam for 70+ years. The effect of this loss on aquatic productivity, riparian vegetation and terrestrial food webs is impossible to accurately quantify but is considered a significant habitat management issue.

- A shift from natural salmonid production to artificial propagation, except for bull trout and fall Chinook. This has decreased the diversity of the prey base for bull trout.

Operation

The effects of past Project operations included:

- Entrainment of bull trout from the forebay of each of the four powerhouses into the turbines, where they risk mortality or injury from abrupt pressure changes, abrasion, or mutilation.

- Entrainment of bull trout from the forebay of each of the three dams into the spillways, where they risk mortality or injury, either from abrasion on the spillway or falling onto the rocks below it.

- The current trap-and-haul operations, which do not fully remove the limit to passage of anadromous salmonids from the lower 20 miles of the Lewis River to the upper watershed.

- Altered temperature and flow regimes in the mainstem Lewis River below Merwin Dam. This reduced habitat quality introduces the risk of stranding due to rapid decreases in spill and power production. Power generation contributes to cooler instream temperature because this water is drawn from an intake 85 ft below the Merwin full pool elevation.

- Reservoir drawdown in the winter and spring to accommodate flood management and spring runoff. This may prevent the development of aquatic plants at the reservoir rim, and may slightly concentrate bull trout, their predators, and their prey into a reduced aquatic habitat.

- Past power generation at Swift No. 1 and Yale powerhouses resulted in elevated levels of total dissolved gases (TDG) in the tailraces. This has the potential to injure or kill fish in the tailrace. PacifiCorp has remedied this condition at Yale Lake by adjusting the operation of the turbines and is seeking further refinements pursuant to the 401 Certifications under the new licenses. Similar measures are being enacted at Swift No. 1 to reduce TDG.

Recent Hydropower Facility History

On April 21, 2002, the Swift No. 2 power canal failed, dewatering the canal. The failure displaced approximately 350,000 cubic yards of soil and rock that flowed around and into the powerhouse, filling the tailrace and extending into the upper reaches of Yale Lake. Fish, including bull trout, also entered Yale Lake. Immediately following the failure, Cowlitz PUD, in cooperation with others, initiated emergency work to recover and secure Project facilities and equipment. This work included:

- Lowering the stoplogs in the check-structure to prevent water from flowing into the lower 2/3 of the canal and to allow Swift No. 1 to resume operations;
- Constructing a temporary coffer dam just downstream of the check-structure to provide additional stability to the check structure;
- Opening the canal drain between the check structure and the coffer dam, allowing flows to enter an existing side channel of the bypass reach that is isolated from the main channel and is protected from spill from Swift No. 1. This made it possible for bull trout from Yale Lake to enter the lower half of the Bypass Reach;
- Lowering the top of the side-channel spillway approximately 3 ft to reduce the level of water upstream of the check structure;

- Grouting and lining the wasteway of the side channel spillway with large boulders to prevent erosion;

- Resuming Swift No. 1 operations within 6 days after the failure, using the check structure and side channel spillway to divert water flowing out of Swift No. 1 through the wasteway into the Lewis River Bypass Reach; and

- Recovering bull trout stranded in pools within the dewatered part of the power canal, and releasing them above the Swift No. 1 Dam.

In early 2006, Cowlitz PUD completed reconstruction of Swift No. 2 and achieved commercial operation in June 2006.

The Yale Lake bull trout population, which spawns in Cougar Creek, could have experienced an increase in spawners caused by the sudden entry of Swift Creek Reservoir bull trout into Yale Lake during the failure. The Washington Department of Fish and Wildlife, FWS, and Cowlitz PUD salvaged 42 live adult bull trout from standing water left in the canal after the failure. An additional six bull trout were found dead in the canal after the failure. The existing genetic structure of the Cougar Creek population was not affected as Neraas and Spruell (2004) determined that the Cougar Creek population already exhibited a mixture of genetic material from the upstream Rush and Pine Creek local populations.

Certain conservation measures were required under the Interim Biological Opinion issued June 28, 2002. These actions, which were ongoing before the SA, include the Cougar Creek, Swift Creek, and Devil's Backbone conservation purchases and covenants, and the net-and-haul program at the Yale and Swift No. 2 tailraces. The conservation purchases ensure that timber harvest and rural residential development do not affect either the bull trout rearing area in the Swift Creek Arm of the Reservoir, or the bull trout spawning grounds in Cougar Creek.

<u>Non-hydropower Management of Utility Lands</u>

The utilities own certain lands surrounding the reservoirs and projects, which they manage for purposes not directly related to power generation; that is fish and wildlife conservation, timber production, and recreation. PacifiCorp manages the riparian forest and adjacent uplands along Cougar Creek to protect bull trout spawning grounds and rearing areas. The Utilities manage the riparian forest along Swift Arm to primarily to protect bull trout rearing in Swift Reservoir. PacifiCorp manages its other holdings for limited timber production, and operates recreation facilities along the reservoirs including day use parks, campgrounds, boat launches, fishing access piers, and non-motorized trails.

Bull Trout Status in the Action Area

Recovery planning for bull trout is based on successive subdivisions of populations and land areas (Table 4).

Table 4. Hierarchy of population and geographic subdivisions in the Draft Bull Trout Recovery Plan (USFWS 2003).

Population Name	Population unit	Relation to next higher level	Geographic area
Bull trout	Population	NA	Range of the species
Columbia River	Interim Recovery Unit	One of 5 in the range of the species; others include Coastal-Puget Sound in WA	Columbia River Subregion
Lower Columbia	Management Unit	One of 3 in Interim Recovery Units in Washington; the others are Middle Columbia, Upper Columbia, and Northeast Washington	Lower Columbia Basin
Lewis River	Core Area, with Core Habitat and Core Population	One of 2 Core Areas in the Management Unit; the other is the Klickitat River. The White Salmon River is unoccupied Core Habitat	Lewis River subbasin, which is the Action Area
Rush, Pine, and Cougar Creek	Local Populations	Rush and Pine Creeks are the 2 Local Populations on the Swift Creek Reservoir; the Cougar Creek Local Population is on Yale Lake	Lower Rush Creek subwatershed in the Middle Lewis River watershed; Lower and Middle Pine Creek and Cougar Creek subwatersheds in the Lower Lewis River watershed

Currently, reproducing populations of bull trout within the Lewis River Core Area are found in certain tributaries of Yale Lake and Swift Creek Reservoir. Bull trout in the Lewis River are considered to be predominately adfluvial. The number of bull trout inhabiting the Lewis River Core Area is estimated to be low but increasing. Spawning occurs in Cougar, Rush, and Pine Creeks. Rearing occurs predominantly in Cougar Creek; Pine Creek; the Lewis River; Swift Creek Reservoir, especially Swift Arm; and Yale Lake. Rearing may also occur in Swift Creek. The status of a bull trout core population can be described based on four key elements: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity.

Number and Distribution of Local Populations

Three local populations are known to occur in the Lewis River Core Area, based entirely on distribution of their spawning grounds: Cougar, Rush, and Pine Creeks. Spawning adfluvial bull trout in Yale Lake migrate into Cougar Creek from the middle of August through early September and spawn from late September through early October. The other local populations occur in Swift Creek Reservoir and spawn in Rush and Pine Creeks. Four adult bull trout were sighted in Swift Creek in August 2006, but it is unknown whether these adults were moving up to spawn as there has been no documented bull trout spawning in this stream. No juvenile bull trout were observed during the daytime snorkeling in Swift Creek. Given this new information, work has not begun to search for reproduction in Swift Creek.

Adult Abundance

The estimated Cougar Creek local population ranges from 0 to 40 individuals based on annual adult counts taken between 1979 and 2005. These low spawner numbers, coupled with preliminary genetic analysis (Spruell et al. 1998), indicated the Cougar Creek spawners may represent a genetically distinct stock at risk of inbreeding depression. However, more thorough genetic analysis conducted in 2003 (Neraas and Spruell 2004) indicate the Cougar Creek local population represented a mix of Rush and Pine Creek stocks.

The Rush Creek local population is estimated to support over 1,000 spawners and thus is not at risk from genetic drift or inbreeding depression. The Pine Creek local population is estimated to be approximately 140 adults, and is thus at risk from genetic drift, although not from inbreeding depression. The total core area adult population has been increasing since 1999, and is now estimated to be approximately 1,220 adults.

Productivity

For a population to contribute to recovery, its growth rate must indicate that the population is stable or increasing for a period of time. Weighing the long-term population increase in the Rush Creek local population against the low number of local populations and the small size of the Pine Creek and Cougar Creek local population, this Core Area is considered to be at risk of extirpation.

Connectivity

Lack of passage at hydroelectric facilities within the Lewis River Core Area has fragmented populations and prevented bull trout from using foraging and overwintering habitats in the mainstem Lewis and Columbia Rivers. Migratory bull trout persist by adopting an adfluvial life-history form in Swift Creek Reservoir and Yale Lake. Lack of passage and the low abundance of two of three local populations limits the possibility for genetic exchange and local-population refounding, placing the Lewis River Core Area at increased risk of extirpation.

Bull trout may pass from Swift Creek Reservoir to Yale Lake via the Swift No. 1 spillway and the Bypass Reach, or they may pass through the Swift No. 1 turbines to the Power Canal. From there they may enter the Bypass Reach through the wasteway or the Canal Drain, or may pass through the Swift No. 2 turbines into Yale Lake.

The Cougar Creek spawning population is considered depressed due to consistently low adult counts, although past survey methods may have underestimated the run size. The current survey method suggests a larger population but the new method has not been applied long enough to detect a trend. Adult and juvenile bull trout have been sighted in the Bypass Reach in recent years, and occasional spawning may occur but is not likely to be successful. Bull trout from Yale Lake sometimes pass downstream to Lake Merwin through the Yale Dam spillway or turbines. Lake Merwin bull trout are not considered a local population because there are no suitable spawning streams entering that reservoir.

Although the Rush and Pine Creek local populations are increasing, their persistence is precarious since they depend almost entirely on two spawning streams. Rush Creek, which ordinarily supports the largest bull trout spawning population in the Lewis subbasin, may be susceptible to low flows or changes in the shape of gravel bars which discourage bull trout entry in some years. Pine Creek and Muddy River remain vulnerable to debris flows from future eruptions of Mt. St. Helens. The persistence of the Cougar Creek bull trout local population may depend on restoring and maintaining two-way passage between Swift Creek Reservoir and Yale Lake.

Conservation Needs

The Draft Columbia River Recovery Plan lists the following broad recovery measures for the Lewis River Core Area (USFWS 2002):

1. Protect, restore, and maintain suitable habitat conditions for bull trout.
2. Identify barriers or sites of entrainment for bull trout and implement tasks to provide passage and eliminate entrainment.
3. Establish fisheries management goals and objectives compatible with bull trout recovery, and implement practices to achieve goals.
4. Characterize, conserve, and monitor genetic diversity and gene flow among local populations of bull trout.
5. Conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks.
6. Use all available conservation programs and regulations to protect and conserve bull trout and bull trout habitats.

More specific recovery measures are provided in Table 5.

Table 5. Elements of the Lower Columbia Recovery Unit Bull Trout Recovery Plan addressed by the proposed action.

Item	Bull Trout Recovery Plan Action
1.2.1	**Provide fish passage at Merwin, Yale, and Swift Dams.** Evaluate passage options and implement actions necessary to restore two-way passage at Swift (including both No. 1 and No. 2 power projects), Yale, and Merwin Dams through the relicensing process. Passage at Merwin Dam is necessary to restore connectivity to the Columbia River. Passage at Swift and Yale Dams is necessary to reconnect Cougar, Rush, and Pine Creek local populations. Reconnecting these populations…would allow bull trout movement between reservoirs and strengthen spawning populations in Cougar Creek.
1.2.4	**Reduce entrainment.** Quantify the level of entrainment at Yale Dam and Swift Dam (Nos. 1 and 2) and recommend actions to reduce impacts. Reducing entrainment in the Lewis River is being addressed through the relicensing process. Blocking fish from entrainment through the turbines or spillway may include the use of guide nets and a surface collector. Bull trout use of this type of collector has not been verified. Therefore, evaluation and adaptive management will be needed to make sure bull trout can be captured safely and transported safely to provide downstream passage…

Item	Bull Trout Recovery Plan Action
1.2.7	**Provide fish passage at Merwin Dam.** Partial passage currently exists at Merwin Dam and implementing actions to improve passage would allow bull trout access to the mainstem Columbia River for overwintering and feeding.
1.3.2	**Protect and restore habitat in upper Rush and Pine Creeks.** Implement habitat restoration activities in Rush and Pine Creek watersheds to address problems with shading, slope stability, channel complexity, and riparian revegetation.
1.3.4	**Work with private landholders in Pine Creek drainage.** Work with private landholders (A and E Forest of Lewis River and Olympic Resources Group) to assess habitat conditions and recommend restoration actions where appropriate within Pine Creek drainage.
1.4	**Operate dams to minimize negative effects on bull trout in reservoirs and downstream.**
3.1.2	**Conduct assessment of nutrient levels and cycling**. Passage barriers on the Lewis River prevent anadromous salmon and steelhead from entering these systems without assistance and may have negatively impacted nutrient levels and natural cycling
3.2.1	**Provide information to anglers.** Provide information to anglers about bull trout identification, special regulations, fisheries management of endangered species, and how to reduce hooking mortality of bull trout caught incidentally in recreational fisheries.
4.1	**Incorporate conservation of genetic and phenotypic attributes of bull trout into recovery and management plans.**
4.2	**Maintain existing opportunities for gene flow among bull trout populations.**
5	Conduct research and monitoring to implement and evaluate bull trout recovery activities consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks.
5.2	Conduct research evaluating relationships among bull trout distribution and abundance, bull trout habitat, and recovery tasks.
6.1	Use partnerships and collaborative processes to protect, maintain, and restore functioning core areas for bull trout.
6.1.2	**Protect habitat.** Provide long-term habitat protection through purchase from willing sellers, land exchanges, conservation easements, with initial emphasis on identified bull trout spawning and rearing streams.
6.1.3	**Coordinate recovery efforts**. Coordinate bull trout recovery activities with Federal, State, and Tribal anadromous fish reintroductions and recovery plans.
6.2	Use existing Federal authorities to conserve and restore bull trout.
6.2.1	**Participate in relicensing activities.** Complete relicensing of Swift, Yale, Merwin Dams and implement appropriate mitigation activities.

ENVIRONMENTAL BASELINE IN THE ACTION AREA - SPOTTED OWL

The WDFW database identifies 20 pairs of spotted owls in the Lewis River watershed. No activity centers are known to exist on PacifiCorp or Cowlitz PUD lands, but some PacifiCorp or Cowlitz PUD lands are within 1.8 miles of 9 known spotted owl activity centers and are within and adjacent to the Siouxon Spotted Owl Special Emphasis Area (SOSEA). The closest known spotted owl activity center is 0.26 mile from Utility-owned lands. Spotted owls have not been documented nesting on lands to be managed under Wildlife Habitat Management Plans (WHMP).

The highest density of spotted owl territories in the action area is south of Swift Reservoir and east of Yale Lake. This includes Range and Drift Creeks, the south side of the Lewis River Bypass Reach, and the east shore of Yale Lake. Other territories are on the west shore of Yale Lake and the north shore of Lake Merwin.

Utility-owned lands currently encompass over 10,000 acres, of which approximately 122 acres are old-growth and 713 acres are mature mixed conifer forests; these lands are considered spotted owl nesting habitat (C. McShane, EDAW, pers. comm. 2006). There is a total of approximately 5,238 acres of suitable spotted owl roosting and foraging habitat on Utility-owned lands (PacifiCorp *in litt.* 2006). Of the suitable habitat, most of the stands are small and isolated, or the "larger" stands are adjacent to industrial lands that have been clear-cut harvested. Only one spotted owl has been heard during field surveys; this spotted owl was heard in the early morning during breeding bird surveys and it was not located on Utility-owned lands. Spotted owl nesting is considered unlikely on PacifiCorp and Cowlitz PUD lands because of the lack of large patches (>70 acres) of nesting habitat (F. Shrier, PacifiCorp, pers. comm. 2006; C. McShane, EDAW, pers. comm. 2006). The FWS concurs there is a low likelihood the suitable habitat on Utility-owned lands is occupied by a pair of spotted owls at this time. However, over the life of the licenses, suitable habitat conditions are likely to improve as a result of forest management activities, forest succession, or from the acquisition of lands containing suitable spotted owl habitat and, thus, the occupancy of these lands may change.

ENVIRONMENTAL BASELINE IN THE ACTION AREA – BALD EAGLE

According to the WHMP standards and guidelines, since 1981, PacifiCorp has conducted surveys for nesting bald eagles and osprey in the Project vicinity and along the Lewis River downstream to Woodland. As in other areas of the State, the populations of these species in the Project vicinity have increased (Table 6). Based on the results of the 2005 surveys, there are 10 bald eagle nesting territories on or near WHMP lands—4 at Lake Merwin, 2 at Yale Lake, 2 at Swift Creek Reservoir, and 2 downstream of Merwin Dam. There were 3 new bald eagle nest sites discovered in 2005. Most nest sites are in large conifer trees and are located within about 1 mile (1.6 km) of the reservoirs. Productivity (number of young per occupied territory) in 2005 was 0.60 and has ranged from 0.60 to 1.5 over the last 9 years. The number of bald eagles recorded during the winter is highly variable, ranging from 5 to 80 over the 9 winter survey years. The WDFW has records of 17 bald eagle communal roost sites – 7, 6, and 4 along Yale, Swift No. 1, and Merwin reservoirs, respectively.

Table 6. Bald eagle occurrence and distribution in the action area.

Bald Eagle Breeding Territories[1] and Communal Roost Sites[2]	Land Owner[3]	Activity[4]	Breeding Territory Site number[4]
BLM Communal Roost	BLM & GPNF	Communal roost in 1986 on south shore of Lewis River just east of Eagle Cliff.	NA
Canyon Creek Communal Roost	PacifiCorp	Communal roost 1984 to 1986.	NA
Colvin Creek Breeding Territory	PacifiCorp	Nest occupied in 2005 and 2006.	1661
Cougar Creek Breeding Territory	PacifiCorp	Successful nesting in 2005.	1662
Drift Creek Communal Roost	GPNF	Communal roost 1985 and 1986	NA
Drift Creek Breeding Territory	GPNF	Successful nesting 1996, 1997, 2000, and 2006.	544
East Fork Lewis Breeding Territory	Private	Nest occupied in 2001, 2002, 2003, and 2005.	1356
La Center Breeding Territory	Private	Successful nesting 1989, 1990, 1991, 1992, 2000, and 2002. 1988 nest on north bank of E. Fork Lewis River on outskirts of La Center; 1991 nest site was on Breeze Creek on the east edge of La Center; 1996 nest was 600 ft from a house on the bluff; and the 2002 nest was on the south side of E. Fork Lewis River.	869
Lake Merwin Communal Roost	PacifiCorp	Communal roost 1984 to 1986.	NA
Lake Merwin Breeding Territory	PacifiCorp	Successful nesting 1998, 2001, and 2005.	1055
McKee Meadow Breeding Territory	PacifiCorp	Successful nesting in 2003, 2004, and 2005.	1486
Miller Creek Communal Roost	GPNF	Communal roost in 1986 on south side of Lewis River east of confluence with Muddy River.	NA
Morgan Farm Breeding Territory	Private	Successful nesting in 1985, 1986, 1988, 1995, 1996, 1997, 2000, 2001, and 2002.	784
Ole Creek Communal Roost	WDNR	Communal roost in 1986 along Ole Creek, 1/2 mile south of Power Canal.	NA
Siouxon Creek Communal Roost	WDNR	Communal roosts at N and S sites on Siouxon Creek in 1986.	NA
Siouxon Notch Communal Roost	WDNR and PacifiCorp	Communal roost 1985 and 1986.	NA
Siouxon Notch / RM 35.5 Breeding Territory	WDNR & PacifiCorp	Successful nesting 1988, 1989, 1990, 1994, 1997, 1999, 2002, and 2005.	546
Speelyai Bay Breeding Territory	PacifiCorp	Nest occupied 1999, 2005, and 2006.	1266

Swift 2 Powerhouse Breeding Territory	WDNR	Nest occupied in 2006.	2006 nest; number not yet assigned
Swift Canal Communal Roost	Private	Communal roost in 1986, south side of Power Canal.	NA
Swift Reservoir Communal Roost	WDNR	Communal roost in 1986.	NA
Swift Reservoir Breeding Territory	WDNR & Private	Successful nesting 1996, 1997, 2000, and 2006.	1056
Woodland Breeding Territory	Private	Successful nesting in 1997, 1998, 2000, 2001, 2003, 2005 and 2006.	1168

[1] This lists active territories only. Active nest site territories have been occupied within the last 5 years. WDFW 2006. Bald Eagle Management. Accessed at http://wdfw.wa.gov/ wlm/diversty /soc/baldeagle/ on August 21, 2006.

[2] Communal roosts information is obtained from PacifiCorp data. Roosts have not been monitored since 1986 and are assumed to be active.

[3] GPNF=Gifford Pinchot National Forest; BLM=Bureau of Land Management; WDNR=Washington Department of Natural Resources.

[4] Information was obtained from Washington Heritage Database, WDFW Bald Eagle Territory History website http://wdfw.wa.gov/wlm/diversty/soc/baldeagle/territory/ search/search.php?searchby=Name&search=COLVIN%20CREEK, and PacifiCorp data.

Kirk Naylor and Todd Olson (PacifiCorp, pers. comm. 2006) noted the following regarding bald eagle status in the action area:

- Bald eagles were not observed nesting along any of the Project reservoirs until 1991 when an active nest site was noted at Siouxon Notch along Yale Lake; successful nesting at this site was first documented in 1994.
- The number of bald eagle nests increased to 10 by 2005. There has been no decline in active nests over the years surveyed.
- Winter roosting was documented in the1980s; the greatest number of foraging bald eagles recorded during the winter was in 2005.
- The primary bald eagle foraging grounds are in the Yale and Merwin tailraces, as shown by surveys.

Dave Anderson (WDFW, pers. comm. 2006) noted the following regarding bald eagle status in the action area:

- The bald eagle population along the Lewis River has boomed in recent years.
- Feeding locations change seasonally. In winter, bald eagles congregate at the tailraces. But during the breeding season it is not well known where they feed as foraging is scattered.
- Bald eagles are susceptible to disturbance by boat traffic. July and August have the highest boat traffic. Although bald eagles' nests and summer foraging perches, as well as visitors' campsites, are generally both widely dispersed, Drift Creek Cove on the Swift Creek Reservoir experiences concentrated boating and camping in the vicinity of

two bald eagle territories. One nest may have shifted location in response to human activity.
- Surveys have not identified any specific perches used on a regular basis during spring and summer in the action area.

Boat traffic below Yale Dam is prohibited in the tailrace. Between the tailrace and Cresap Bay, boat speed is limited to 5 knots, and no wake is permitted. The Merwin tailrace is a narrow reach and access is prohibited near the tailrace. Therefore, this reach gets little fishing pressure. The majority of boat use downstream of the dams is concentrated around the three WDFW hatcheries. However, jet boats go as far upstream as Cedar Creek. Most boating on the Lewis River is downstream from this point.

EFFECTS OF PROPOSED ACTION ON BULL TROUT

Regulations implementing the ESA define "effects of the action" as "the direct and indirect effects of an action on the species or habitat together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline" (50 CFR 402.02). Direct effects are the immediate effects of the action on the species or its habitat. Direct effects result from the agency action and the interrelated and interdependent actions. Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. We organized our assessment of effects by the following project elements; these project elements follow the general outline contained in Table 1.4-1 in the BE, as described in the proposed action section of this Biological Opinion:

- Project Element 1: Anadromous Fish Reintroduction
- Project Element 2: Bull Trout Passage
- Project Element 3: Instream Construction and Instream Habitat Restoration
- Project Element 4: Habitat Protection
- Project Element 5: Instream Flows
- Project Element 6: Total Dissolved Gas (TDG)
- Project Element 7: Rainbow Trout and Kokanee Stocking
- Project Element 8: Monitoring of Bull Trout
- Project Element 9: Information and Education
- Project Element 10: Wildlife Habitat Management Plan

Project Element 1: Anadromous Fish Reintroduction

Section 3.1 of the SA describes the goal for this project element as: …"achieve genetically viable, self-sustaining, naturally spawning, harvestable populations [of Chinook salmon, steelhead, and coho salmon] above Mervin Dam greater than minimum viable populations."

Under the proposed action, the Utilities will reintroduce spring Chinook salmon, coho salmon, and late-winter steelhead into the upper Lewis River basin above Merwin, Yale, and Swift Dams. Adult and juvenile Chinook salmon, coho salmon and steelhead will be transported and released above the dams, with the adults spawning and the juveniles rearing before migrating downstream. Overall, the reintroduction of salmon and steelhead will increase fish production in the Lewis River basin thereby increasing the available prey base for adult and sub-adult bull trout. The reintroduction effort will also indirectly increase the bull trout prey base by restoring marine-derived nutrients (MDNs) into the ecosystem. However, the reintroduction effort may also create some level of interspecific competition between juvenile salmon, steelhead, and bull trout for food and space; competition for spawning sites; and the potential for juvenile bull trout predation by salmon and steelhead.

The risk of introducing diseases that may affect bull trout is considered discountable. There have been no direct disease impacts noted across the range of bull trout and it is assumed no known diseased hatchery fish would be released. The risk of introducing whirling disease, specifically, is considered low. Although whirling disease has been found in Washington (Grande Ronde system) it would most likely have to be accidentally introduced into the Lewis River system because the risk of it spreading naturally is considered low.

Marine-Derived Nutrients

Reintroduction of anadromous fish to the upper watershed will have an indirect benefit to bull trout by restoring MDNs back into the watershed. The watershed historically had anadromous fish access before the dams were built. The enrichment of the freshwater ecosystem from input of salmon carcasses may have far reaching benefits throughout the food web by increasing primary productivity. The increase in MDNs will likely increase the aquatic invertebrate biomass, thereby increasing the forage base for the reintroduced juvenile anadromous salmonids as well as juvenile bull trout and other native fishes. There are no data on the potential for MDNs to have adverse effects on the aquatic environment.

Interspecific Competition for Food and Space

The draft Lewis River Hatchery and Supplementation Plan (Mobrand-Jones & Stokes 2005) states "offspring of the adult salmon and steelhead plants are likely to residualize in large numbers in Swift [Creek] Reservoir." We anticipate the same to be true in Yale Lake and Lake Merwin as a result of downstream passage. With regard to potential competition for foraging, overwintering and rearing habitat in the reservoirs, juvenile adfluvial bull trout prefer colder water and are more closely associated with the deeper portions of lakes than other salmonids (Goetz 1989, Pratt 1992, Rieman and McIntyre 1993). Therefore, we do not anticipate a substantial degree of overlap in habitat use of the reservoirs by juvenile bull trout and reintroduced juvenile salmonids. In addition, juvenile bull trout may be more closely associated with the shoreline than juvenile coho salmon which may be more pelagic (Shrier, PacifiCorp, pers. comm. 2006). Bull trout distribution in lakes is likely a function of temperature (Pratt 1992). As a thermocline develops in a lake or reservoir, shoreline feeding declines and bull trout move to deeper, cooler waters further differentiating these species use of habitats and potential for competitive interactions.

In the stream environment, juvenile bull trout do not predominately occur in the same microhabitat niche as any *Oncorhyncus* species. Rather, bull trout are more benthic, nocturnal, and cryptic (Goetz *in litt.* 2006) than salmon and steelhead. Therefore, we do not anticipate substantial competitive interactions between reintroduced salmonid species and bull trout in stream environments.

The severity of competition, if it occurred, would probably increase over the period of implementation. It would likely be greatest after full reintroduction and when anadromous fish passage is in place. Adverse competitive interactions between the species could result if the population of reintroduced salmon and steelhead increased such that they were forced to use habitats marginal to those species but preferred by bull trout. This risk is considered greatest in the Yale Lake system as a result of limited available stream habitat for bull trout in Cougar Creek. However, because of niche partitioning and historic co-existence of these species in the Lewis River basin, we do not expect this potential competitive interaction for food and space to affect a large percentage of bull trout in Cougar Creek and thus we do not anticipate an appreciable reduction in the local population of bull trout in Yale Lake.

Competition for Spawning Habitat

Although coho salmon and steelhead spawning may improve spawning gravel conditions for bull trout the following fall through their excavation of redds which loosen and clean spawning gravels, reintroduced coho salmon pose a risk of competition for bull trout spawning habitats. Steelhead and Chinook salmon do not spawn during the same time as bull trout and therefore do not pose a risk of competition for available spawning grounds (Goetz *in litt.* 2006). Coho salmon are likely to compete with bull trout for available spawning habitat because their spawning period and preference for spawning habitat overlap (Goetz *in litt.* 2006, Pratt 2003, Burley *in litt.* 2006). "Coho spawning could have negative interactions for bull trout...with superimposition of spawning over existing bull trout redds and the loss of deposited eggs" (Pratt 2003). Frank Shrier (PacifiCorp, Portland, Oregon, *in litt.* August 2006) supports this possibility, stating that coho salmon spawn locally from October 15 through December 20, immediately after bull trout, which spawn from July 15 through October 5. He cites redd depths range from 0.18 to 0.39 m for coho salmon, and 0.16 to 0.46 m for bull trout. On the other hand, Dave Beauchamp (University of Washington, pers. comm. 2006) expects that "bull trout and coho salmon redds might segregate...spatially in response to subtle differences in thermal and substrate size preferences." F. Shrier (*in litt.* August 2006) supports this possibility, citing a spawning temperature range of 5.6 to 13 °C for coho salmon and 4 to 9 °C for bull trout.

Because coho salmon are able to spawn in a wide variety of habitats we expect the overlap in bull trout spawning grounds to be relatively small above Swift Creek Reservoir as a result of a large amount of spawning habitat available for coho salmon and the relative inaccessibility of Rush Creek to coho salmon. A potential for spawning overlap could occur in Pine Creek. Although specific spawning areas for bull trout are not known in Pine Creek it is believed substantial spawning habitat for bull trout and coho salmon occur in this system.

In the Yale Lake system, there are three high potential spawning locations for coho salmon: Cougar Creek, Siouxon Creek and the Bypass Reach. Bull trout do not spawn in Siouxon Creek. The risk of redd superimposition is considered greatest in Cougar Creek for the Lewis River core population due to the small size of the local population of bull trout and the historic use of Cougar Creek by coho salmon. Chambers (1956) documented coho salmon spawning in Cougar

Creek prior to construction of the Swift Dam; however, he did not document where the coho spawning occurred.

Bull trout are expected to spawn in the higher reaches of streams and are known to use stream gradients greater than 4 percent whereas coho salmon prefer gradients less than 4 percent (Sandercock *in* Groot and Margolis 1991). Therefore, the risk of redd superimposition is greatest in the lower reaches of Cougar Creek and Pine Creek, but we do not expect a full overlap of bull trout and coho salmon spawning as a result of stream gradient. This expectation is consistent with other systems where co-occurrence of these species occurs. Because coho salmon excavate deeper redds than bull trout, redd superimposition could result in the loss of some bull trout eggs, but a complete loss of bull trout spawning effort in Cougar Creek and Pine Creek is not anticipated. There are no spawning areas available to bull trout associated with Lake Merwin.

Reintroduction of coho salmon will occur in Yale Lake in Year 13. In Year 8 of the new licenses, PacifiCorp will begin the Yale segment of the Habitat Preparation Plan (HPP) which will include the release of hatchery coho salmon to spawn in the Yale Lake streams and thus prepare the spawning grounds for future reintroduced salmon and steelhead. These efforts will be monitored. This would require documentation of coho presence during the bull trout and kokanee spawning surveys (SA 9.6) and further evaluation of spawning activity in the 5 years prior to full reintroduction. If it were determined that redd superimposition may be occurring in Cougar Creek then this new information would be considered prior to Year 13 when the reintroduction efforts are scheduled to take place in order to limit future risk to bull trout from coho salmon presence in Cougar Creek

Coho salmon used the Bypass Reach historically and it is likely they would resume use of this area if stream flows and water temperatures were suitable after their reintroduction. The flow management regime proposed is likely to provide the appropriate environmental conditions for coho salmon use of the Bypass Reach. Based on available water temperature data, bull trout are likely to forage and overwinter in the Bypass Reach, but water temperature is likely to preclude successful spawning. If bull trout attempted to spawn in the Bypass Reach, spawning would be expected to fail because of water temperatures during the egg development stage. Therefore, even if redd superimposition of coho salmon over bull trout occurred in the Bypass Reach, there would be no population level effect as bull trout spawning would have failed despite the superimposition. Overall, coho salmon production in the Bypass Reach is likely to provide good foraging opportunities for adult bull trout.

Predation of Juvenile Bull Trout

Although the risk is considered low that reintroduced salmon and steelhead juveniles may prey upon juvenile bull trout, bull trout would be expected to actively prey upon the reintroduced juvenile salmonids while co-inhabiting the reservoirs. D. Beauchamp (pers. comm. 2006) supports this prediction:

> "Our operating hypothesis is that the [Skagit River] bull trout primarily function as a predator, starting at a fairly small size, so re-establishing anadromous fishes would probably be a net benefit to most life stages of bull trout. [Preliminary] data indicate that

bull trout ...have eaten steelhead, age-0 coho salmon, whitefish, sculpin, and perhaps spring Chinook salmon...Since some of the juvenile salmon might rear in the reservoirs for significant periods (especially Chinook, but possibly coho, too), they could be vulnerable to predation by bull trout there as well...I suspect predation by bull trout rather than competition for food would be the stronger interaction in the reservoirs..."

This risk of juvenile bull trout predation would probably increase over the period of implementation and be greatest after full reintroduction of salmon and steelhead and when bull trout passage is in place (Kirkendall *in litt.* 2006). The magnitude of the effect is unknown. However, we anticipate bull trout fry would be more susceptible to predation than larger juveniles. Fry typically emerge in February and occur in the upper watersheds when the feeding activity of the reintroduced species would be low due to cold water temperatures. In addition, bull trout fry tend to be cryptic and associated with the substrate which helps them avoid predation.

Under the proposed action, monitoring will be implemented to determine impacts on bull trout, if any, from the anadromous salmon reintroduction program. The SA (8.2.2.10) states the Hatchery and Supplementation Plan must contain "measures to minimize...negative impacts...on listed species." Section 9.7 commits PacifiCorp to "monitor ...the interaction between reintroduced... salmonids and resident fish." This monitoring program will provide a mechanism to implement adaptive management as new information becomes available to limit impacts to bull trout that may arise from competitive interactions.

Effects of Recreational Fishing on Bull Trout

With the reintroduction of anadromous salmonids, we anticipate recreational fishing pressure to increase possibly resulting in the bycatch of bull trout in the reservoirs and tributaries. Bull trout are known to be susceptible to angling pressures. However, angling, and the potential bycatch or harvest of bull trout, is managed through the Washington State Fishing Regulations, therefore, this potential indirect effect will not be addressed in this Biological Opinion as it is regulated by other means. As per the SA, PacifiCorp will provide an additional Law Enforcement Officer which will have indirect benefits to bull trout through the enforcement of the fishing regulations.

Summary of Effects of the Reintroduction of Anadromous Fish

Anadromous salmonid reintroduction could either increase or decrease the growth, survival, and resiliency of the Lewis River core population of bull trout. The reintroduction of salmon and steelhead will increase fish and primary production in the Lewis River basin thereby increasing the available prey base for bull trout. However, the reintroduction effort may also create interspecific competition between juvenile salmon, steelhead, and bull trout for food and space; competition for spawning sites; and the potential for juvenile bull trout predation. We anticipate only a small degree of overlap in habitat use of the reservoirs and tributaries by juvenile bull trout and reintroduced juvenile salmonids. We do not anticipate this level of competition for food and space to result in a decline in the local populations of bull trout. Coho salmon are likely to compete with bull trout for available spawning habitat. We consider the risk of redd superimposition to be greatest in Cougar Creek due to the small size of the Yale Lake local population of bull trout and the historic use of Cougar Creek by coho salmon. However, because bull trout are expected to spawn in the higher reaches of streams and are known to use stream gradients greater than 4 percent whereas coho salmon prefer gradients less than 4 percent, we do not expect a complete overlap in coho salmon and bull trout spawning. Therefore, even if redd superimposition occurred it is not expected to result in a complete loss of bull trout spawning effort. Monitoring will occur after the implementation of the HPP, but before the reintroduction efforts; therefore, if information is gained that demonstrates a high risk of redd superimposition adaptive management actions would be implemented to reduce this risk/impact. Bull trout fry would be susceptible to predation by the reintroduced species. However, since bull trout fry typically emerge in February when the feeding activity of the reintroduced species would be low and bull trout fry tend to be cryptic and associated with the substrate, we do not anticipate predation would result in population level declines of bull trout. In addition, if through monitoring it is determined the reintroduction efforts are having negative impacts on bull trout, adaptive measures would be taken to minimize these impacts.

Bull trout, Chinook and coho salmon and steelhead have co-existed and evolved sympatrically in the Lewis River and throughout most of the bull trout range (USFWS 2004b). Nonetheless it will take time to reach equilibrium between these sympatric populations that have been separated for over 60 years, and this equilibrium may be different than what existed prior to dam construction due to changes in habitat types and habitat availability within the watershed. The reintroduction of coho salmon poses the greatest risk of negatively affecting bull trout. Despite the potential for negative interactions, coho salmon and bull trout have co-evolved sympatrically in the Lewis River and in many other river basins, such as the Skagit and Snohomish rivers where they currently co-exist. Therefore, natural coho salmon production is not likely to eliminate bull trout production, but may cause reductions in at least the Yale Lake local population.

Overall, the anadromous fish reintroduction program will likely be beneficial by providing MDNs and increasing the forage base for bull trout. This strategy will be aided by the reintroduction schedule as laid out in the SA where salmon and steelhead are reintroduced above Swift Creek Dam 4 ½ years after the licenses are issued. Yale Lake reintroduction begins with the HPP calling for adults to be transported to Yale Lake 8 years after the licenses are issued. Finally, Merwin Lake reintroduction begins with the HPP in year 12 of the new licenses. This strategy allows time for assessments to occur prior to massive reintroductions at each project.

Project Element 2: Bull Trout Passage

The following proposed action and SA activities will be evaluated under this Project Element:

- *Upstream Passage*
    - *4.1.8 Mode of Transport*
    - *4.2 Merwin Trap*
    - *4.3 Merwin Upstream Collection and Transport Facility*
    - *4.7 Yale Upstream Passage*
    - *4.8 Swift Upstream Passage*
    - *4.10.2 Upstream Passage Absent Anadromous Facilities*

- *Interim Upstream Passage*
    - *4.9.1 Collect and Haul at Yale and Swift No. 2*
    - *4.9.2 Investigation of Alternative Collection Methods*
- *Interim Downstream Passage*
    - *4.9.3 Yale and Merwin Bull Trout Entrainment Reduction*
- *Downstream Passage*
    - *4.4 Passage at Swift Dam*
    - *4.4.2 Satellite Collector*
    - *4.4.3 Release Pond*
    - *4.5 Passage at Yale Dam*
    - *4.6 Passage at Merwin Dam*
    - *4.10.1 Downstream Passage Absent Anadromous Facilities*
    - *5.1 Yale Spillway Modifications*

Implementation of bull trout passage activities may negatively affect bull trout during collection, upstream or downstream transportation, handling, and release. However, bull trout passage at the facilities will provide substantial conservation benefits to the species by restoring connectivity of local populations within the core population as well as potentially allowing for the recovery of the anadromous form (if this life history were to be expressed in the population) in this core population which would strengthen the genetic resiliency of the core population. This project element will meet one of the key Recovery Plan Objectives for bull trout.

The magnitude of negative effects will depend on the bull trout attraction efficiency at each facility as well as the injury and mortality rates due to passage through the facilities, including both the mechanical effect of the structures and the effect of human handling.

Permanent Upstream Passage

4.1.8 Mode of Transport

At Yale Lake (Swift No. 2 tailrace) and Lake Merwin (Yale tailrace) the Utilities will continue to use their existing collect and haul process until full upstream passage is implemented. Prior to completion of upstream passage facilities at Yale Dam and the Swift Projects in Year 17, the Utilities in conjunction with the FWS and other entities will evaluate potential alternative methods to collect and haul. It is assumed if an alternative method of transport is chosen; the negative effects to bull trout would be no greater than the current effects of collect and haul.

4.2 Merwin Trap

At Merwin Dam there is no upstream passage for bull trout, nor have bull trout been captured in the Merwin Trap since 1992. Within a year after licensing, the Merwin Trap would be upgraded and any bull trout captured would be hauled to Yale Lake. In Year 4.5 the Merwin Trap would be further upgraded and a new sorting/transport facility would be built to achieve more efficient capture and handling of transport species (steelhead, coho salmon, Chinook salmon, cutthroat trout and bull trout).

Upstream fish passage will be designed to meet 99.5 percent adult bull trout survival and 2 percent injury standards; however, in the event those standards are not achieved, PacifiCorp will implement facility adjustments or modifications as directed by the Services pursuant to the SA. For purposes of this analysis, to be conservative, we assume that upstream passage survival will not meet 99.5 percent survival and 2 percent injury performance standards. Several studies have shown that entrance rates and overall steelhead passage success and survival exceeded 98 percent at each of the 5 mid-Columbia projects (Priest Rapids, Wanapum, Rock Island, Rocky Reach and Wells Dams) (Nordland, NMFS, pers. comm. 2006, as reported by Shrier, PacifiCorp, pers. comm. 2006). While actual data on bull trout upstream passage survival does not exist, it is reasonable to assume that bull trout would survive as well if not better than steelhead. Therefore, we will assume 98 percent adult bull trout survival. Injuries could occur such as descaling and abrasions from contact with the facilities or from human handling. To be conservative, we assume that injuries could affect up to 10 percent of the fish captured, but will not result in mortality. The current likelihood of bull trout being below Merwin Dam and being trapped is low. With the restoration provisions for bull trout passage, the probability of bull trout passing through this facility would increase over time. Bull trout passage over Merwin Dam will benefit bull trout through genetic exchange with other core populations through the restoration of connectivity.

Attraction flows and traps will be designed using the best available technology to meet the Adult Trap Efficiencies (ATE) stated in the SA. Although these standards will be designed to meet salmon and steelhead requirements, it is assumed the standards would also meet the needs for bull trout passage. Currently, the lowest ATE measured at Merwin Dam is approximately 52 percent. It is assumed the new designs would achieve substantially greater efficiencies although they cannot be determined precisely today. Assuming a worst-case ATE of 52 percent, the genetic benefits stated above would still be achieved. Since no bull trout are currently being passed over Merwin Dam, even if only half of the future potential migratory bull trout are safely passed above the dam this would be beneficial to bull trout genetics. In addition, not all migratory bull trout spawn every year so the potential loss of reproduction would likely be less than half which is an improvement over current conditions.

4.7 Yale Upstream Passage

In Year 17 a new permanent upstream trap will be built below Yale Dam. Upstream fish passage will be designed to meet 99.5 percent adult bull trout survival and 2 percent injury standards; however, in the event those standards are not achieved, PacifiCorp will implement facility adjustments or modifications as directed by the Services pursuant to the SA. For purposes of this analysis, to be conservative, we assume that upstream passage survival will not meet 99.5 percent survival and 2 percent injury performance standards. Several studies have shown that entrance rates and overall steelhead passage success and survival exceeded 98 percent at each of the 5 mid-Columbia projects (Priest Rapids, Wanapum, Rock Island, Rocky Reach and Wells Dams) (Nordland, NMFS, pers. comm. 2006, as reported by Shrier, PacifiCorp, pers. comm. 2006). While actual data on bull trout upstream passage survival does not exist, it is reasonable to assume that bull trout would survive as well if not better than steelhead. Therefore, we will assume 98 percent adult bull trout survival. Injuries could occur such as descaling and abrasions from contact with the facilities or from human handling. To be conservative, we assume that injuries could affect up to 10 percent of the fish captured, but will not result in mortality. Bull trout passage over Yale Dam will benefit bull trout through genetic exchange with other local populations through the restoration of connectivity.

Attraction flows and traps will be designed using the best available technology to meet the ATE stated in the SA. Although these standards will be designed to meet salmon and steelhead requirements, it is assumed the standards would also meet the needs for bull trout passage. Currently, the lowest ATE measured at Merwin Dam is approximately 52 percent. It is assumed, therefore, the new designs would achieve substantially greater efficiencies although they can not be determined precisely today. Assuming a worst-case ATE of 52 percent, the genetic benefits stated above would still be achieved. In Yale Lake, bull trout wanting to spawn upstream may spawn in Cougar Creek or they may not spawn thereby reabsorbing their eggs to spawn another time. This may or may not result in a risk of loss of reproduction that year by some percentage of migratory bull trout, the reason being that bull trout may or may not spawn every year. Some bull trout are repeat annual spawners but this behavior is not consistent in every population or even within a population (Shepard et al. 1984). The new permanent upstream trap would be expected to more safely and effectively collect and transport bull trout upstream, but at a minimum it would not result in a reduced ATE over current conditions. These measures would benefit bull trout spawning opportunities and genetic exchange.

4.8 Swift Upstream Passage

In Year 17 a new permanent upstream trap would be built somewhere between the Swift No. 2 tailrace and the Upper Release Point. Upstream fish passage will be designed to meet 99.5 percent adult bull trout survival and 2 percent injury standards; however, in the event those standards are not achieved PacifiCorp and Cowlitz PUD will implement facility adjustments or modifications as directed by the Services pursuant to the SA. For purposes of this analysis, to be conservative, we assume that upstream passage survival will not meet 99.5 percent survival and 2 percent injury performance standards. Several studies have shown that entrance rates and overall steelhead passage success and survival exceeded 98 percent at each of the 5 mid-Columbia projects (Priest Rapids, Wanapum, Rock Island, Rocky Reach and Wells Dams) (Nordland, NMFS, pers. comm. 2006, as reported by Shrier, PacifiCorp, pers. comm. 2006). While actual data on bull trout upstream passage survival does not exist, it is reasonable to assume that bull trout would survive as well if not better than steelhead. Therefore, we will assume 98 percent adult bull trout survival. Injuries could occur such as descaling and abrasions from contact with the facilities or from human handling. To be conservative, we assume that injuries could affect up to 10 percent of the fish captured, but will not result in mortality. Bull trout passage over the Swift projects will benefit bull trout through genetic exchange with other local populations through the restoration of connectivity.

It is assumed attraction flows and traps will be designed using the best available technology to meet the Adult Trap Efficiencies (ATE) stated in the SA. Although these standards will be designed to meet salmon and steelhead requirements, it is assumed the standards would also meet the needs for bull trout passage. Currently, the lowest ATE measured at Merwin Dam is approximately 52 percent. It is assumed, therefore, the new designs would achieve substantially greater efficiencies although they can not be determined precisely today. Assuming a worst-case

ATE of 52 percent, the genetic benefits stated above would still be achieved. Bull trout wanting to spawn upstream of Swift Creek Reservoir may drop back down into Yale Lake and spawn in Cougar Creek or they may not spawn thereby reabsorbing their eggs to spawn another time. This may or may not result in a risk of loss of reproduction that year by some percentage of migratory bull trout, the reason being that bull trout may or may not spawn every year. Some bull trout are repeat annual spawners but this behavior is not consistent in every population or even within a population (Shepard et al. 1984). The new permanent upstream trap would be expected to more safely and effectively collect and transport bull trout upstream, but at a minimum it would not result in a reduced ATE over current conditions. These measures would benefit bull trout spawning opportunities and genetic exchange.

It is assumed based on strong homing behaviors of bull trout, that Cougar Creek bull trout would not likely be captured and hauled above Swift Dam. If Cougar Creek bull trout entered the upstream trap and they were transported into Swift Creek Reservoir they would spawn in Pine or Rush Creeks, not spawn due to disorientation, or move back downstream through the Swift downstream collector into Yale Lake. The most likely outcome is that the Cougar Creek bull trout would migrate back downstream into Yale Lake. Similarly, it is assumed any Rush or Pine Creek bull trout that migrated downstream into Yale Lake would be attracted to the Swift upstream facility due to a strong desire to move upstream to spawn in their natal streams.

4.10.2 Upstream Passage Absent Anadromous Facilities

At Year 17 if no anadromous upstream facilities are built at the Yale and Swift facilities, the Utilities will continue to collect and haul bull trout or provide other permanent bull trout passage that meets or exceeds the collect and haul methods currently being used. The effect of this option would be to maintain or improve bull trout passage as it exists in Year 17.

Interim Upstream Passage

Schedule 4.9.1 describes the interim upstream passage requirements for the Yale and Swift facilities as:

> "**YALE AND SWIFT NO. 2 TAILRACE BULL TROUT COLLECTION AND TRANSPORTATION**
>
> PacifiCorp for Yale, and Licensees for Swift No. 2, implement an annual bull trout collection and transport program. Currently, PacifiCorp contracts with WDFW for portions of this program, but PacifiCorp and Licensees have the obligation for the program, as described in this schedule.
>
> Bull trout are captured from the Yale and Swift No. 2 tailwaters using variable mesh gill nets (0.75 – 3 inch stretch). Collection activities begin in June to allow captured bull trout time to acclimate to their release sites and possibly provide better representation in the Cougar Creek counts. Collection typically occurs between the hours of 0800 and 1200 depending on operational constraints. During collection, the Yale powerhouse generators are taken off-line to enable deployment of the nets. Swift No. 2 does not need to be offline for collection due to the configuration of the tailrace. The duration of

collection depends on the number of bull trout captured and time of year. Initially, collection occurs once-a week. As time nears the bull trout spawning period, collection frequency increases to twice per week. If bull trout are not captured in two successive trapping sessions, collection will be delayed for at least 1 week, but not more than 2 weeks. Collection attempts continue until September 30. To reduce the chance of injuring spawning bull trout, no collection will occur past this date.

The method for setting gill nets in the tailrace is as follows: The number of nets (or sets) deployed will be no more than 3 per boat. This is necessary to reduce the amount of time a bull trout may be entangled in the net. Nets are tied to the powerhouse wall and then stretched across the tailrace area using a powerboat. The nets are then allowed to sink to the bottom. Depending on conditions or capture rate, the nets are held by hand on one end or allowed to fish unattended. The maximum time nets are allowed to 'fish' unattended is less than 10 minutes. Upon capture of a bull trout, the fish is immediately freed of the net and placed in a live well. Once biological information is gathered (such as length and sometimes weight) and a Floy Tag ™ is inserted, the bull trout are placed in a water–filled, soft sided hypalon fabric tube with a metal ring at the top to hold it open. A rope is tied to the tube, which allows hatchery crews on the work platform to hoist the bull trout out of the tailrace area and into hatchery trucks. The entire process, from capture to hatchery truck, takes only a few minutes. Bull trout placed into hatchery trucks are transported to Yale reservoir and released either at Cougar or Yale Park. Swift No. 2 fish are taken to Cougar unless otherwise directed by the FWS. If necessary, the tank water will be tempered if a significant temperature difference (> 2 deg. C) exists between tank and reservoir water. Reservoir water temperature will be compared to transport tank water each time fish are released."

Prior to the operation of the Yale and Swift upstream facilities, under Section 4.9.2 of the SA, the Utilities will investigate the use of alternative methods to collect bull trout more safely and effectively than the method in use at that time. If more effective collection methods are identified, and the FWS concurs, those methods will be implemented. It is potentially possible that the investigation of alternative collection methods could temporarily decrease the efficiency of the collection method in comparison to that currently in use. However, these decreases in effectiveness would be readily apparent and the alternative collection method would be discontinued quickly. The effect of the investigation of the alternative upstream collection methods would be no appreciable decrease in the efficiency in the collection method or increase in injury, but it may result in finding an alternative method that is more effective than current methods.

During interim upstream passage, the collect and haul operations would occur as described above (according to Schedule 4.9.1 or as modified through investigation of alternative methods) until permanent upstream passage facilities expected to meet or exceed the current/interim collect and haul methods are provided. The effect of the interim upstream passage operations would be the potential to injure bull trout through descaling and other mechanisms, but this level of injury is not expected to result in eventual death of bull trout. The FWS anticipates no more than one bull trout would be killed per year as a result of the interim capture and haul operations. The capture and haul operations would benefit bull trout passage as described above.

Interim Downstream Passage

In a given year, we expect spent adult bull trout migrating downstream from spawning grounds to peak in late fall. Fry bull trout migrating downstream from incubation and early rearing areas are expected to peak in the spring around March and April while older juveniles are expected to migrate downstream in the fall (McPhail and Murray 1979). Spill events have typically occurred in December through February, when the downstream movement of bull trout juveniles is not likely although a potential exists for a few bull trout juveniles to migrate at any time of the year.

Effects of Spill

Regarding downstream passage over spillways, baseline conditions at the Swift projects and Merwin Dam will persist indefinitely while the conditions at Yale Dam will persist until spillway modification is complete in Year 4.5. There may be as many as 15 adult and juvenile bull trout (primarily adults) entrained at the Yale and Swift Dam spillways when spill occurs, which on average is about once every 2.3 years (Table 6). This estimate of 15 bull trout is based on Yale tailrace collect-and-haul efforts which have collected as many as 19 bull trout in one season with an average of 10 per year when the projects spill. This was estimated as the midpoint between the annual mean and the maximum annual estimated entrainment. Survival at the Swift Dam spillway is expected to be low. For Yale Dam, the majority of bull trout entrained in the spillway will likely survive to reside in Yale Lake. There is some evidence adult bull trout residing in Lake Merwin entered there through Yale spillway since spawning habitat does not exist in Lake Merwin tributaries (Shrier, PacifiCorp, pers. comm. 2006). The movement of adult bull trout from their spawning habitat to their downstream overwintering habitat can occur during the winter spill period. However, given the Lewis River bull trout population is adfluvial, we do not expect many adult bull trout to migrate farther than their lake of origin after spawning. Experience at Baker Dam, where bull trout exist, shows an average of four bull trout juveniles are captured in the existing floating surface collector per day during the peak migrations (Puget Sound Energy 2006) suggesting that numbers of bull trout at the Lewis River dams are likely to be low in relation to the local bull trout populations. Downstream passage at the Merwin spillway is discountable due to the low probability of bull trout occurring downstream of the Yale tailrace.

Effects of Turbine Passage

The existing effects of downstream passage through turbines at Swift No. 1, Swift No. 2, Yale and Merwin Dams will persist until permanent downstream collectors are installed in License Years 4.5, 13 and 17, at Swift No. 1, Yale and Merwin Dams, respectively (Table 6). According to the SA, these facilities will be built to certain performance standards including an Overall Downstream Survival (ODS) of 75 percent. So, for the interim period until year 4.5 of the new licenses it is expected that loss of bull trout through turbine entrainment could be approximately three bull trout or less per year at Swift Dam and at Yale Dam. Given the type of turbines at Yale and Swift No. 1 and the net head at each project, survival through turbine entrainment is estimated to be about 45 percent (Eicher Associates 1987). Since there are presently so few bull trout in Lake Merwin and hydroacoustic tag surveys show the adults spend the majority of their time in the Yale tailrace, no effects are anticipated at Merwin Dam.

Swift No. 2 Canal

There are four features at the Swift No. 2 Canal that are unique to the Lewis River hydroelectric projects. These are the Upper Release Point, Canal Spillway, Canal Drain, and Surge Arresting Structure. The purpose of the Upper Release Point and Canal Drain is to release water into the Bypass Reach to meet minimum flow requirements. The Canal Drain is an existing open, lined pipe with a short drop at its outlet and is considered compatible to any fish wanting to safely exit the Canal via this structure. The Upper Release Point is a new facility and will be designed and built to accommodate fish that want to safely exit the Canal.

The Canal Spillway is an overflow weir and provides a safe exit for any fish wanting to exit the Canal. The Utilities anticipate using the Canal Spillway and wasteway for high flow events, operational reasons or during emergency circumstances as provided in SA 6.1.5a. We do not anticipate any negative effects to bull trout from the operation of the Canal Spillway and, in fact, view the operation of the Canal Spillway as a mechanism for bull trout to safely exit the Canal and return to the natural environment.

The Surge Arresting Structure (SAS) was designed and constructed during the Swift No. 2 canal rebuild to allow for an outlet at the Swift No. 2 intake for quick release of water in the event of an unexpected outage at the Swift No. 2 power plant. The SAS is set to open automatically and release flow in the equivalent of one turbine unit capacity (about 4,500 cfs) into Yale Lake. Since the SAS releases water through a cone-type valve, fish are not expected to survive going through this structure. The SAS can also pass flows when one or more Swift No. 2 turbines are off-line. We assessed the risk of mortality at this facility to be equivalent to that at Swift No. 1 Dam assuming $\leq$ 3 bull trout per year move through the Swift No. 1 turbines and into the Swift No. 2 canal prior to installation of the downstream collector. The SAS is expected to be used infrequently resulting in no more than 3 bull trout per year being killed by this structure (Table 7). The SAS would not affect all bull trout that entered the Power Canal because some would leave the canal through the Upper Release Point, the Canal Spillway, or the Canal Drain.

Table 7. Estimated annual mortality of interim downstream passage on bull trout at the Lewis River dams.

Site	Passage through collector or turbine	Passage over spillway	Passage through Upper Release Point	Passage through Canal Drain	Passage through Surge Arresting Structure
Swift No. 1	$\leq$ 3 bull trout/year for Swift No. 1 and No. 2 together until installation of downstream collector in year 4.	$\leq$ 15 bull trout/year in years of spill; spills are expected to occur, on average, every 2.3 years.	No mortality, designed to be fish friendly	N/A	N/A

Swift No. 2			No mortality due to low head spill. Also provides avenue for bull trout to leave canal safely.	N/A	No mortality, passive exit structure	≤ 3 bull trout/year
Yale	≤ 3 bull trout/year for Yale Dam until installation of an entrainment reduction device by November 2007 which would reduce the potential for entrainment.		≤ 15 bull trout/year in years of spill; spills are expected to occur, on average, every 2.3 years.	N/A	N/A	N/A
Merwin	Not anticipated due to effect of upstream dams on bull trout abundance in Lake Merwin.		Not anticipated due to effect of upstream dams on bull trout abundance in Lake Merwin.			

Downstream Passage and Permanent Collectors

Downstream passage facilities will be constructed to meet 99.5 percent downstream bull trout survival and 2 percent injury standards; however, in the event such standards are not achieved, PacifiCorp will implement facility adjustments and modifications as directed by the Services pursuant to the SA in an effort to achieve those standards. We expect high survival of captured individuals, but for the purpose of this Biological Opinion, to be conservative, we assume downstream passage survival will not be lower than 98 percent and injury will not be greater than 10 percent.

For those bull trout that are not captured and become entrained, we expect that about 1 percent of those bull trout could survive below Merwin Dam having passed through all the projects. This estimate is based on the 100-year population cycle model used in the Lewis River Fish Planning document (PacifiCorp and Cowlitz PUD 2004). Based on experiences at Baker Dam, the potential loss of bull trout from downstream passage either through the collection system or through the turbines is less than 2 fish per day during peak migration. Therefore, with surface collectors and entrainment reduction equipment in place along with spillway improvement, annual entrainment into the turbines is estimated to improve slightly to ≤ 2 bull trout per year at Swift Dam and at Yale Dam and for entrainment at the spillways to be ≤ 12 bull trout in years when spills occur at Swift Dam and ≤ 8 bull trout in years when spills occur at Yale Dam (Table 8).

Table 8. Estimated annual bull trout mortality from downstream passage after permanent facilities are constructed at the Lewis River dams.

Site	Passage through collector or turbine	Passage over spillway	Passage through Upper Release Point	Passage through Canal Drain	Passage through Surge Arresting Structure
Swift No. 1	≤ 2 bull trout/year for Swift No. 1 and No. 2 together	≤ 12 bull trout/year in years of spill; spills are expected to occur, on average, every 2.3 years.	No mortality, designed to be fish friendly	N/A	N/A
Swift No. 2		No mortality due to low head spill and provides avenue for bull trout to leave canal safely.	N/A	No mortality, passive exit structure	≤ 2 bull trout/year
Yale	≤ 2 bull trout/year for Yale Dam	≤ 8 bull trout/year in years of spill; spills are expected to occur, on average, every 2.3 years.	N/A	N/A	N/A
Merwin	Not anticipated because downstream migrants at Yale Dam will be transported to below Merwin Dam.	Not anticipated because downstream migrants at Yale Dam will be transported to below Merwin Dam.			

Bull trout collected at the downstream surface collectors will encounter a separator as soon as they enter the main body of the collector. The separator will segregate bull trout into three size categories: adult, smolt-size, and fry. Adult bull trout (estimated to be two bull trout per day during peak migration) will be netted from the separator and placed into a transport tank as soon as possible. It is assumed these adult bull trout are making an effort to move downstream so they will be transported to the next reservoir downstream, adults collected in the Merwin forebay will be released downstream. This protocol may change once more is understood about adult behavior in the Lewis River core population. Therefore, based on new information, adult bull trout may be moved to another location besides downstream if the science is sufficient to determine where the adult bull trout are attempting to go.

Smolt-size juvenile bull trout that enter the separator (estimated to be two bull trout per day during peak migration) will be processed together with the other downstream migrating salmonids and hauled to the Release Pond. During peak migration times there could be as many as 48,000 salmon, steelhead, and cutthroat trout juveniles passing through the floating surface collector per day. Even though the SA calls for the FWS to determine where to place juvenile bull trout, the sorting of bull trout from amongst the other fishes is not necessary for the following reasons:

1. With 48,000 downstream migrants and only 2 of them likely to be juvenile bull trout, all of the fish would need to be anesthetized in order to locate the bull trout juveniles. This places undue stress on the bull trout and the rest of the fish in the collector and may cause unnecessary mortalities; and

2. The Cowlitz River collector can currently handle approximately 10,000 to 12,000 fish per day for sorting. If 48,000 fish were to come through the collector at any Lewis River project, it is unlikely they could all be processed in one day resulting in significant delays for bull trout and other species potentially causing injuries or mortality from overcrowding.

Bull trout fry will be separated from adults and smolt-sized fish and will be transferred to a fry tank for transport. The SA states that bull trout fry collected in Swift and Yale forebays will be released into Yale Lake, and that bull trout fry collected in the Merwin forebay will be released back into Lake Merwin.

Migration delays can be expected at fish passage facilities because bull trout may either have difficulty finding the entrance or be hesitant to enter the passage facility, and at least some delay would occur while bull trout are held in the holding area of the collection facility before they are transported. Bull trout, on the other hand, may choose to remain in the collection facility to capitalize on foraging opportunities. Short delays in downstream migration are likely to have little impact on bull trout survival, but long delays could result in increased predation by larger bull trout. It is assumed the passage facility will be designed correctly and sufficient attraction flows would be provided, thus only temporarily delaying migrations without the risk of mortality.

Although the installation of downstream bull trout passage facilities would be an improvement over the present condition, some injury and mortality may still occur as a result of the collection, temporary holding and transport of bull trout. The injury standard stated in the SA (SA 4.1.4b) will provide a mechanism to assess injury and make adjustments to prevent future injury to bull trout passing through a facility. We therefore anticipate a low incidence of injury at these fish passage facilities.

Satellite Collection Facility

A satellite collection facility is anticipated for the mainstem Lewis River where it enters Swift Creek Reservoir. This facility may be used for either supplementing spring Chinook outmigrant capture or as a capture facility to mark downstream migrants for fish passage evaluations. There is no intention to mark bull trout for evaluations at this facility so we expect bull trout to simply be counted and released back to the mainstem Lewis River without injury. The capture facility may cause some delay in downstream migrating bull trout juveniles but we do not anticipate delays that would cause injury or a significant disruption in their downstream migratory behavior because the collection facility would be checked daily.

Swift No. 2 Canal

There are four features at the Swift No. 2 Canal that are unique to the Lewis River hydroelectric projects. These are the Upper Release Point, Canal Spillway, Canal Drain, and Surge Arresting Structure. The purpose of the Upper Release Point and Canal Drain is to release water into the Bypass Reach to meet minimum flow requirements. The Canal Drain is an existing open, lined pipe with a short drop at its outlet and is considered compatible to any fish wanting to safely exit the Canal via this structure. The Upper Release Point is a new facility and will be designed and built to accommodate fish that want to safely exit the Canal.

The Canal Spillway is an overflow weir and provides a safe exit for any fish wanting to exit the Canal. The Utilities anticipate using the Canal Spillway and wasteway for high flow events, operational reasons or during emergency circumstances as provided in SA 6.1.5a. We do not anticipate any negative effects to bull trout from the operation of the Canal Spillway and, in fact, view the operation of the Canal Spillway as a mechanism for bull trout to safely exit the Canal and return to the natural environment.

The Surge Arresting Structure (SAS) was designed and constructed during the Swift No. 2 canal rebuild to allow for an outlet at the Swift No. 2 intake for quick release of water in the event of an unexpected outage at the Swift No. 2 power plant. The SAS is set to open automatically and release flow in the equivalent of one turbine unit capacity (about 4,500 cfs) into Yale Lake. Since the SAS releases water through a cone-type valve, fish are not expected to survive going through this structure. The SAS can also pass flows when one or more Swift No. 2 turbines are off-line. Once permanent collectors are constructed, we assessed the risk of mortality at this facility to be equivalent to that at Swift No. 1 Dam assuming ≤ 2 bull trout per year move through the Swift No. 1 turbines and into the Swift No. 2 canal. The SAS is expected to be used infrequently resulting in no more than 2 bull trout per year being killed by this structure. The SAS would not affect all bull trout that entered the Power Canal because some would leave the canal through the Upper Release Point, the Canal Spillway, or the Canal Drain.

Release Pond

A release pond will be constructed about ½-mile downstream of the City of Woodland and upstream of the confluence of the East Fork Lewis River with the mainstem Lewis River. The release pond will serve as the site for release of all downstream migrants captured at the floating surface collectors. The main purpose of the release ponds is to allow for an assessment of downstream transport survival. Downstream migrants will be held in these ponds for about 24 hours and volitionally released into the mainstem Lewis River. Any bull trout juveniles that are transported to this site will be released along with the rest of the downstream migrants. We do not anticipate any bull trout mortality during this operation because similar facilities on the Cowlitz River hydroelectric project exhibit high survivals for juvenile salmonids transported and released there (LaRaviere, Tacoma Power pers. comm. 2006).

Bull trout Passage Summary

Implementation of bull trout passage activities may negatively affect bull trout during collection, upstream or downstream transportation, handling, and release. However, bull trout passage at the facilities will provide substantial conservation benefits to the species by restoring connectivity of local populations within the core population as well as potentially allowing for the recovery of the anadromous form (if this life history were to be expressed in the population) in this core population which would strengthen the genetic resiliency of the core population. This project element will meet one of the key Recovery Plan Objectives for bull trout. However, all bull trout passage features, while beneficial overall, may injure or kill a small number of bull trout (Tables 7 and 8).

Upstream survival at each of the facilities is expected to be at least 98 percent of the adult fish captured. Injuries could occur such as descaling and abrasions from contact with the facilities or from human handling. To be conservative, we assume that injuries could affect up to 10 percent of the bull trout captured and are not expected to result in mortality. We assume all facilities will attract and capture at least 52 percent of all adult bull trout attempting to migrate upstream to spawn. Under the *Interim Upstream Passage,* no more than 1 bull trout per year is expected to be killed and a small number of bull trout may be injured that would not result in eventual death.

There may be as many as 15 adult and juvenile bull trout (primarily adults) entrained at the Yale and Swift Dam spillways when spill occurs, which on average is about once every 2.3 years. Survival at the Swift Dam spillway is expected to be low. For Yale Dam, the majority of bull trout entrained in the spillway will likely survive to reside in Yale Lake. Downstream passage at the Merwin spillway is discountable due to the low probability of bull trout occurring downstream of the Yale tailrace.

The existing effects of downstream passage through turbines at Swift No. 1, Swift No. 2, Yale and Merwin Dams will persist until permanent downstream collectors are installed in License Years 4.5, 13 and 17, at Swift No. 1, Yale and Merwin Dams, respectively. For the interim period until year 4.5 of the new licenses it is expected that loss of bull trout through turbine entrainment could be approximately 3 bull trout or less per year at Swift Dam and at Yale Dam. In the absence of data from the Lewis River, the settlement parties assumed that turbine survival was zero; however, based on Eichner Associates (1987), given the type of turbines at Yale and Swift No. 1 and the net head at each project, survival through turbine entrainment is estimated to be about 45 percent. Since there are presently so few bull trout in Lake Merwin and hydroacoustic tag surveys show the adults spend the majority of their time in the Yale tailrace, no effects are anticipated at Merwin Dam.

Entrainment into turbine intakes will be greatly reduced by the construction of the downstream floating surface collectors and the installation of forebay entrainment reduction equipment. We expect high survival ($\geq$ 98 %) of captured individuals and assume no more than 10 percent will be injured, but for those bull trout that are not captured and become entrained, we expect that about 1 percent of those bull trout could survive below Merwin Dam having passed through all the projects. Therefore, with surface collectors and entrainment reduction equipment in place along with spillway improvement, annual entrainment into the turbines is estimated to improve slightly to $\leq$ 2 bull trout per year at the Swift projects and at Yale Dam and for entrainment at the spillways to be $\leq$ 12 bull trout in years when spills occur at Swift Dam and $\leq$ 8 bull trout in years when spills occur at Yale Dam (Table 8). The assessed risk of mortality at the SAS is $\leq$ 3 bull trout per year when operated. The downstream surface collectors and satellite collectors may cause slight delays in bull trout migration that are not anticipated to cause a significant disruption in their behavior.

The proposed improvements in bull trout passage would tend to increase population size by reducing previous mortality from entrainment into the powerhouses, spillways and surge arresting structure, and indirect mortality from delay or blockage of migration. The improvements would tend to expand the distribution of the population because more suitable habitat would be available to each individual passing between the projects.

Bull trout passage will facilitate expression of any migratory tendency innate in the local populations but not allowed by existing dams. That is, an anadromous and fluvial component may develop in the core population. Increased variability in life history would enable the population to take advantage of different environments not previously available after dam construction, and thus we anticipate an overall increase in the population and its resiliency.

The persistence of the Cougar Creek local population would be more likely because of the bull trout passage provisions. Removal of artificial barriers may restore the genetic integrity of the local populations. Isolation of local populations would decrease with construction of the passage facilities. We expect passage-related mortality due to handling to be low enough as to not affect population persistence given the beneficial effects of providing passage.

Project Element 3: Instream Construction and Habitat Restoration

Proposed activities with at least some components that may occur in fish-bearing waters include:

1. An unspecified number of acclimation ponds on or upstream of the reservoirs to imprint hatchery-reared salmonids on local water sources.
2. Three floating collectors, one in each reservoir forebay to capture downstream migrant salmonids, plus facilities to haul them downstream.
3. If needed, one floating collector at the head of Swift Creek Reservoir to capture downstream migrant spring Chinook salmon, plus facilities to haul them downstream.
4. Upgrades to the existing upstream migrant collect-and-haul facility at Merwin Dam.
5. Construction of two new upstream migrant collect-and-haul facilities, one each at Yale and the Swift Projects.
6. Construction of a release pond along the Lewis River near the town of Woodland for observation of fish trapped at the reservoirs and hauled downstream.

7. Removal of rock outcrops that may be a hazard to downstream migrant fish from the base of the Yale spillway.
8. Additional instream habitat improvements in the existing Constructed Channel.
9. Construction of the Upper Release Point and a fish-friendly channel from there to the Bypass Reach.
10. Enlargement of several existing boat launches.
11. Repair to the intake pump and associated screens at the Speelyai Hatchery.
12. Gravel augmentation in the Bypass Reach, and, if needed, below Merwin Dam.
13. Instream habitat improvement under the Aquatic Fund at three known sites on Pine Creek not on U.S. Forest Service land. Helicopters will install clusters of boulders, logs, and rootwads in the channel migration zone. Due to the high quality of habitat in Cougar Creek and PacifiCorp's conservation covenant in the watershed, there are no habitat improvement projects proposed in Cougar Creek. All Aquatic Fund projects on U.S. Forest Service land will be consulted on under section 7 of the ESA as separate actions. Therefore, such projects are not considered part of the proposed action in this consultation.

Sediment Impacts

Mechanism of Effect

Instream or near stream construction can result in elevated sediment levels that arise from resuspension of instream sediment or by entry of material from onshore. Construction can result in several short-term impacts on bull trout or their prey base (Table 9). These mechanisms may act simultaneously and are not arranged in any particular order of severity, but rather, taken as a group, form the basis for determining the Severity of Effect score as described below.

Table 9. Mechanism of effects to bull trout resulting from elevated suspended sediment.

Sediment Impacts to Bull trout	**Summary of Adverse Affects Related to Suspended Sediment**
Gill trauma	Sediment can clogs gills which impedes circulation of water over the gills and interferes with respiration.
Prey base	Sediment can disrupt both habitat for and reproductive success of macroinvertebrates and other salmonids that serve as bull trout prey.
Feeding efficiency	Sediment can reduce bull trout visibility which can impact feeding rates and prey selection.
Habitat	Sediment can fill pools, and simplify and reduce suitable habitat.
Physiological	Sediment can increase stress, resulting in decreased immunological competence, growth and reproductive success.
Behavioral	Sediment can result in avoidance and abandonment of preferred habitat.

Effect of Specific Activities on Bull Trout from Suspended Sediment

Construction activities associated with existing structures are not expected to adversely affect bull trout in that they are not likely to cause elevated suspended sediment levels; these include activities Nos. 4 and 11.

Activities Nos. 2, 3, 5, 7, and 10 are likely to resuspend sediment entirely within the reservoirs, outside of flowing waters. Activities Nos. 2 and 3 are not expected to appreciably affect bull trout because they require little or no alteration of the shoreline, and because any resulting sediment would not travel far from the construction site thereby limiting the potential exposure to bull trout. Activity No. 5 would be unlikely to elevate sediment level if they were built entirely inside the existing powerhouses or the protected shorelines adjacent to them. This activity could, however, detectably elevate sediment in the tailrace if the new trap were to expand the footprint of the existing powerhouses; see discussion below. Activity No. 7 would leave fine material at the base of the Yale spillway which would be washed into the tailrace during spill, when background turbidity would probably be so high that material left over from the spillway modification would not detectably add to background levels. Activity No.10 would be done primarily in the dry with only minor amounts of sediment being detectable during a rising reservoir stage that are not expected to appreciable affect bull trout.

Activities Nos. 1, 5, 6, 8, 9, 12, and 13 are likely to resuspend detectable levels of sediment into a stream channel. Activity No. 1, construction of acclimation ponds, could significantly increase sediment levels and therefore affect bull trout if the activity occurred inside an occupied reach or if the sediment plume extended downstream into an occupied reach. Activity No. 5, construction of a permanent upstream migrant trap at an undetermined point along the Bypass Reach, which would occur after flow was provided at the Upper Release Point, is likely to affect rearing bull trout wherever it may be built. The effect of Activity No. 6 would be discountable at present, because bull trout are highly unlikely to occur near Woodland, Washington. If a migratory component of the bull trout core population developed in the future, it is assumed construction would not occur during migration and the impacts to bull trout would still be insignificant due to a low likelihood of bull trout presence during construction. Activity No. 8 is likely to elevate sediment levels in the vicinity of bull trout because the species is likely to be rearing in the Constructed Channel. Activity No. 9 may elevate sediment levels as far downstream as the lower Bypass Reach which supports bull trout, but the effect is expected to be insignificant because this point is greater than 600 feet downstream from the construction site. Activity No. 12 could significantly elevate sediment levels in the Bypass Reach downstream of the Constructed Channel, and could have the same effect in the Bypass Reach upstream of the Constructed Channel if that reach was receiving flow from the Upper Release Point at the time of gravel augmentation. Gravel augmentation below Merwin Dam would have discountable effects on bull trout for the same reasons as Activity No. 6. Activity No. 13 could cause a significant short-term rise in sediment levels with the potential to adversely affecting bull trout in Pine Creek.

Magnitude of the Effect

Exposure of bull trout to excess sediment is likely to occur at random intervals during the construction period associated with activities Nos. 1, 5, 8, 12 and 13. We assume the potential exposure of bull trout to excess sediment will occur up to 8 hours a day, for one or more days between July 1 and September 30. This is based on the assumptions that 1) all instream work done in one day is completed in an 8-hour shift, 2) elevated turbidity declines within a short time after the shift ends, 3) in-water work will take more than one day to complete, and 4) the work is likely to take place in the summer low flow season. Effects will probably subside within a day after construction or peak flow events. Sedimentation may reoccur one or more times during the next high flow season, as rising stream stage resuspends fine materials left from construction and runoff brings material from newly-disturbed surfaces at the construction site into the stream.

To calculate the minimum intensity and duration of the rise in suspended sediment which supports that at least one of the adverse effects in Table 8 would occur, we followed the guidance of Newcombe and Jensen (1996). We determined that a Newcombe and Jensen Severity of Effect Score of at least "6" was the threshold of when adverse effects would occur because only adult and juvenile bull trout are likely to be present at instream construction sites, not eggs or alevins. This score represents several combinations of rise in suspended solids, measured in milligrams per liter (mg/L), and the duration of this rise, measured in hours or days.

To estimate the rise in suspended sediment we assume the actions will meet, but will not exceed, the standards (RCW 940.48 and WAC 173-201A) set forth by the Washington Department of Ecology (2003). This standard is based on the Washington Department of Ecology class of project waters, which in this case are "AA," "A," or "Lake" (DEIS Table 3.3.2-5). For these waters, turbidity, measured in Nephelometric Turbidity Units (NTU), may not exceed 5 NTU over background. To convert NTU to mg/L we used USGS data from the North Fork Lewis River immediately below Merwin Dam obtained from http://nwis.waterdata.usgs.gov/wa/nwis/qwdata/. We only considered data from July through September since construction would most likely be limited to those months. A total of 12 samples, taken from 1979 through 1986, generated a ratio of 2.7 mg/L per NTU. Thus, an increase of 5 NTU times 2.7 equals an increase of 13.5 mg/L in suspended solids. To evaluate the duration of elevated sediment we estimated that in-water work would occur during business hours, up to 8 hours a day. From these data we determined that adverse effects (Table 8) to bull trout would occur if the actions continuously exceeded background turbidity by 1,104 NTU for up to 1 hour, 406 NTU between 1 and 3 hours, or 149 NTU for up to 7 hours.

At the initial point of sediment disturbance, turbidity will be at concentrations that will adversely affect bull trout that are in the immediate vicinity. As the suspended sediment enters the stream and moves downstream, the concentration levels will become diluted and heavier particles will settle out. Even with the use of Best Management Practices for construction activities, these effects may occur as far downstream as 600 feet based on monitoring of other projects in western Washington. Therefore, the FWS anticipates that sediment/turbidity could adversely affect bull trout as described in Table 8 associated with activities Nos. 1, 5, 8, 12, and 13.

Spawning Gravel Embeddedness

Increased embeddedness is likely to occur during the construction period and possibly during post-construction runoff if there is not enough instream flow to remove excessive fine material. Increased embeddedness is most likely to be detectable between the habitat improvement and pond sites and the tail-out of the next pool downstream. We expect embeddedness to increase during each instream construction project. Embeddedness is expected to return to its natural level after the first few high-flow events in the fall after construction. However, if excessive fine sediment remains in place during bull trout spawning, the embedded streambed can make redd construction difficult and can impede respiration of deposited eggs, thus potentially decreasing their survival.

We assume that only those activities that may significantly elevate instream sediment levels can also significantly elevate sediment embeddedness. Thus, instream construction activities associated with Nos. 1, 5, 6, 8, 9, 12, and 13 could increase sediment embeddedness by resuspending instream sediment. Activities Nos. 1, 5, 6, and 13 could also increase embeddedness by way of surface runoff from the construction site.

However, not all of these activities are likely to have significant effects on bull trout. Activities Nos. 5, 8, 9, and 12 would be located in the Bypass Reach, Constructed Channel, and the Upper Release Point which are not likely to affect spawning grounds, because instream temperatures in the Bypass Reach appear too high, even with flow from the Canal Drain and Upper Release Point, to support bull trout spawning and egg survival in this location. Activity No. 6 and that portion of Activity No.12 which would place gravel between Merwin Dam and Woodland, Washington are not expected to significantly affect bull trout because there is an extremely low likelihood of bull trout spawning in this location. In the long-term, gravel augmentation in the Bypass Reach is likely to expand the rearing and foraging distribution of the Cougar Creek local population, both by providing potential interstitial cover and by expanding the spawning grounds of their reintroduced salmonid prey species. The net result should be increased resilience of the local Cougar Creek population.

The only activities remaining which may significantly increase embeddedness are activities Nos. 1 and 13, if acclimation ponds or instream habitat were located on or within one or two meander bends upstream of bull trout spawning grounds. Currently acclimation ponds are anticipated on the lower Muddy River, lower Clear Creek, and the upper mainstem Lewis River near the Lower Falls and habitat improvements are proposed for bull trout-bearing reaches of Pine and Rush Creeks. There is a high probability that bull trout will be present during and after anticipated instream habitat improvements in Pine Creek. There is less probability that bull trout will be present during and after construction of acclimation ponds, because of their anticipated locations. We expect habitat improvement projects to restore 1) the natural variability in local gradient and riffle/pool ratio, by turning excessively long runs into a series of riffles and pools, 2) natural variability in stream velocity, by placing energy-dissipating logs, and 3) the quality of spawning gravels, whose size composition will be chosen to meet the needs of reintroduced salmonids.

Potential for Direct Iinjury or Death

Activity No.12 may directly injure or kill bull trout that are present at the gravel augmentation sites by the placement of gravel in the wetted channel. However, injury or mortality is not considered likely due to the low likelihood of bull trout being present below Merwin Dam and for bull trout possibly residing in the Bypass Reach during construction it is assumed they will leave the site and seek refuge in deeper pools until the deployment of gravel is complete.

Project Element 4: Habitat Protection

Acquiring and protecting riparian buffers, old-growth stands, and covenant lands is expected to positively affect bull trout through:

- Decreased instream temperatures by allowing growth of trees that increase shade on the water surface;
- Reduced suspended sediment and restoration of streambank erosion to its natural range, by stabilizing the bank through root growth and by intercepting surface runoff from unprotected uplands;
- Reduced embeddedness and increased gravel porosity by reducing sediment input from the streambanks;
- Increased large woody debris as a result of allowing riparian trees to mature and allowing the stream channel to migrate naturally, thus recruiting large trees;
- Preserved refugia by securing the natural hydrologic processes that maintain local bull trout populations;
- Decreased width/depth ratios as a result of naturally stabilized banks; reduced ratio of peak/base flows by contributing to the hydrologic maturity of the watershed.

The effects of improved instream habitat and watershed function on the Lewis River bull trout core population may include increased population size, due to improved habitat quality; an expanded distribution, due to increased extent of suitable habitat; improved resiliency in population growth, due to improvements in both quantity and quality of habitat; and higher likelihood of persistence and genetic integrity, due to a combination of the above factors.

Project Element 5: Instream Flows

The following proposed action and SA activities will be evaluated under this Project Element:

- *Bypass Reach Flow*
  - *6.1 Flow Releases in the Bypass Reach: Constructed Channel*
  - *6.1.4 Interim Flow Schedule: Combined Flow Schedule*
- *Merwin Streamflow*
  - *6.2.1 Ramping Rates Below Merwin*
  - *6.2.2 Plateau Operations at Merwin Dam*
  - *6.2.4 Minimum Flows Below Merwin Dam*
  - *6.2.5 Low Flow Procedures*

Bypass Reach Flow
In their draft 401 Water Quality Certifications for Swift No. 1 and Swift No. 2, Washington Department of Ecology (WDOE) requires the following instream flow schedule, based on the SA flow provisions. These may be altered in the future by mutual agreement of WDOE and the Aquatic Coordination Committee (ACC) following the adaptive management process described in the SA (6.1.4.c).

For the Canal Drain release, the instream flow release will commence following completion of the Constructed Channel and will be 14 cfs. For the Upper Release Point, the instream flow release will commence following completion of the Upper Release Point and will follow the schedule provided in Table 10:

Table 10. Upper Release Point instream flows by month.

November 1 to November 15	76 cfs
November 16 to November 30	56 cfs
December 1 to January 31	51 cfs
February 1 to February 28 (29 on leap years)	75 cfs (74 cfs only for 1st week in leap year)
March 1 to May 31	76 cfs
June 1 to September 30	54 cfs
October 1 to October 31	61cfs

The proposed Upper Release Point is expected to supply sufficient instream flow to the upper Bypass Reach to support year-round bull trout use. The Utilities anticipate the releases will maintain instream temperature at the downstream end of the Bypass Reach at Swift No. 2 within the preferred range for spawning cutthroat trout, rainbow trout and mountain whitefish (FEIS Section 3.3.3.2, pg. 3-74). This temperature, while at times higher than the 12 °C optimum for bull trout rearing, may be sufficient to support bull trout use year-round, but is not expected to provide adequate temperatures for successful spawning in the Bypass Reach.

A 1999 evaluation (PacifiCorp & Cowlitz PUD 2002) looked at temperatures in the Power Canal at the Swift No.1 tailrace and several miles downstream at Swift No. 2. Neither location had optimum temperatures for bull trout reproduction in 1999, but individual bull trout would have been able to seek temperatures in which they could survive. Water temperatures did not drop to 9 °C or lower at either location until late in October or November. The temperatures did not fall to 7 °C until December. Pratt (2003 pgs. 8-9) confirmed that Swift No. 1 tailrace would not provide optimum temperatures during this period. Both the observed and the modeled temperature regimes peaked in October (PacifiCorp 2002 Section WTS-4), when spawning is expected. The observed peak temperature in 1999 was close to 14 °C. The modeled peak was 12 °C. This implies that optimum spawning temperatures would not occur in the Bypass Reach until November or December. Therefore, the temperature of the Bypass Reach flows, delivered from the Power Canal through the Upper Release Point and Canal Drain, while improving spawning conditions, are expected to delay or abort bull trout spawning.

The relationship between temperature and survival of eggs in the gravel depends upon timing of spawning, which warmer temperatures may delay. If we assume bull trout can delay spawning until temperatures drop to 7 °C, and temperatures continue to drop during the spawning period, then there may be some egg survival. If the adults do not delay spawning, then either they will reabsorb their eggs or they will spawn and expose their eggs to temperatures over of 10 °C, and mortality of eggs will likely occur (Pratt 2003).

Providing instream flow in the upper Bypass Reach will directly increase base flows. These relatively steady flows may increase the amount of off-channel habitat which could provide additional foraging areas for bull trout, may improve stream bank condition (through erosion, deposition, and revegetation), and may improve riparian function. These flows may also alter substrate character in the main channel of the Bypass Reach. Peak flows, resulting from periodic spill at Swift No. 1, will remain about the same as under current conditions, thus some of the benefits to bull trout may be overshadowed by the souring effects of spills. These flows will also provide bull trout access to the existing large deep pools in the Bypass Reach. Overall, instream flows in the Bypass Reach will contribute to restoration of the aquatic function of the Bypass Reach, but will not provide for successful bull trout spawning.

Steady flows from the Canal Drain will maintain stream bank condition, riparian function, and substrate character in the existing Constructed Channel. Natural channel migration may also indirectly create additional off-channel habitat for bull trout. This channel is isolated from the main Bypass Reach and is expected to be isolated from, and not affected by, periodic spill from Swift No. 1. As such, the benefits to bull trout from steady flows in the Constructed Channel are expected to accrue over the life of the licenses.

Merwin Streamflow

The proposed flow regime mimics the natural flow pattern although peak winter flows are lower and summer low flows are higher than historical (Figure 2). Given the size of the Lewis River downstream of Merwin Dam, the minimum flow of 1,200 cfs, and the lack of bull trout presence in the lower river currently, we do not expect Merwin flows to appreciably effect bull trout. If bull trout were to enter the lower Lewis River from the Columbia River, they would have access to diverse habitats (including pools interspersed with runs and small rapids, and cool water within the mainstem and in side-channel rearing areas in the lower 19 miles of the Lewis River. Assess to the upper watershed would be provided through passage facilities.

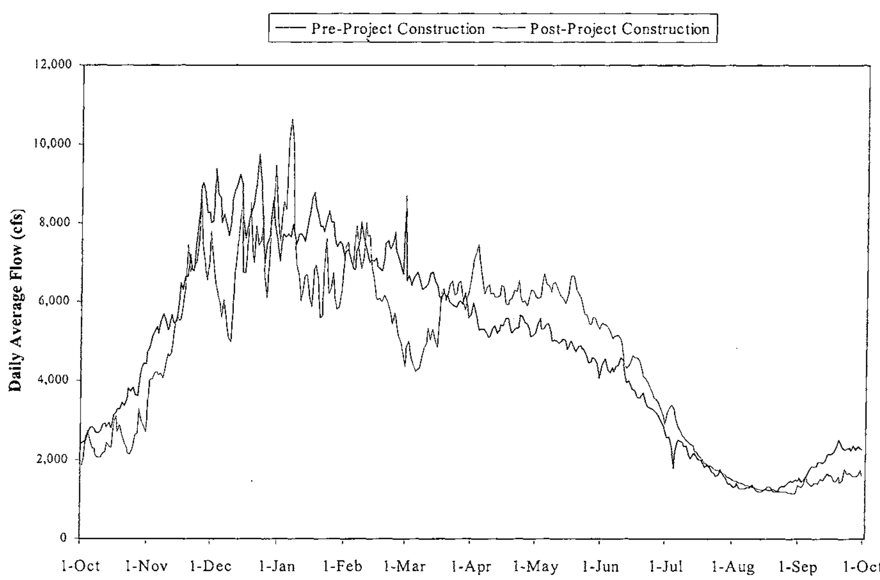


Figure 2. Pre-construction and post Merwin construction plot of average daily flow for pre- (October 1910 to July 1923) and post-construction (Water Year 1994 to present).

Project Element 6: Reduce Total Dissolved Gas (TDG)

The following proposed action and SA activities will be evaluated under this Project Element:

- *Water Quality Standards*
  - *401 Certifications*

Elevated total dissolved gas (TDG) pressures resulting from power generation with the Lewis River hydropower complex are limited to the Swift No. 1 tailrace, Swift No. 2 canal and the tailrace area immediately below the Yale Project. No WDOE exceedances have been observed in the Merwin tailrace (FEIS, Section 3.3.2.1, pg. 3-22). Water Quality Management Plans are a requirement of WDOE's draft Section 401 certifications. These plans call for monitoring of TDG in each of the project tailraces.

Total Dissolved Gas – Swift No. 1 Tailrace
For the Swift No. 1 project, TDG exceedances have been observed which are directly related to turbine operations in the inefficient range (typically when units are passing less than 1,000 cfs) (Shrier, PacifiCorp, pers comm. 2006). PacifiCorp is currently testing a new algorhythm to operate the air entrainment valves in a coordinated fashion with turbine operation. This procedure has been shown to bring the Yale project into compliance with the WDOE standard of less than 110 percent saturation. Once this procedure for TDG reduction is established, TDG will be monitored as provided in the WDOE 401 Certification.

Total Dissolved Gas – Swift No. 2 Tailrace
Prior to the embankment failure, Swift No. 2 generation did not result in TDG exceedances (PacifiCorp and Cowlitz PUD 2004). New turbines were installed at Swift No. 2 during reconstruction and TDG will be monitored as provided in the 401 Certification. Cowlitz PUD expects TDG in the Swift No. 2 tailrace to remain below WDOE standards.

Total Dissolved Gas – Yale Tailrace
Since installation of automated air entrainment valves at Yale, monitoring has shown that Yale is in compliance with TDG WDOE standards. TDG will be monitored as provided in the WDOE 401 Certification.

Total Dissolved Gas – Merwin Tailrace
While no exceedances have been observed in the Merwin tailrace, monitoring will be established and will be continued under the Water Quality Management Plan as provided in the WDOE 401 Certification.

With upstream passage facilities likely to be associated with project tailraces, TDG above WDOE standards would pose a threat to bull trout especially if they are held in shallower depths prior to removal from such facilities. The Merwin Upstream Transport Facility is the key to successful reintroduction efforts on the Lewis River and Merwin tailrace waters are expected to meet the WDOE's TDG standard during normal operations. Therefore, TDG are not expected to significantly impair bull trout in the Merwin tailrace.

The Yale tailrace TDG levels also meet WDOE standards and TDG are not expected to significantly impair bull trout present in the tailrace or accessing upstream passage facilities. Bull trout are known to frequent this area especially when turbine units are running since this operation provides cold water to the tailrace. Investigations have shown that juvenile salmonids that are allowed to seek greater depths in the presence of elevated TDG (119 percent to 128 percent saturation) did not suffer mortality (Bell et al. 1974). Backman et al. (1998) found a ten-fold increase in fish survival for juvenile salmonids that were able to move to deeper water to compensate for gas saturation. Since the Yale tailrace is over 60 feet deep and compensation depth is usually less than 7 feet, it is possible that bull trout could still take advantage of the cooler water in the Yale tailrace without experiencing gas bubble trauma.

We assume PacifiCorp, through its ongoing efforts, will resolve TDG exceedances in the Swift No. 1 tailrace and that monitoring of the new turbines at Swift No. 2 confirms that Swift No. 2 tailwaters continue to meet the WDOE standards. The Swift No. 2 tailrace is about 48 feet deep, allowing bull trout to move to deeper water to compensate for gas saturation if it were to be present. In addition, based on the design and/or function of the Upper Release Point, Swift No. 2 wasteway, Canal Drain, and SAS, we assume these structures do not produce or contribute to TDG exceedances in the Bypass Reach or Swift No. 2 tailrace. Therefore, TDG are not expected to significantly impair bull trout present in the Swift No. 2 tailrace, Bypass Reach, or the Power Canal.

Project Element 7: Rainbow Trout and Kokanee Stocking

Kokanee are not common in Swift Creek Reservoir. A naturally-reproducing population in Yale Lake spawns in Cougar Creek. Kokanee are maintained by hatchery production only in Lake Merwin. No change is proposed in the stocking of kokanee in Lake Merwin. Because kokanee are predominately plankton feeders and there are few bull trout are expected to be in Lake Merwin, the risk of bull trout being consumed by kokanee is discountable.

Under the SA, the same poundage of rainbow trout would be stocked in Swift Creek Reservoir as has been over the past 30 years. The stocking of rainbow trout in Swift Creek Reservoir has coincided with an increase in the bull trout's population despite major habitat perturbations (eruption of Mt. St. Helens). The previous stocking of 40 rainbow trout per pound corresponded to an average length of about 4 inches. This size class of rainbow trout likely provides a prey base for bull trout. Because rainbow trout, especially at this size, are predominately insectivorous, the risk of rainbow trout feeding upon bull trout fry is considered low. The overall effect of rainbow trout stocking on bull trout has likely been beneficial from the standpoint of providing a substantial prey base for bull trout.

The Hatchery and Supplementation Plan will include measures to minimize the potential negative impacts of hatchery fish on bull trout and other ESA-listed species (SA 8.2.2.10). Therefore, we assume if it is documented that stocked rainbow trout are adversely affecting the bull trout population actions would be taken to reduce these effects.

Project Element 8: Monitoring of Bull Trout

This element includes bull trout capture and tagging to estimate the adult population. Bull trout will not be handled and tagged to test the efficiency of upstream or downstream collect and haul facilities. Project Element 1 completely describes bull trout handling in routine passage operations. The description of Project Element 8 presented in here, plus the following analysis, along with the Incidental Take Statement in this Biological Opinion, provide sufficient information to serve in place of a Section 10(a)(1)(A) permit.

Adult bull trout will continue to be collected by netting at the head of the Swift Creek Reservoir, Swift No. 2 tailrace, and Yale tailrace. A permanent upstream collection facility somewhere between the Swift No. 2 tailrace and the Upper Release Point will eventually replace netting at the Swift No. 2 tailrace, and a permanent collection facility at the Yale tailrace will replace netting there. Adult bull trout are inserted with a Floy® tag in the spring of each year. During late summer and fall snorkeling surveys, all bull trout that are observed are counted and those with tags are noted thus providing a means to estimate the population without further handling. This method is not likely to significantly disrupt holding or spawning bull trout.

The effect of netting and capture depends on the degree of stress to individual bull trout; the amount of abrasion by entanglement, removal from nets, and activity in live boxes and holding tubes; the temperature and dissolved oxygen while the bull trout are being held or transported; and disorientation of bull trout upon release. The effect of gill netting has been minimized by using short sets (less than 20 minutes) or drift sets. Bull trout are usually entangled in netting for less than 10 minutes. Due to the long experience of State and Utility field technicians with juvenile and adult bull trout collection in the Lewis River, these potential effects are expected to be minimized to the greatest extent possible. The risk of mortality is expected to be $\leq$1 bull trout per year from these activities. From 2001 to 2005, 4 bull trout were injured and 1 bull trout was killed in gillnetting.

Project Element 9: Information and Education

This element will likely have a positive effect on bull trout by reducing incidental catch, minimizing incidental hooking mortality, and improving anglers' catch-and-release techniques.

Project Element 10: Wildlife Habitat Management Plans

The SA (10.8.1) calls upon the Utilities to execute Wildlife Habitat Management Plans consistent with specific standards and guidelines (EDAW 2006). Specific standards and guidelines that may affect bull trout include:

- **Old-Growth Habitat Goals and Objectives, Objective c:** Protect and manage forested buffers adjacent to streams, wetlands, and reservoir shorelines to promote the development of large trees where appropriate;

- **Riparian Habitat Goals and Objectives, objective a:** Identify and establish buffers to protect, maintain, and enhance riparian habitat structure and functions, using...300 ft or the height of 2 site potential trees, whichever is greater, for perennial fish-bearing streams that potentially support bull trout…;

- **Riparian Habitat Goals and Objectives, objective b:** Maintain a 200-ft buffer around the reservoirs to protect shoreline habitat as a minimum when planning forest management activities;

- **Riparian Habitat Goals and Objectives, Objective d:** Protect existing large snags in the riparian habitats; and

- **Riparian Habitat Goals and Objectives, Objective e:** Identify riparian sites damaged by anthropogenic processes and prepare restoration plans within 5 years of identification, if feasible.

The benefits of these standards and guidelines are similar to those discussed under Project Element 4, above. Although small amounts of sediment may enter bull trout water from restorative activities under these objectives, they are not anticipated to reach a level where they would be detectable to bull trout and therefore would be insignificant. The WHMP allows some timber harvest. On the stand scale, it appears that riparian buffers will be wide enough, and activities within them limited enough, to avoid detectable loss of streamside shade, increased suspended sediment carried into the stream from storm runoff, diminished LWD input, or accelerated streambank erosion. On the watershed scale, PacifiCorp's proposed timber management is not likely to significantly increase the peak/base flow ratio because most operations would not involve commercial thinning to a degree that would accelerate storm runoff. Even if a timber harvest did degrade the hydrologic maturity of a stand, the concentration of PacifiCorp lands at the lower point of small, hydrologically independent catchments along the shore of each reservoir, would prevent significant concentration of canopy removal in any one subwatershed.

The other standards and guidelines are not expected to appreciable affect bull trout except for **Public Access Management,** especially **Objective a:** Identify roads for closure and type of closure (abandonment, temporary closure, seasonal closure) to motorized use by the public, and schedule appropriate treatments… and **Objective f:** Consider buffers for wetland and riparian habitat and ways to minimize potential disturbances to wildlife, especially TES species.

These land management objectives are expected to contribute to reducing the ratio of peak to base flows in the watershed, and slightly decreasing the drainage network which would have beneficial effects on bull trout through slightly improved habitat conditions.

Summary of Effects

Overall, the long-term effects of the action on bull trout and its habitat would be beneficial. The action is likely to result in an increased bull trout population due to instream habitat enhancements, habitat protection, angler education, improvements in the Bypass Reach, guaranteed increased instream flows, passage for bull trout between the reservoirs, nutrient enrichment of the watershed, and an expanded prey base. The probable benefits of these elements are expected to offset the negative effects of anadromous steelhead and salmon reintroduction, injury or mortality to bull trout during passage or capture and handling, and sediment from instream construction.

Habitat restoration and reintroduction of salmon and steelhead, with its consequence of increased marine-derived nutrients and improved quality of spawning gravel, may improve bull trout survival from fertilization to emergence. The action will have a mixed effect on bull trout survival from emergence to juvenile out-migration from natal streams and continued rearing in the reservoirs, depending on the effects of competition and predation involving reintroduced species. The action will greatly improve adult bull trout passage from Yale Lake to Swift Creek Reservoir. The action may have a slight negative effect on adult bull trout before spawning due to instream construction, but habitat improvements are likely to benefit all life stages over the long-term. The action is not likely to reduce bull trout gamete survival and maturation before spawning. The action may have a mixed effect on bull trout spawning, depending on the effects of competition between the species for space, and superimposition of coho salmon redds on bull trout redds.

EFFECTS OF PROPOSED ACTION ON SPOTTED OWL

Conservation Role of Utility-Owned Lands for Spotted Owls

The draft recovery plan for the spotted owl identified specific conservation roles that non-Federal lands provide for the conservation and recovery of spotted owls. These roles include: 1) providing habitat (suitable or dispersal) to support the conservation of spotted owls in Federal reserves in areas where non-Federal lands are mixed with Federal lands, 2) providing for clusters of breeding pairs on non-Federal lands in locations where Federal lands are not adequate to provide for recovery, 3) provide habitat for existing spotted owl pairs to avoid take of those owls as defined by the ESA, and 4) providing dispersal habitat for connectivity between Federal reserves (U.S. Fish and Wildlife Service 1992b, p.106).

Much of the spotted owl habitat that occurs on Utility-owned lands is widely scattered in small patches, and much of this habitat does not exist in sufficient quantities to support territorial spotted owls on Utility-owned lands. However, these lands do support spotted owl territories with active nest sites off of Utility-owned lands, and these small patches of habitat are potentially important for spotted owl connectivity by providing important dispersal and foraging habitat functions for spotted owls dispersing across these lands between areas with large blocks of habitat on adjacent State and Federal lands.

Summary of Scientific Research Regarding the Effects of Timber Harvest to Spotted Owls

Habitat loss is a well-known factor influencing spotted owl populations throughout the species range, and is the primary reason the species was listed as a federally threatened species in 1990 (55 FR 26114-26194). Spotted owls have large home ranges encompassing thousands of acres of forest. Spotted owls prefer to use mature and old forest habitats, presumably because they are most effective at capturing their preferred prey in these habitats. Spotted owls move across their home ranges over the course of the year searching for prey (Forsman et al. 1984). Loss of suitable habitat reduces the amount of foraging area available and likely reduces the overall population and availability of prey, and thus reduces the capability of the landscape to support spotted owls. Landscapes below a certain threshold of habitat amount will not support spotted owls. Bart and Forsman (1992) found that spotted owls in some landscapes were capable of reproducing in areas with 20 to 40 percent suitable habitat. However, approximately 50 times more young spotted owls were fledged in areas with greater than 60 percent suitable habitat than in areas with less than or equal to 20 percent suitable habitat.

Timber harvest practices have the potential to reduce availability of spotted owl nest and roost sites. Spotted owls do not construct their own nests, but depend upon existing structures such as cavities and broken tree tops, characteristics associated with stands in later seral stages of development (Forsman et al. 1984; Buchanan et al. 1995; LaHaye and Gutiérrez 1999). Silvicultural prescriptions that specifically target the oldest, most-decadent trees in the stand for economic purposes, or require removal of hazard trees and snags to address human safety concerns, are likely to result in loss of nesting opportunities for spotted owls by removing the trees that contain those structures.

Removal or downgrading of habitat within home ranges, and especially close to the nest site, can reasonably be expected to have negative effects on spotted owls. Bart (1995) reported a linear reduction in spotted owl productivity and survivorship as the amount of nesting, roosting, and foraging habitat within a spotted owl home range declined. Timber harvest resulting in relatively open stands or patch clear-cuts can fragment forest stands, creating more forest edge, and reducing the area of interior old forest habitat (Lehmkuhl and Ruggiero 1991). Extensive habitat fragmentation has the potential to isolate individual spotted owls or populations of spotted owls by increasing distances between suitable habitat patches and reducing habitat connectivity. Such isolation decreases the likelihood of successful dispersal of juvenile spotted owls (Miller 1989).

Although there are recognized benefits to spotted owls from thinning, the effects of commercial thinning on spotted owls are unclear and not well documented in the published literature. In a recent scientific review of the status of the spotted owl, Courtney et al. (2004) identified spotted owl responses to various silvicultural treatments as an important research need. Hansen et al. (1993) suggest that commercially-thinned stands would be functionally non-suitable during project implementation because spotted owls are likely to avoid these areas during the commercial-thinning operation due to the presence of logging equipment and the activities associated with timber harvest. Meiman et al. (2003) tracked the response of a single male spotted owl following commercial thinning in young Douglas-fir stands in the Oregon Coast Range. The data collected in this study indicated that commercial thinning resulted in significantly reduced use of the thinned area during and after harvest, and a shift in use away from the thinned stand. Hicks et al. (1999) documented spotted owls using partially harvested stands for roosting 6 months after treatment, suggesting that use of thinned stands by spotted owls may occur rapidly following treatment in some areas.

In extreme cases, timber-harvest activities can result in direct mortality of adults, eggs, or young. Such cases are rare, but direct mortality due to timber felling has been documented (Forsman et al. 2002). The potential risk for spotted owls to be struck and killed or injured by falling trees during timber harvest is highest in the area relatively close to the nest tree. During timber harvest, non-breeding adult spotted owls can reasonably be expected to move away from the area and avoid injury. However, nesting spotted owls tending to reproductive activities such as incubation or brooding may be reluctant to leave the area (Delaney et al. 1999), and therefore, may be vulnerable to such injury. Fledglings, whether in or out of the nest, may also be at risk of direct mortality due to the effects of tree falling, or might disperse prematurely in response to the disturbance and thus be subject to predation or starvation outside of the nest grove. Potential effects to eggs range from parental abandonment to destruction during tree falling. These kinds of effects are only likely during the breeding season and then only if breeding activities are underway.

Habitat loss from timber harvest has the potential to increase the competitive interactions between barred owls and spotted owls in the remaining habitat patches that are left. Because spotted owls and barred owls are competitive with each other and utilize the same habitats, the loss of suitable habitat could result in increased competitive interactions between spotted owls and barred owls in the remaining patches of suitable habitat (Courtney et al. 2004). It is important to note that the recent scientific review of the status of spotted owls completed by Courtney et al. (2004) concluded that there is no direct scientific evidence that has clearly demonstrated that forest management has an effect on the outcome of interactions between barred owls and spotted owls (Courtney et al. 2004).

Effects of Disturbance to Nesting Spotted Owls Associated with Forest Practices Activities

Road building, maintenance, and repair; timber harvesting; and timber hauling require the use of heavy equipment, chainsaws, and large vehicles, all of which introduce an increased level of sound into the environment. The Washington Forest Practices Board recognized that noise disturbance might disrupt spotted owl breeding behavior; therefore, the Board adopted rules to protect spotted owls from disturbance by imposing an operating restriction during the spotted owl nesting season (March 1 through August 31) (Washington Forest Practices Board 1996). Restricted activities include road construction, operation of heavy equipment, blasting, timber felling, yarding, helicopter operations, and slash disposal or prescribed burning. These activities are prohibited within 0.25 mile of spotted owl site centers located within SOSEA boundaries (WACs 222-24-030 and 222-30-050, -060, -065, -070, -100).

The FWS previously completed an analysis of the potential for injury associated with disturbance (visual and sound) to spotted owls (U.S. Fish and Wildlife Service 2003). In this analysis, we concluded that behaviors indicating potential injury to spotted owls are: flushing from the nest and aborted feedings. These determinations and the associated injury threshold distances are based on research by Delaney et al. (1999) who documented that Mexican spotted owls (*Strix occidentalis lucida*) flushed from their roosts when chainsaws were operated within a distance of 197 feet (60 meters). Based on these data, the FWS determined the injury threshold distance for chainsaws falling trees is 65 yards, and the threshold distance for heavy equipment (e.g., excavators) is 35 yards. It was noted that scientific data related to injury threshold distances associated with sound and visual disturbance is limited, and we continue to collect pertinent data related to the issue. Therefore, these injury threshold distances may be adjusted in the future based on best available science. Because of a lack of scientific data relating to blasting, the FWS considers blasting within 1 mile of a spotted owl nest site during the early nesting season (March 1 to July 15) to be an activity that may result in potential injury to spotted owls.

Other situations that could lead to disturbance to spotted owls include harvesting suitable habitat within a median home range circle, or timber harvesting adjacent to unsurveyed suitable habitat. on Federal lands. The result could be that spotted owl foraging behavior would be disrupted in the harvest areas, precluding spotted owl use of important foraging habitat during the nesting season.

Elements of the Proposed Action that May Affect the Spotted Owl

The project elements that may affect the spotted owl include: construction of fish passage facilities; enhancement of an aquatic habitat channel; construction of aquatic habitat enhancement projects; wildlife habitat acquisition, protection and management; and recreational facilities upgrades and management. All other activities, such as anadromous fish reintroductions, construction of a release pond in Woodland, construction of a visitor's center in the town of Cougar, stream flow management, cultural and historic resources protection, public education, monitoring and evaluation, human presence at the facilities or for recreational purposes, and law enforcement are not anticipated to adversely affect spotted owls because they will have no effect on spotted owl habitat and are not likely to disturb spotted owls because either they are not located in close proximity to suitable habitat or the activity will not generate loud and unaccustomed sounds with the potential to disturb spotted owls, if present in the vicinity of the activity (USFWS 2003).

Aquatic Habitat Enhancement Projects

Because the Utilities are uncertain where instream habitat enhancement projects will occur, the FWS is unable to conduct an analysis of potential effects to spotted owls from this activity. Therefore, this aspect of the proposed action in relation to effects to spotted owls must be addressed, as appropriate, in a separate section 7 consultation when site-specific conditions are known. This Biological Opinion, therefore, does not include an analysis of potential effects of instream habitat enhancement projects on spotted owls.

Construction of Fish Passage Facilities and Aquatic Habitat Channel

Construction related to fish passage facilities and the enhancement of the aquatic habitat channel are all located at existing project facilities, which do not support spotted owl habitat. As a result no spotted owl habitat will be removed or altered. In addition, the closest known spotted owl activity center is estimated to be 0.5 mile from the closest future-built fish passage facility (the Swift Downstream Facility). This distance is greater than the distance where disturbance to spotted owls could occur from construction-related sounds and activities (USFWS 2003). Therefore, the potential to disturb known occupied spotted owl nest sites as a result of construction-related activities is considered insignificant at this distance. In addition, because there is a low likelihood that spotted owls are nesting on Utility-owned lands, the potential to disturb unknown nesting spotted owls on Utility-owned lands is discountable.

If construction would occur within 0.25 mile of unsurveyed suitable habitat on lands not owned by the Utilities, either 1) the habitat will be surveyed to protocol prior to construction to confirm the presence or absence of spotted owl nesting, or 2) high-impact sound-generating activities associated with construction (such as pile driving, rock drills or impact hammers) will be scheduled to occur outside the early nesting season of March 1 to July 15 to avoid potentially disturbing nesting spotted owls. If through protocol surveys it is determined there is no activity center within 0.25 mile of the construction site, spotted owls would not be adversely affected through sound generated by construction activities at any time of the year. If an activity center is detected the Utilities will restrict sound-generating activities from March 1 to July 15 to reduce the impacts of sound on known nesting spotted owls. Implementation of these conservation measures will reduce potential impacts from sound-generating activities on known or assumed nesting spotted owls to an insignificant level (USFWS 2003). Similarly, if construction requires the use of helicopters or blasting within 0.25 mile of unsurveyed suitable habitat or known occupied areas, these activities will occur outside the full nesting season of March 1 through September 30, which will preclude disturbance of known or assumed nesting spotted owls.

Wildlife Habitat Acquisition, Protection, and Management

The Utilities will manage part of their current holdings for wildlife habitat and acquire additional land for the same purpose over the life of the licenses. SA Schedule 10.8 identifies the broad wildlife objectives that will guide and inform the development of the Wildlife Habitat Management Plans (WHMPs). The WHMP standards and guidelines were finalized in July 2006 (EDAW *in litt.* 2006). All lands acquired in the future under the land acquisition and habitat protection funds will be added to those lands already managed under the PacifiCorp WHMP. The FWS assumes these standards and guidelines will be adhered to in the management of all lands under the WHMPs.

Of the 10,085 acres (4,081 ha) currently included in PacifiCorp's WHMP, there are:

- 9,629 acres (3,900 ha) for which wildlife habitat management is the primary priority. These lands will be managed as per the WHMP standards and guidelines described and analyzed below.

- 159 acres (64 ha) (34 sites) for which wildlife habitat is a secondary priority. Secondary management areas include parts of some recreation developments, lands leased to other entities, and maintenance areas. In general, secondary WHMP lands will be managed for wildlife provided that there is no conflict with the primary purpose of these areas.

  These lands are developed sites and are not located within 0.25 mile of a known spotted owl activity center. Although these lands may contain individual standing trees, they do not provide suitable nesting structure and are not likely to be occupied by nesting spotted owls (K. Naylor, pers. comm., PacifiCorp 2006). Because these lands are developed, have existing and ongoing activities associated with them, and do not occur in an area assumed or known to be occupied by spotted owls, the FWS concurs that activities associated with these lands would have discountable effects to spotted owls.

- 23 acres (9.3 ha) in the Cresap Bay Recreation Area that will be managed for wildlife except during the peak recreation season (Memorial Day to the end of September) when PacifiCorp will manage for both wildlife and recreation. This area will be closed to public vehicle access during the off-season with the intent of minimizing disturbance to wildlife. PacifiCorp may need periodic access to Cresap Bay during the off-season for scheduled maintenance; these activities will be timed to minimize disturbance to wildlife and will be discussed with the TCC on an annual basis, except for emergencies.

  This Recreation Area is a campground and it does not support spotted owl habitat (K. Naylor, pers. comm., PacifiCorp 2006). Because this location does not support suitable spotted owl habitat, is greater than 0.25 mile from known activity centers, and has ongoing activities associated with it, the FWS concurs that actions conducted in this area are discountable in regards to the spotted owl.

- 308 acres (100 ha), including 273 acres (110 ha) in the Cougar/Panamaker Conservation Covenant and 35 acres (14 ha) in the Swift Creek Arm Conservation Covenant, which are to be maintained in perpetuity for bull trout.

  Although these areas may provide spotted owl dispersal habitat, there are no planned activities that would remove dispersal habitat (K. Naylor, pers. comm., PacifiCorp 2006). In addition, any activity conducted pursuant to the Covenants is not expected to disturb nesting spotted owls because the activities would not occur within 0.25 mile of known or assumed occupied stands. Therefore, the FWS concurs that management of these lands would have discountable effects to the spotted owl.

Cowlitz PUD will manage 525 acres of wildlife habitat under its WHMP. Of that, 397 acres is forestland. Cowlitz PUD's ownership includes 87 acres within the Devil's Backbone Conservation Covenant which will be protected for bull trout in perpetuity. Although the Devil's Backbone Conservation Covenant may provide suitable spotted owl habitat, there are no planned activities that would remove or degrade suitable habitat. In addition, any activity conducted pursuant to the Covenant is not expected to disturb nesting spotted owls because the activities would not occur within 0.25 mile of known or assumed occupied stands. Therefore, the FWS concurs that management of these lands would have discountable effects to the spotted owl.

Project facilities, hatcheries, and parts of some recreational developments are excluded from the WHMP and represent about 263 acres (106 ha) of PacifiCorp's ownership. These lands are all developed and do not provide spotted owl habitat (K. Naylor, pers. comm., PacifiCorp 2006). Approximately 138 acres (56 ha) of Cowlitz PUD-owned lands, primarily Project facilities, are excluded for the same reasons as for the PacifiCorp-owned lands. Because these lands are developed, do not provide suitable habitat, have existing and ongoing activities associated with them, and do not occur in an area assumed or known to be occupied by spotted owls, the FWS concurs that activities associated with these lands would have discountable effects to spotted owls.

Of the WHMP standards and guidelines (EDAW 2006), the following may affect the spotted owl on those lands managed under the WHMP as a primary priority. The following goals and objectives have been excerpted out of the EDAW (2006) report verbatim.

Old-Growth Habitat Goals and Objectives (3.1.4)

> **Goal:** Promote the development, maintenance, and connectivity of old-growth coniferous forest and/or associated habitat components (e.g., snags, down wood, "wolf trees," multistoried stands) for wildlife species that use old-growth habitat.

Objective a: Within 5 years of WHMP implementation, evaluate ***existing*** old-growth stands (based on maps in PacifiCorp and Cowlitz PUD 2004) to determine the number of snags and trees (>=20 in. [51 cm] dbh), and develop a schedule to create snags where needed and appropriate to improve habitat for pileated woodpeckers. The number and size of snags created will be consistent with the intent of WDFW Priority Habitats and Species (PHS) guidelines for nesting and roosting (2 snags/10 acre >=30 in. dbh; 12-18 in. diameter at the top of the created snag [2 snags/4 ha, 76 cm dbh, 30-45 cm diameter at top]).

Objective b: Protect and maintain ***existing*** old-growth conifer stands (based on maps in PacifiCorp and Cowlitz PUD 2004) to provide high quality habitat for pileated woodpeckers, other cavity nesters, and other species over the life of the licenses.

Objective c: Protect and manage ***forested buffers*** (see Sections 3.2 and 3.3 for a discussion of buffer widths) adjacent to streams, wetlands, and reservoir shorelines to promote the development of large trees where appropriate, and to provide connectivity between existing old-growth conifer stands over the life of the licenses.

Objective d: Within 5 years of WHMP implementation, identify and evaluate specific ***mature*** conifer stands or other areas that could improve habitat connectivity between old-growth stands or increase number or size of old-growth patches, and develop a schedule to manage/protect these areas as appropriate. Complete identification/evaluation process within 5 years of the acquisition of Interests in Land.

Objective e: Within areas to be thinned to develop old-growth characteristics (see Objectives **c** and **d**), leave LWD in sizes that reflect the trees in the stand or import wood from other locations where possible and appropriate.

Riparian Habitat Goals and Objectives (3.3.4)

> **Goal:** Protect, maintain, and/or enhance riparian areas to include a diversity of native plant species and vegetation structures to benefit wildlife species that use riparian habitats.

Objective a: Identify and establish buffers to protect, maintain, and enhance riparian habitat structure and functions, using the following guidelines as a minimum when planning forest management activities: 1) 300 ft (90 m) or the height of two site potential trees, whichever is greater, for perennial fish-bearing streams that potentially support bull trout (*Salvelinus* *confluentus*) or anadromous fish, 2) 300 ft (90 m) for perennial fish-bearing streams that support residential fish species only, 3) 150 ft (45 m) for perennial non-fish bearing streams, and 4) 100 ft (30 m) for intermittent streams. Buffer widths are measured horizontally from the ordinary high water mark or the outer margin of the channel migration zone and are applied to both sides of the stream. Buffers will be larger for streams showing evidence of mass wasting or erosion (as per Table 3-5). Reduced buffer widths and other management activities would only be allowed for the purpose of meeting specific wildlife habitat objectives.

Objective b: Maintain a 200-ft (60 m) buffer around the reservoir to protect shoreline riparian habitat as a minimum when planning forest management activities. Reduced buffer widths would only be allowed for the purpose of meeting specific wildlife habitat objectives.

Objective c: Within 5 years of WHMP implementation, evaluate the number of live conifers and snags >= 20 in. (50 cm) dbh in riparian mixed stands.

- If <= 20 live conifer trees/acre >= 20 in. dbh (49/ha, 50 cm dbh)→ protect large conifers.

- If >20 live trees/acre >= 20 in. dbh (49/ha, 50 cm dbh)→ determine if creation of additional large snags is needed to increase snag numbers (at least 1 per 6 acre >=20 in. dbh [1 per 2.4 ha, 50 cm dbh]) and snag average dbh (>= 25 in. [63 cm] dbh) for pileated woodpecker. Develop a schedule to create additional snags, if needed.

Objective d: Protect existing large snags in riparian habitats.

Objective e: As part of implementation of the WHMP, identify riparian sites damaged by anthropogenic processes and prepare restoration plans within 5 years of identification, if feasible. Restoration plans should incorporate measures to meet applicable objectives for invasive species and public access management (see Sections 4.1.4 and 4.3.4).

Forestland Habitat Goals and Objectives (3.9.4)

Goal: Promote forestland species composition and structures that benefit wildlife and provide an appropriate mosaic of big game hiding cover and forage.

Objective a: At the Management Unit level, provide a range of alternatives for developing and maintaining a mix of forage and hiding cover for elk, considering activities on adjacent lands, over the life of the licenses. Revise Management Unit Plans for WHMP lands associated with the Merwin Project and create new plans for WMHP lands at the Yale and Swift No. 1 Projects.

Objective b: Over the life of the licenses, maintain or create at least 8 snags (>= 20 in. [50 cm] dbh), green retention trees (>= 15 in. [38 cm] dbh), or wildlife reserve trees (>=15 in. [38 cm] dbh) per acre (19.8 per ha) if available within the harvest area. Retain larger trees and snags representative of the harvest area. A different number of snags, retention, or reserve trees would be allowed only to meet specific wildlife objectives. To the extent possible, retain or create 4 logs/acre (9.9/ha) (>= 24 in. [60 cm] diameter and 50 ft [15 m] long).

Objective c: At the Management Unit level, promote forest habitat diversity for wildlife by increasing or maintaining minor native tree species (e.g., cottonwood, big-leaf maple [*Acer macrophyllum*], western red-cedar) composition where appropriate site conditions exist over the life of the licenses.

Raptor Site Management Goal and Objectives (4.2.4)

> **Goal:** Provide and protect habitat for, and minimize or avoid disturbance to, raptors, including bald eagles, buteos, ospreys, accipiters, and owls. Note: only those objectives pertaining to spotted owls are reiterated here (C. McShane pers. comm. EDAW 2006).

Objective g: In accordance with USDI-FWS Limits of Operating Periods (Harke [FWS] 2003; see Table 4-4.), limit WHMP activities that may generate noise-related disturbance near spotted owl nest sites.

> In cooperation with the USDI-FWS, the USDA-FS recently established "limited operating periods" (LOPs) to minimize impacts to spotted owls during implementation of various projects on the GPNF (Harke [FWS] 2003). These LOPs include the following:

- ***Removal of suitable northern spotted owl nesting, roosting, and foraging habitat from March 1-August 31 (primary nesting and fledging season on the GPNF).*** This LOP applies to the following situations:
  - Planned activities are located within unsurveyed suitable spotted owl habitat.
  - Planned activities would remove nesting or foraging habitat located within an active northern spotted owl home range that is below the incidental take thresholds of 500 acres (202 ha) and 2,663 acres (1,078 ha) within 0.7-mile (1.1 km) and 1.82-mile radius (2.9 km), respectively, of an active northern spotted owl home range.
  - Planned activities are located within the 70-acre (28 ha) core of the best nesting, roosting, and foraging habitat surrounding an active northern spotted owl nest.
  - Planned activities that result in the removal of foraging habitat only (i.e., the habitat lacks the structural features necessary for nesting habitat) may be subject to an early season LOP (March 1-June 30) to avoid disturbing spotted owls that are using the stand early in the nesting season.

- ***Disturbance from noise and smoke from March 1-June 30 (early season when spotted owls are most vulnerable to nesting failure).*** This LOP applies in the following situations:
  - Planned activities are located with the specified disturbance distance (Table 11) of unsurveyed nesting habitat.

- Planned activities are located within the specified disturbance distance (Table 11) of an active spotted owl 100-acre (40 ha) core area.

- For projects that generate smoke, planned activities are located within 0.25 mile (0.4 km) of unsurveyed habitat.

Table 11. Injury distance thresholds for the northern spotted owl on the GPNF.

Type of Activity	Combined Injury Threshold Distances
Blasts > 2 lbs	1 mile
Blasts ≤ 2 lbs	120 yards
Impact pile drivers	60 yards
Helicopters or single-engine airplanes	120 yards
Heavy equipment	35 yards
Chainsaws	65 yards
Source: Harke [FWS] 2003	

Objective h: Unless separated by a reservoir from the nest site center, manage WHMP lands > 2 miles (3.2 km) from the Siouxon SOSEA and within Spotted Owl Management Circles (Status 1-3) to maintain at least 50 percent submature habitat or better, as defined by WAC 222-16-085 (1) (a), within the Licensees' ownership in each management circle. In addition, all conifer trees > 21 in. dbh within Spotted Owl Management Circles will be retained unless otherwise determined by the TCC.

Objective i: Unless separated by a reservoir from the SOSEA over the life of the licenses, manage at least 50 percent of WHMP lands within a 2-mile (3.2 km) buffer outside of the Siouxon SOSEA to provide/develop high quality nesting spotted owl habitat, as defined by WAC 222-16-085 (1) (a).

Objective j: Manage WHMP lands within the SOSEA under Forest Practices, especially WAC 222-16-080 and 222-10-041.

In summary, the above WHMP standards and guidelines would protect and maintain all existing old-growth habitat; promote the protection and development of old-growth stand structure such as large live trees, shrub and tree species diversity, snags and downed wood; and protect and manage forested buffers, mature conifer habitats and riparian areas to provide for connectivity of old-growth areas.

Snag creation in existing old-growth or mature stands would be the only forest management activity conducted in suitable spotted owl nesting habitat, if needed to meet snag density objectives. Commercial thinning and snag creation may occur in mid-successional stands and upland mix vegetation, which provides suitable spotted owl roosting and foraging habitat, to achieve the goals of promoting late-successional stand structure. The WHMPs would also provide for a mosaic of big game hiding cover and forage. To achieve this objective, commercial thinning or clearcut harvesting (≤ 30 acres in size) will be conducted in mid-successional stands and upland mix vegetation which provides spotted owl roosting and foraging habitat, or in spotted owl dispersal habitat.

The only activity that would occur in suitable spotted owl *nesting* habitat (old-growth and mature stands) would be snag creation, if snag densities were below the stated goals. The action of snag creation would not reduce the amount of suitable spotted owl nesting habitat on Utility-owned lands and would not be expected to degrade this habitat, but may actually enhance the habitat by providing nest sites for either the spotted owl or its prey species. With the implementation of the noise Limiting Operating Periods (Table 11) for snag creation activities (use of chainsaws or blasting), there is a low risk of disturbing unknown nesting spotted owls in close proximity to the treatment areas. Because there is a low likelihood of spotted owl nesting on Utility-owned lands and snags would be created outside of the LOP, there is a correspondingly low likelihood that snag creation would remove a spotted owl nest tree. Further reducing this potential risk is the fact that snags are usually created from trees with limited defects for safety reasons and these types of trees generally do not support spotted owl nesting

To achieve some of the other WHMP goals, active forest management will occur in suitable spotted owl *roosting and foraging* habitat or in dispersal habitat (which is considered unsuitable) and may include the creation of snags, commercial thinning, and small clearcuts. The action of creating snags would not reduce the amount of suitable spotted owl roosting and foraging habitat or dispersal habitat on Utility-owned lands and would not be expected to degrade these habitats, but may actually enhance the habitat by providing nest sites for spotted owl prey species. With the implementation of the noise LOPs (Table 11) for snag creation activities (use of chainsaws or blasting), there is a low risk of disturbing unknown nesting spotted owls in close proximity to the treatment areas.

Commercial thinning within spotted owl roosting and foraging habitat or dispersal habitat is not expected to reduce the stand's function from pre- to post-treatment (PacifiCorp *in litt.* 2006). Commercial thinning prescriptions would be designed to accelerate late-successional forest habitat characteristics which may degrade the stands in the short-term, but would be expected to improve those stands functionality for spotted owls and other late-successional associated species over the long-term. Short-term degradation may result from ground disturbance which may trample understory vegetation important to spotted owl prey species or from opening the canopy (removal of trees) which may affect the microclimate in the stand until the canopy closes in again. However, degradation of these stands would not change the function of that stand between pre- and post-treatment conditions. Commercial thinning in dispersal habitat may improve that habitat's dispersal function by allowing greater flying space between trees if the stand was densely stocked prior to treatment which restricted the ability of spotted owls to easily fly through the stand. Commercial thinning in dispersal stands may also promote understory vegetation development that is usually lacking in these treated stands which would benefit spotted owl prey species. Therefore, commercial thinning would not result in the loss of suitable spotted owl habitat or dispersal habitat, but may likely in the long-term enhance the treated stand's function as suitable spotted owl habitat or dispersal habitat. Because the noise and smoke LOPs (Table 11) would be applied to these activities, there is a low risk of disturbing unknown nesting spotted owls in close proximity to the treatment areas.

Small clearcuts (10 – 30 acres in size) will be conducted to improve the distribution and abundance of elk forage on Utility-owned lands. Clearcuts may occur in suitable spotted owl roosting and foraging habitat, and dispersal habitat. For clearcuts to be conducted in dispersal habitat, at least 50 percent of the Utility-owned lands would need to provide dispersal habitat at any point in time. If 50 percent of the Utilities landscape is retained in at least a dispersal habitat condition or better, spotted owl dispersal through this landscape would not be precluded. In addition, LOPs would be applied to this activity which would reduce the potential of disturbing unknown nesting spotted owls during the breeding season in close proximity to the activities.

The creation of small clearcuts in mid-successional and upland mix vegetation would adversely affect the spotted owl through removal of suitable spotted owl roosting and foraging habitat. Cowlitz PUD proposes to clearcut harvest no more than 10 acres of upland mix vegetation on their properties (MacDonald, Cowlitz PUD, pers. comm. 2006). PacifiCorp proposes to harvest 65 acres per year of mid-successional and upland mix vegetation over the term of their license (50 years) (PacifiCorp *in litt.* 2006). This would equate to 3,283 acres or 63 percent of the 5,238 acres of extant suitable spotted owl habitat on PacifiCorp-owned lands being harvest over the next 50 years. Over the life of the license, it is anticipated that many acres of currently unsuitable spotted owl habitat would develop into suitable spotted owl habitat. PacifiCorp anticipates over the next 20 years approximately 895 acres of currently dispersal habitat would mature into suitable spotted owl roosting and foraging habitat. The distribution of the loss of suitable spotted owl habitat on PacifiCorp-owned lands is anticipated to be approximately 2,047 acres surrounding Lake Merwin, predominately on the north side of the reservoir; approximately 878 acres surrounding Yale Lake, predominately on the west side of the reservoir; and approximately 358 acres near Swift Creek Reservoir with most of the harvest occurring on the north side of the reservoir.

Although nesting is not known to occur on Utility-owned lands, many acres of Utility-owned lands occur within known spotted owl home ranges, especially along the eastern shore of Yale Lake, and between Yale Lake and Swift Creek Reservoir. Some of these lands also occur within the Siouxon SOSEA. Due to a lack of spotted owl surveys on Utility-owned lands, other Utility-owned lands may also be providing suitable spotted owl habitat to unknown spotted owl home ranges. Therefore, all Utility-owned lands proposed for harvest are considered unsurveyed suitable spotted owl habitat for purposes of our analysis.

Cowlitz PUD owns land in the general vicinity of the downstream end of Swift Creek Reservoir to the upper end of Yale Lake. The parcel of land that may be subject to clearcut harvesting is located adjacent to the downstream end of Swift Creek Reservoir (MacDonald, Cowlitz PUD, pers. comm. 2006) and is not located within the Siouxon SOSEA, but is within the 2-mile buffer around the SOSEA. However, the lands are separated from the SOSEA by the reservoir, therefore no specific management requirements are applied to these lands from a spotted owl habitat perspective. The FWS assumes the 10 acres of suitable spotted owl habitat to be harvested would more than likely occur within spotted owl home range #1159. However, harvest would not occur within the immediate 70-acre core area of this home range which is on the south side of the Lewis River. Because of mixed landownership in the action area we are unable to determine the status of spotted owl habitat within each of the home ranges and therefore assume the worst-case that each of these home ranges contains less than 40 percent suitable spotted owl habitat. This would mean that additional habitat removal could impair the breeding behavior of spotted owls in the known home ranges as a result of insufficient habitat to support successful breeding. However, the Cowlitz PUD lands to be harvested would occur at the outer periphery of this spotted owl pair's home range which are separated from the activity center by the reservoir. Harvest would result result in reduced foraging capacity for this pair of spotted owls if they foraged in this location. This relatively small loss of disjunct foraging and roosting habitat is not likely to result in the abandonment of this home range, but it would reduce the amount of foraging and roosting habitat available within the home range. If Cowlitz PUD harvested their lands outside of this home range, this would result in the loss of unsurveyed suitable habitat assumed to be within an unknown spotted owl home range. Because we do not anticipate nesting on Utility-owned lands and harvest would not occur within suitable nesting habitat, this activity would not result in the loss of nesting habitat or likely habitat within a 70-acre core area. Therefore, the impacts to an unknown home range would be similar to those described for home range #1159.

The vast majority of proposed habitat removal (approximately 2,047 acres) on PacifiCorp lands would occur on lands surrounding Lake Merwin. There is currently only one known pair of spotted owls that has a home range (#799) that overlaps these lands. None of these lands occur with the Siouxon SOSEA or the 2-mile buffer around the SOSEA. In this general area there are approximately 3,286 acres of suitable spotted owl habitat; habitat removal would represent a 62 percent loss of available spotted owl habitat over the 50-year life of the license. Given that 62 percent of the available spotted owl habitat would be harvested, there is a chance that harvest could occur within the one known spotted owl home range that overlaps this area; however, harvest would not occur within the 70-acre core area of this home range and would only remove roosting and foraging habitat at the outer periphery of the home range. As described above, we assume this home range has insufficient habitat to support a viable home range. Therefore, additional habitat loss would reduce the foraging opportunities for this pair of spotted owls, but given the location of PacifiCorp lands in relation to the nest site and the relatively few acres that might be harvested within the home range we do not anticipate harvest would result in the abandonment of the home range. In addition, we can not rule out the presence of other spotted owl home ranges surrounding Lake Merwin due to a lack of spotted owl surveys. Therefore, habitat removal in this location has the potential to affect unknown spotted owl pairs through the removal of roosting and foraging habitat. Because we do not anticipate nesting on Utility-owned lands and harvest would not occur within suitable nesting habitat, the harvest of unsurveyed suitable habitat would not result in the loss of nesting habitat or likely habitat within a 70-acre core area. Therefore, the impacts to unknown home ranges would be similar to those described for home range #799.

PacifiCorp proposes to harvest approximately 878 acres or 66 percent of the available suitable spotted owl habitat near Yale Lake, predominately on the west side of the reservoir where there is only one known spotted owl home range (#849). However, as stated before, other spotted owl pairs can not be ruled out due to a lack of spotted owl surveys in this location. On the eastern shore of Yale Lake to the downstream end of Swift Creek Reservoir there are five known spotted owl home ranges (#759, 652, 1009, 740, and 1159). These five home ranges occur within the Siouxon SOSEA. Given that 66 percent of the habitat around Yale Lake is expected to be harvested over the next 50 years, there is a likelihood that one or more of these home ranges would experience some habitat loss. However, habitat loss would not occur within any core area as there are no PacifiCorp lands in the 70-acre core areas. There are few acres of PacifiCorp land within home range #849 which is outside of the SOSEA. Harvest in this location would remove roosting and foraging habitat at the outer edges of the home range having a similar impact on this home range as previously described; continued loss of available habitat to support spotted owl reproduction but no anticipated abandonment of the home range. On the eastern shore of Yale Lake there are PacifiCorp lands adjoining the downstream end of Yale Lake that do not occur within a known home range, but do occur within the 2-mile buffer around the SOSEA. Objective i would apply to these lands which states "manage at least 50 percent of the WHMP lands to provide/develop high quality nesting spotted owl habitat." As such, no more than 50 percent of these lands are assumed to be clearcut harvested. These lands are still considered unsurveyed suitable habitat and therefore may result in the loss of roosting and foraging opportunities for unknown nesting spotted owls. The rest of the lands along the eastern shore of Yale Lake occur within a known spotted owl home range and are within the SOSEA; therefore, Objective j applies to these lands which states "manage WHMP lands within the SOSEA under Forest Practices, especially WAC 222-26-080 and 222-10-041." Therefore, we assume these lands will be managed to protect the viability of spotted owls; that is, all suitable spotted owl habitat would be maintained within 0.7 mile of each spotted owl site center and a total of 2,605 acres of suitable spotted owl habitat would be maintained in the median annual home range. Harvest activities that met these criteria would result in adverse effects from the removal of suitable spotted owl habitat, but it would not rise to the level where spotted owl nesting viability would likely be precluded.

PacifiCorp proposes to harvest approximately 358 acres near Swift Creek Reservoir with most of the harvest occurring on the north side of the reservoir. Two parcels of PacifiCorp lands occur within a known spotted owl home range which occurs within the 2-mile buffer of the SOSEA. Two other parcels do not occur within a known home range, but due to a lack of surveys these parcels may occur within an unknown spotted owl home range. Given that 57 percent of the habitat around Swift Creek Reservoir would be harvested it is likely that the known spotted owl home range would experience habitat loss outside of its 70-acre core area, as there are no PacifiCorp lands in the core areas. This would result in the reduction of available suitable roosting and foraging habitat within the home range which would reduce the breeding spotted owls ability to forage, but is not anticipated to result in the abandonment of the nest site due to the proximity of the lands to the nest stand and the relatively limited loss of habitat. The removal of unsurveyed suitable habitat outside of this home range would have similar impacts as previously described.

In summary, over the 50-year life of the licenses, Cowlitz PUD would harvest no more than 10 acres of suitable spotted owl roosting and foraging habitat near Swift Creek Reservoir. PacifiCorp would harvest approximately 3,283 acres or approximately 63 percent of existing suitable spotted owl habitat. Habitat removal would occur within known and unknown spotted owl home ranges which are assumed to exist given a lack of surveys in the action area. No suitable nesting habitat would be removed and no known or suspected core areas would be affected. Therefore, the loss of suitable spotted owl roosting and foraging habitat is anticipated to reduce the ability of reproducing spotted owls to successfully forage which may reduce their ability to successfully rear young except for harvest that may occur along the eastern shore of

Yale Lake where management can not exceed the criteria to maintain home range viability which would apply to five of the eight affected home ranges in the action area. In addition, given the proximity of Utility-owned lands to the three other known home ranges, we do not anticipate spotted owls would abandon their nesting territories as a result of these actions. This analysis does not consider that many of the unharvested forested stands would likely mature into suitable roosting and foraging habitat within the next 50 years. Use of LOPs would reduce the potential of disturbing potential breeding spotted owls in close proximity of the harvest unit.

Recreational Facilities Upgrades and Management

Because the lands associated with existing recreational facilities are developed, do not provide suitable spotted owl habitat, have existing and ongoing activities associated with them, and do not occur within a disturbance radius assumed or known to be occupied by spotted owls, the FWS concurs that activities associated with these existing facilities are not likely to adversely affect spotted owls.

The SA and WHMPs identify other recreational activities that may affect spotted owls. These include the management of hazard trees along trails or in recreational/visitor use areas, conversion of the International Paper (IP) Road to a non-motorized trail, development of trailheads and trails, expansion of campgrounds, and road closures.

The Utilities may need to manage hazard trees in areas of human use. Hazard removal, while not appreciably reducing suitable acreage, has the potential to remove large, defective live trees and snags that have high habitat value for late-successional species. Although most hazard removal will occur at trailheads, parking lots, and campgrounds, some may also occur along developed trails (T. Olson, PacifiCorp, pers. comm. 2006). If hazard tree removal occurred in suitable spotted owl habitat, the impact is not likely to appreciably reduce the value of that stand as suitable habitat, but may slightly reduce available prey habitat. Because these suitable stands are not likely to be occupied by spotted owls, this action is not anticipated to result in the loss of a spotted owl nest site. This action may degrade the habitat conditions at the localized scale, but is not anticipated to appreciably affect the suitability of the stand if spotted owls were to forage, roost or disperse through the stand. Likewise, the implementation of the limited operating periods would preclude the potential to adversely affect spotted owls through disturbance due to the use of chainsaws.

The 12-mile IP road spans from Yale Dam to the IP sort yard south of the Bypass Reach. The Recreation Resource Management Plan (Exhibit C, Yale Lake, Item 2) intends to "have the existing roadway open to non-motorized multi-use recreation access from the bridge over the Lewis River at the eastern terminus [that is, south of the Bypass Reach] to Healy Road on the west [that is, the vicinity of Yale Dam]." The conversion of a road to a non-motorized trail would reduce potential disturbance of spotted owls in close proximity to that road/trail. If PacifiCorp can secure easements to the IP Road, the Plan (Exhibit C, Yale Lake, Item 3) will include construction of "two end trailheads for [a] continuous trail, [and] a mid-point trailhead...Studies will be completed for bridge safety" (SA 11.2.2.3). Resurfacing the trail is also proposed (SA 11.2.2.4). Two new trails are proposed: one between Yale Camp and Cougar Camp, and another in the Eagle Cliff area. The FWS assumes no suitable spotted owl habitat would be removed for the construction of the trailheads or trails and that an LOP would be followed to preclude disruption of potentially nesting spotted owls in close proximity to these sites. The availability of new trails may introduce disturbance into forested areas that are currently not accessible to hikers, cyclists, or equestrians. However, effects on spotted owls are unlikely because the areas surrounding these trails are not likely to be occupied by nesting spotted owls and non-motorized activities are not anticipated to adversely affect spotted owls.

Expansion of Swift Campground (SA Section 11.2.1.6) and Cougar Campground (SA Section 11.2.2.14) may entail removal of forest that may be providing limited habitat for dispersing spotted owls. These lands are not expected to provide foraging or roosting opportunities because of the existing activities associated with the campgrounds and they are not in close proximity to known spotted owl core areas. The Utilities will manage their lands to provide at any point in time at least 50 percent of their lands in a dispersal habitat condition or better. Therefore, this minor removal of dispersal habitat is not expected to appreciably affect the ability of spotted owls to disperse through the landscape.

Implementation of road closures may benefit spotted owls if current activities on those roads are in close proximity to spotted owl use areas and the closed roads may eventually provide suitable habitat conditions.

Implementation of other habitat type standards and guidelines, such as wetlands and unique habitats, contained in the EDAW (2006) report, but not reported here are not anticipated to affect the spotted owl because the activity would not affect suitable spotted owl habitat or be likely to disturb nesting spotted owls.

Summary of Effects

Construction related to fish passage facilities and the enhancement of the aquatic habitat channel are all located at existing project facilities. As a result no spotted owl habitat will be removed or altered. In addition, there is a low likelihood that construction-related activities would disturb known or unknown nesting spotted owls.

Management of lands not covered by the provisions of the WHMPs would have discountable effects on spotted owls because either they do not provide suitable habitat or activities would not affect suitable or dispersal habitat conditions and these lands either have existing and ongoing activities associated with them or do not occur in an area assumed or known to be occupied by spotted owls therefore activities would not disrupt normal behavior patterns of nesting spotted owls.

For those lands managed under the WHMPs, the only activity that would occur in suitable spotted owl *nesting* habitat (old-growth and mature stands) would be snag creation. Snag creation would not reduce the amount of suitable spotted owl nesting habitat on Utility-owned lands and would not be expected to degrade this habitat, but may enhance the habitat by providing nest sites for either the spotted owl or its prey species. With the implementation of the noise LOPs, there is a low risk of disturbing unknown nesting spotted owls in close proximity to the treatment areas or felling a potentially active nest tree.

Commercial thinning may occur in mid-successional stands and upland mix vegetation, which provide suitable spotted owl roosting and foraging habitat. Commercial thinning would not result in the loss of suitable spotted owl habitat or dispersal habitat, but may likely in the long-term enhance the treated stand's function as suitable spotted owl habitat or dispersal habitat. Because the noise and smoke LOPs would be applied to these activities, there is a low risk of disturbing unknown nesting spotted owls in close proximity to the treatment areas.

Clearcut harvesting (≤ 30 acres in size) will be conducted in mid-successional stands and upland mix vegetation which provides spotted owl roosting and foraging habitat, or in spotted owl dispersal habitat. The Utilities would maintain at least 50 percent of the landscape in at least a dispersal habitat condition or better; therefore, spotted owl dispersal through this landscape would not be precluded.

However, the creation of small clearcuts in mid-successional and upland mix vegetation would adversely affect the spotted owl through removal of suitable spotted owl roosting and foraging habitat. Cowlitz PUD proposes to clearcut harvest no more than 10 acres of upland mix vegetation on their properties (MacDonald, Cowlitz PUD, pers. comm. 2006). PacifiCorp proposes to harvest 65 acres per year of mid-successional and upland mix vegetation over the term of their license (50 years) (PacifiCorp *in litt.* 2006). This would equate to 3,283 acres or 63 percent of the 5,238 acres of extant suitable spotted owl habitat on PacifiCorp-owned lands. Habitat removal would occur within known and unknown spotted owl home ranges which are assumed to exist given a lack of surveys in the action area. No suitable nesting habitat would be removed and no known or suspected core areas would be affected. Therefore, the loss of suitable spotted owl roosting and foraging habitat is anticipated to reduce the ability of reproducing spotted owls to successfully forage which may reduce their ability to successfully rear young except for harvest that may occur along the eastern shore of Yale Lake where management can not exceed the criteria to maintain home range viability which would apply to five of the eight affected home ranges in the action area. In addition, given the proximity of Utility-owned lands to the three other known home ranges, we do not anticipate spotted owls would abandon their nesting territories as a result of these actions. Clearcut harvesting would follow the LOPs to reduce the potential of disturbing potential breeding spotted owls in close proximity of the harvest units.

Hazard tree removal may occur in suitable spotted owl habitat; however, this activity is not likely to appreciably reduce the value of the stand as suitable habitat, but may slightly reduce available prey habitat. Because these suitable stands are not likely to be occupied by spotted owls, this action is not anticipated to result in the loss of a spotted owl nest site. In addition, implementation of the LOPs would preclude the potential to adversely affect spotted owls through disturbance due to the use of chainsaws.

EFFECTS OF PROPOSED ACTION ON BALD EAGLE

Elements of the Proposed Action that May Affect the Bald Eagle

The Final BE and FEIS describe the project elements that may affect the bald eagle. In addition to Project operations and upgrades, the Utilities will expand and improve campgrounds and boat launches, remove or harden existing dispersed camp sites, construct/upgrade new trails, manage forests to maintain old-growth and old-growth forest characteristics and for other wildlife values such as elk forage, reintroduce anadromous salmon and steelhead, and manage roads and trails to minimize impacts on wildlife species, including bald eagles. Table 12 identifies the elements of the proposed action potentially having a direct effect on bald eagles.

Table 12. Proposed construction-type actions and their proximity to known bald eagle roosting and nesting sites.

Site	SA Item	Action	Year	***Within 800 m of nest/roost site?***
Island River Access	11.2.4.1	Construct new toilet	1	*No*
Johnson Creek	11.2.4.1	Construct new toilet	1	*No*
Cedar Creek	11.2.4.1	Construct new toilet	1	*No*
Lewis River Hatchery	8.7	Upgrade	Scheduled	*No*
Merwin Park	11.2.3.8	Construct new shelters	4	*No*
Merwin Hatchery	8.7	Upgrade hatchery	Scheduled	*No*
Merwin tailrace	4.2	Construct trap	Yrs 2-3	*No*
Merwin forebay	4.6	Install collector	17	*No*
Lake Merwin	8.8.2	Construct acclimation site.	13	*No*
Marble Creek Trail	11.2.3.3	Improve trail	4	*No*
Speelyai Hatchery	8.7	Upgrade hatchery	Scheduled	*No*
Yale tailrace	4.7	Provide upstream passage	17	*No*
Yale spillway	5.1	Modify to improve passage	4.5	*No*
Yale Dam	11.2.2.5	Develop Saddle Dam trail		*No*
Yale forebay	4.5	Install collector	13	*No*
Yale Lake	8.8.2	Construct acclimation site	13	*Yes, Siouxon Notch Communal Roost; (Cougar Creek nest 1662-1 is > 1 mi. from acclimation site and > 800 m from ADA facility changes)*
	11.2.2.1	Manage dispersed campsites	1-50	
	11.2.2.6	Renovate facilities for ADA compliance	1-7	
Yale-IP Road	11.2.2.3	Develop trail, parking, reservoir access, and day use facilities	2	*Yes, Siouxon Notch Communal Roost (Ole Creek Communal Roost is > 1 mi. from any of the trail work; Swift Canal Communal Roost is > 2 mi. from any of the trail work*
	11.2.2.4	Resurface trail	15-16	
Yale Bridge	11.2.3.7	Construct boating access	6	*No*
Yale Park	11.2.2.7	Extend boat ramp, replace docks	4	*No*
Cougar Park	11.2.2.11	Renovate restroom	6	*No*
	11.2.2.14	Expand campground	When needed	
Cougar and Beaver Bay	11.2.2.5	Develop trail between camps	5	

Camps				
Beaver Bay Camp	11.2.2.8	Replace docks	4	*No*
	11.2.2.12	Replace restrooms	13	
Bypass Reach	4.8	Provide upstream passage	17	*Yes, the Swift No. 2 Powerhouse nest*
		Construct Upper Release Point	1	*No*
	6.1.3	Construct channel	2	*Yes, the Swift Canal Communal Roost is within 800 m*
Swift forebay	4.4	Install collector	4.5	*No*
Swift Reservoir	8.8.1	Construct acclimation sites	4	*Yes, depending on site chosen, Swift Reservoir Communal Roost and Swift Reservoir nest 1056-1 SE of Swift Dam; Drift Creek Communal Roost 7389 & Drift Creek nests 544-1, 544-2, and 544-3*
	11.2.1.1	Maintain dispersed sites	1-50	
	11.2.1.4	Renovate ADA sites	1-7	*No*
Swift Forest Camp	11.2.1.5	Construct new picnic shelter	5	*No*
	12.2.1.6	Expand campground	When needed	
Eagle Cliff Park	11.2.1.5	Construct toilets and other improvements	11	*No*
Eagle Cliff Trail	*11.2.1.2*	*Build trail*	*4*	*No*

Table 13 identifies those elements of the proposed action potentially having an indirect effect on bald eagles by either altering the prey base or acquiring more land for wildlife conservation.

Table 13. Elements of the proposed action potentially having an indirect effect on bald eagles by either altering the prey base or acquiring more land for wildlife conservation.

Purpose	Measure in BE	*Description*
Improve fish passage over dams	4.2	*Merwin upstream trap improvement*
	4.3	*Merwin upstream collection and transport facility*
	4.4	*Downstream passage at Swift No. 1 Dam*
	4.5	*Downstream passage at Yale Dam*
	4.6	*Downstream passage at Merwin Dam*
	4.7	*Upstream passage at Yale Dam*
	4.8	*Upstream passage in Bypass Reach*
	4.9	*Net-and-haul at Yale Dam and Swift No. 2 tailrace*
	4.9	*Yale and Merwin entrainment reduction*
	4.10.1	*Yale and Merwin downstream bull trout passage*
	4.10.2	*Yale and Swift upstream bull trout passage*
	5.1	*Yale spillway modification*
Increase natural and artificial fish production	4.4.3	*Release pond below Merwin Dam*
	7.1	*Large Woody Debris and Aquatics Fund*
	7.2	*Placement of spawning gravel below Merwin Dam*
	401 Certs	*Gravel augmentation in the Bypass Reach*
	8.8.1	*Juvenile acclimation pond above Swift Creek Reservoir*
	8.8.2	*Juvenile acclimation ponds above Yale and Merwin Dams*
Reintroduce anadromous species above dams	7.4	*Salmon passage for habitat preparation*
	8.3	*Anadromous hatchery ocean recruits*
	8.4	*Supplementation of juvenile salmon*
Acquire and manage land for wildlife conservation	10.1	*Yale land acquisition fund*
	10.2	*Swift 1 & 2 land acquisition fund*
	10.3	*Lewis River Fund*
	10.8	*Implementation of the Wildlife Habitat Management Plans*
Change instream flows to increase natural fish production	6.1.1	*Flow from the Canal Drain to the Constructed Channel*
	6.1.2	*Construction of Upper Release Point*
	6.1	*Flow from Upper Release Point*
	6.2.1	*Ramp rates below Merwin Dam*
	6.2.2	*Plateau flow below Merwin Dam*
	6.2.4	*Minimum flow below Merwin Dam*
	6.2.5	*Low flow consultation process*
Produce resident salmonids	*8.6*	*Stock resident fish*

Conservation Measures Proposed by the Utilities

The Utilities will manage part of their current holdings for wildlife habitat and acquire additional land for the same purpose over the life of the licenses. SA Schedule 10.8 identifies the broad wildlife objectives that will guide and inform the development of the Wildlife Habitat Management Plans (WHMPs). The WHMP standards and guidelines were finalized in July 2006 (EDAW *in litt.* 2006). All lands acquired in the future under the land acquisition and habitat protection funds will be included in PacifiCorp's WHMP. The FWS assumes these standards and guidelines will be adhered to in the management of all lands under the WHMPs over the life of the licenses.

Of the 10,085 acres (4,081 ha) currently included in PacifiCorp's WHMP, there are:

- 9,629 acres (3,900 ha) for which wildlife habitat management is the primary priority. These lands will be managed as per the WHMP standards and guidelines described and analyzed below.

- 159 acres (64 ha) (34 sites) for which wildlife habitat is a secondary priority. Secondary management areas include parts of some recreation developments, lands leased to other entities, and maintenance areas. In general, secondary WHMP lands will be managed for wildlife provided that there is no conflict with the primary purpose of these areas.

- 23 acres (9.3 ha) in the Cresap Bay Recreation Area that will be managed for wildlife except during the peak recreation season (Memorial Day to the end of September) when PacifiCorp will manage for both wildlife and recreation. This area will be closed to public vehicle access during the off-season with the intent of minimizing disturbance to wildlife. PacifiCorp may need periodic access to Cresap Bay during the off-season for scheduled maintenance; these activities will be timed to minimize disturbance to wildlife and will be discussed with the TCC on an annual basis, except for emergencies.

- 308 acres (100 ha), including 273 acres (110 ha) in the Cougar/Panamaker Conservation Covenant and 35 acres (14 ha) in the Swift Creek Arm Conservation Covenant, which are to be maintained in perpetuity for bull trout.

Cowlitz PUD will manage approximately 240 acres surrounding the Swift No. 2 project works on the north side of the Bypass Reach under its WHMP and will adhere to the WHMP standards and guidelines.

Cowlitz PUD will also manage 283 acres on the Devil's Backbone, including the Devil's Backbone Conservation Covenant on the north side of Swift Creek Reservoir under its WHMP and will adhere to the WHMP standards and guidelines.

Project facilities, hatcheries, and parts of some recreational developments are excluded from the PacifiCorp WHMP and represent about 263 acres (106 ha) of PacifiCorp's ownership. Approximately 138 acres (56 ha) of Cowlitz PUD-owned lands, primarily Project facilities, are excluded for the same reasons as for the PacifiCorp-owned lands.

The WHMP standards and guidelines refer to the Pacific Bald Eagle Recovery Plan (USDI-FWS 1986) which provides guidelines for minimizing disturbance to bald eagles. In general, logging, construction, habitat improvements, and other activities are discouraged within 1,320 ft (400 m) of nest and roost sites or within 2,640 ft (800 m) of these sites when bald eagles have line-of-sight vision of an activity. The critical nesting period is defined as January 1 through August 31, although this can vary by location; the key winter period for protection of feeding and roost sites is approximately November 15 through March 31 (USDI-FWS 1986).

Of the WHMP standards and guidelines, the following may affect the bald eagle on those lands managed under the WHMPs as a primary priority. The following goals and objectives have been excerpted out of the EDAW (2006) report verbatim.

Old-Growth Habitat Goals and Objectives (3.1.4)

> **Goal:** Promote the development, maintenance, and connectivity of old-growth coniferous forest and/or associated habitat components (e.g., snags, down wood, "wolf trees," multistoried stands) for wildlife species that use old-growth habitat.

Objective b: Protect and maintain ***existing*** old-growth conifer stands (based on maps in PacifiCorp and Cowlitz PUD 2004) to provide high quality habitat for pileated woodpeckers, other cavity nesters, and other species over the life of the licenses.

Objective c: Protect and manage ***forested buffers*** (see Sections 3.2 and 3.3 for a discussion of buffer widths) adjacent to streams, wetlands, and reservoir shorelines to promote the development of large trees where appropriate, and to provide connectivity between existing old-growth conifer stands over the life of the licenses.

Objective d: Within 5 years of WHMP implementation, identify and evaluate specific ***mature*** conifer stands or other areas that could improve habitat connectivity between old-growth stands or increase number or size of old-growth patches, and develop a schedule to manage/protect these areas as appropriate. Complete identification/evaluation process within 5 years of the acquisition of Interests in Land.

Riparian Habitat Goals and Objectives (3.3.4)

> **Goal:** Protect, maintain, and/or enhance riparian areas to include a diversity of native plant species and vegetation structures to benefit wildlife species that use riparian habitats.

Objective a: Identify and establish buffers to protect, maintain, and enhance riparian habitat structure and functions …

Objective b: Maintain a 200-ft (60-m) buffer around the reservoir to protect shoreline riparian habitat as a minimum when planning forest management activities. Reduced buffer widths would only be allowed for the purpose of meeting specific wildlife habitat objectives.

Objective c: Within 5 years of WHMP implementation, evaluate the number of live conifers and snags >= 20 in. (50 cm) dbh in riparian mixed stands.

- If <= 20 live conifer trees/acre >= 20 in. dbh (49/ha, 50 cm dbh)→ protect large conifers.

- If >20 live trees/acre >= 20 in. dbh (49/ha, 50 cm dbh)→ determine if creation of additional large snags is needed to increase snag numbers (at least 1 per 6 acre >=20 in. dbh [1 per 2.4 ha, 50 cm dbh]) and snag average dbh (>= 25 in. [63 cm] dbh) for pileated woodpecker. Develop a schedule to create additional snags, if needed.

Objective d: Protect existing large snags in riparian habitats.

Raptor Site Management Goal and Objectives (4.2.4)

Goal: Provide and protect habitat for, and minimize or avoid disturbance to, raptors, including bald eagles, buteos, ospreys, accipiters, and owls. Note: only those objectives pertaining to bald eagles are reiterated here.

Objective a: Use protocol surveys in areas scheduled for road construction, heavy maintenance, or forestland management activities to identify specific raptors and their active and inactive nest sites and roost sites (including bald eagle winter roosts in suitable habitat), if possible [pending landownership], and implement appropriate measures to protect these sites.

Objective b: Develop a management plan for nesting bald eagles, considering site-specific requirements, within 3 years of WHMP implementation, and revise upon discovery of a new active nest site.

Objective c: Opportunistically identify areas that could be enhanced to provide future nesting, perching, or roosting habitat for raptors. Develop a schedule to implement enhancement measures, if needed.

Objective d: Conduct 2 annual aerial surveys of PacifiCorp WHMP lands to determine bald eagle nest site occupancy and productivity and osprey nest site occupancy.

Objective e: Continue to manage PacifiCorp electrical, distribution, and transmission facilities according to PacifiCorp guidelines, which are based on industry standards for avian protection on power lines (Avian Power Line Interaction Committee [APLIC] 1994, 1996; APLIC and USDI-FWS 2005). Update PacifiCorp guidelines over the license period, if needed, to reflect changes in industry standards.

Objective f: If identified, manage avian interaction problems with Cowlitz PUD electrical and transmission facilities, as described in SA Exhibit B (see Exhibit B in this document), consistent with the APLIC guidelines (1994 and 1996; APLIC and USDI-FWS 2005).

Effects of the Action

The BE and FEIS describe several ways the proposed action could affect bald eagles; in general, the proposed action is likely to benefit bald eagles by increasing the forage base, but it may also increase disturbance to individual bald eagles associated with improved or expanded recreational facilities, increased recreational fisheries and associated visitor/angler use.

Direct Effects to Habitat

For those construction activities identified in Table 12 that may occur within 800 m of a nest or roost site, only construction of the acclimation site at Yale Lake (SA 8.8.2), management of dispersed camping sites along Yale Lake (SA 11.2.2.1), renovation of Yale Lake facilities to meet the Americans with Disabilities Act requirements (SA 11.2.2.6), improvements to the Yale-IP Road (SA 11.2.2.3 and 11.2.2.4), activities associated with the Bypass Reach (SA 4.8, 6.1.2 and 6.1.3), and construction of acclimation sites and management of dispersed sites along Swift Creek Reservoir (SA 8.8.1 and 11.2.1.1) would occur within 800 m of a known nest or roost site. Of these activities, construction of the acclimation sites, renovation of existing facilities, resurfacing of existing trails, provisions for upstream passage in the Bypass Reach, and activities associated with Constructed Channel would all occur in non-suitable habitat and would not result in the modification of suitable bald eagle habitat features (large trees). Management of dispersed camping sites would include closing some sites posing unacceptable environmental damage or impacts to wildlife including bald eagles. Other dispersed camping sites not posing such effects would be hardened to reduce visitor-use impacts. Hardening of these sites will not remove bald eagle habitat features except possibly danger tress which will be addressed below (Shrier, PacifiCorp, pers. comm. 2006). Development of a trail, parking facilities, provision for reservoir access and day-use facilities associated with the Yale-IP Road would occur within 800 m of the Siouxon Notch Communal Roost, but would not result in the loss of bald eagle habitat (Naylor, PacifiCorp, pers. comm. 2006). Therefore, none of the construction activities within close proximity to known nest or roost sites would affect suitable bald eagle habitat.

The remaining construction activities identified in Table 12 would not occur within 800 m of a known bald eagle nest or roost site. Construction includes: new toilets and shelters; upgrades to hatchery facilities; traps, collectors and acclimation sites; improvements to fish passage; boating access; boat ramp and dock upgrades; renovation of existing facilities; and the Upper Release Point. These construction activities would not occur in or affect suitable bald eagle habitat. The development or improvement of trails greater than 800 m from known nest or roost sites may occur in the forested environment, but would not result in the removal of suitable bald eagle habitat (Naylor, PacifiCorp, pers. comm. 2006). Although the expansion of the Cougar Creek and Swift Forest Campgrounds may remove large standing trees that could be providing now or in the future roost or perch trees, these campgrounds do not currently occur within a bald eagle nest or roost territory and the provision of maintaining a 200 foot riparian buffer along the reservoirs will likely limit the removal of present or future perch or roost trees; future nesting in the immediate vicinity of active campgrounds is not anticipated.

Stand management activities may occur in the Cougar/Panamaker and Swift Creek Arm Conservation Covenants for the benefit of bull trout. Although these areas may provide bald eagle perching habitat, there are no known bald eagle nest or communal roost sites within 800 meters of the Covenants and no activities associated with the PacifiCorp WHMP or SA would affect available perching habitat (K. Naylor, pers. comm. PacifiCorp 2006).

Project facilities, hatcheries, and parts of some recreational developments are excluded from the PacifiCorp's WHMP and represent about 263 acres (106 ha) of PacifiCorp's ownership. In addition there are 159 acres (34 sites) for which wildlife habitat is a secondary priority. The 23 acres Cresap Bay Recreation Area will be managed for wildlife except during the peak recreation season (Memorial Day to the end of September) when PacifiCorp will manage for both wildlife and recreation. Approximately 138 acres (56 ha) of Cowlitz PUD-owned lands, primarily Project facilities, are excluded for the same reasons as for the PacifiCorp-owned lands. For all of these areas there are no management activities that will affect suitable bald eagle habitat, except potentially the need to manage danger trees, as discussed below.

Standards and guidelines for the WHMPs for raptor management include:

Objective a: Use protocol surveys in areas scheduled for road construction, heavy maintenance, or forestland management activities to identify specific raptors and their active and inactive nest sites and roost sites (including bald eagle winter roosts in suitable habitat), if possible [pending landownership], and implement appropriate measures to protect these sites.

Objective b: Develop a management plan for nesting bald eagles, considering site-specific requirements, within 3 years of WHMP implementation, and revise upon discovery of a new active nest site. If new nest or roost sites are discovered [on Utility-owned lands], the [appropriate] Utility will prepare a Bald Eagle Management Plan which will incorporate the recommendations in the Bald Eagle Recovery and specifically the management of habitat effects within 800 m. Therefore, it is assumed no construction activities within close proximity to recently detected nest or roost sites would affect suitable bald eagle habitat.

Although WHMPs will allow forest management activities to occur, all existing old-growth conifer stands will be protected and maintained. Forested buffers along streams, wetlands and reservoirs will be protected and managed to promote the development of large trees where appropriate. A minimum of a 200 foot buffer around the reservoirs will be maintained when planning forest management activities. In addition, existing large snags will be protected in riparian habitats. As stated above, surveys will be conducted in areas scheduled for forest management activities to identify active or inactive nest and roost sites of raptors, including bald eagles. Although forest management activities pose a risk of removing an unknown bald eagle perch or roost tree, the provisions provided above greatly reduce this risk. It is anticipated bald eagle nest sites would be easily detected and protected from forest management activities as described previously. In addition, the Utilities will opportunistically enhance or provide for future nesting, perching and roost trees.

In order to provide worker and public safety, the Utilities will manage danger trees. The Utilities have been managing danger trees for many years and the largest number of danger trees that required felling was 20 in one year after a wind storm. Danger trees will be felled around human-use areas such as parking lots, campgrounds, facilities, and trails if they pose a significant risk and the trail cannot be re-routed. Danger trees that are known to be used by bald eagles will not be felled (Naylor, PacifiCorp, pers. comm. 2006). Given the proximity of these high human-use areas and the provision not to fall existing bald eagle use trees, there is a low likelihood that danger tree management would substantially reduce available perch, roost or nest trees now or in the future.

Indirect Effect: Increase in Forage Base

Increases in the forage base are expected as a result of the Project. In particular, reintroducing salmon and steelhead over the dams, restoring salmon and steelhead habitat, providing upstream and downstream fish passage, stocking salmon and trout above the dams, and regulating instream flows below Merwin Dam to enhance Chinook production (Table 13) will increase the distribution and population of fish in the Lewis River Basin which make up the majority of the bald eagle's prey base. In addition, flow released into the Bypass Reach at the Upper Release Point is likely to restore rearing habitat for salmonids and spawning habitat for salmon and steelhead in about 3 miles of the mainstem Lewis River. The increase in the prey base from all these elements is likely to appreciably improve foraging conditions for resident, nesting or overwintering bald eagles. David Anderson (WDFW, pers. comm. 2006) expects all fishery-related elements of this action to support a continuing increase in year-round resident bald eagles around the Lewis River reservoirs. An increase in the availability of prey throughout the year is expected to enhance the survival of adults through the winter and improve nesting success through the ability to adequately feed eaglets.

Increase in Disturbance as a Direct Effect of the Proposed Action

Some construction-related elements of the action are proposed at sites within 800 m of currently active nests or roost sites (Table 12). Noise and visual disturbance may arise from implementing these actions: construction of acclimation sites, management of dispersed sites, renovation of existing facilities at Yale Lake; development of recreational facilities associated with Yale-IP Road; provisions for upstream passage in the Bypass Reach and activities associated with the Constructed Channel; and the construction of acclimation sites and the management of dispersed sites at Swift Creek Reservoir. Construction and activities at these sites may disturb bald eagles due to the movement of people and equipment, as well as noise, but conservation measures described in the WHMP standards and guidelines are expected to reduce these disturbances to a level that is not expected to significantly disrupt normal behaviors. That is, the FWS assumes if these construction activities occurred within 400 m or in 800 m line-of-sight of an active nest or roost site that the activities would not occur during the critical nesting period or key winter period, as appropriate.

Some construction-related actions are proposed at sites greater than 800 m from known bald eagle nests and roost sites (Table 12). These actions and activities are not expected to disturb nesting or roosting bald eagles.

For the lands to be managed under a WHMP, the standards and guidelines are designed to protect all present and future raptor, including bald eagle, populations in the action area from disturbance. The WHMPs commit the Utilities to developing management plans for nesting bald eagles, considering site-specific requirements, within 3 years of WHMP implementation and revise upon discovery of new sites. These plans would follow the Washington Department of Fish and Wildlife's Priority Species and Management Recommendations for Bald Eagles (Watson and Rodrick 2001). The standards and guidelines also commit the Utilities to "use protocol surveys in areas scheduled for road construction, heavy maintenance, or forestland management, to identify specific raptors and their active and inactive nest sites and roost sites, including bald eagle winter roosts, in suitable habitat, and implement appropriate measures to protect these sites." Therefore, management actions conducted under the WHMPs could disturb bald eagles due to the movement of people and equipment, as well as noise, but conservation measures described above are expected to reduce these disturbances to a level that is not expected to significantly disrupt normal behaviors. In particular, the FWS assumes the statement "appropriate measures to protect these sites" implies if these management activities occurred within 400 m or in 800 m line-of-sight of an active nest or roost site that the activities would not occur during the critical nesting period or key winter period, as appropriate.

Not all lands will be managed under the standards and guidelines for the WHMPs. These include the 159 acres (34 sites) for which wildlife habitat is a secondary priority. These lands include parts of some recreation developments, lands leased to other entities, and maintenance areas. Of these areas, the Speelyai Bay and Swift No. 2 Powerhouse bald eagle nest sites are within 800 m line-of-sight of the Speelyai Bay Day-Use Area and Beaver Bay Campground, respectively. However, both of these nest sites have been established in the past 5 years despite ongoing activities in these nearby secondary management areas. In general, recreation and maintenance activities occur during the summer months, long after bald eagles have established their annual nesting territories. Continued ongoing activities at these secondary management areas are not expected to disturb nesting bald eagles to such an extent as to appreciably alter their behaviors or nesting success due to their relative acclimation to activities in these locations. Although secondary management areas may contain individual standing trees capable of supporting bald eagle nests or roosts, bald eagle nesting is unlikely due to the frequency of human activity in proximity to these trees (K. Emmerson, pers. comm. PacifiCorp, 2006). Therefore, future impacts are anticipated to not change over current conditions.

The 23 acre Cresap Bay Recreation Area will be managed for wildlife except during the peak recreation season (Memorial Day to the end of September) when PacifiCorp will manage for both wildlife and recreation. This area will be closed to public vehicle access during the off-season with the intent of minimizing disturbance to wildlife. PacifiCorp may need periodic access to Cresap Bay during the off-season for scheduled maintenance; these activities will be timed to minimize disturbance to wildlife and will be discussed with the TCC on an annual basis, except for emergencies. The Cresap Bay Recreation Area is not within 800 m of an existing bald eagle nest or known communal roost site (K. Emmerson, pers. comm. PacifiCorp 2006). However, this recreation area has trees capable of supporting nesting bald eagles, and is closed during courtship, egg laying, and brooding seasons. Therefore, if a pair of bald eagles nested in the area in the future, the FWS assumes it would be managed as described above for existing nest sites.

The 273 acres Cougar/Panamaker Conservation Covenant and 35 acres Swift Creek Arm Conservation Covenant will be maintained in perpetuity for bull trout. Although these areas may provide bald eagle perching habitat, there are no known bald eagle nest or communal roost sites within 800 m of the Covenants therefore disturbance to nesting or roosting bald eagles are not anticipated.

The Swift No. 2 Powerhouse bald eagle nest is within 800 m line-of-sight of the Swift No. 2 project works property. This site has been established in the past 5 years despite ongoing activities including year-round reconstruction of the Swift No. 2 project. Continued ongoing activities at the Swift No. 2 projects are not expected to disturb nesting bald eagles to such an extent as to appreciably alter their behaviors or nesting success due to their relative acclimation to activities in this location.

Increase in Disturbance as an Indirect Effect of the Proposed Action

The principal sources of indirect disturbance of bald eagles in the action area may arise from the anticipated increase in boating, hiking, camping, and fishing. The proposed action includes management of roads and trails, expanding and improving campgrounds and other recreational facilities, and the reintroduction of salmon and steelhead.

Proposed management of roads and trails will reduce the exposure of bald eagles to disturbance from the use of trails and roads. None of the existing nests are visible from any designated trail or proposed trail, and the forest along the east shore of Yale Lake partially screens feeding perches from trails. Only the Yale-IP Trail would occur within 800 m of a communal roost; however, trail use during the winter when this roost would be used is not anticipated to be heavy and would occur during daylight hours when bald eagles are off the roost thereby limiting impacts of recreationists on this trail on this roost site. PacifiCorp will convert the Yale-IP Road to a trail in a manner that will not increase the visibility of bald eagle feeding perches to recreationists. The public access objectives for the WHMP standards and guidelines are intended to restrict motorized vehicle use of Utility roads. The intent of PacifiCorp is to reduce the use of All Terrain Vehicles on WHMP lands and keep them off the IP Road, using signs and possibly placing gates and boulders. PacifiCorp will also coordinate with State and County law enforcement, neighboring private landowners, and the WDNR to enforce the change to non-motorized use. These actions will reduce the intensity of noise and activity in the vicinity of bald eagle nests and perches, thus reducing recreational disturbance of bald eagles. In the long-term, the improvements in road and trail management would reduce disturbance of bald eagles from recreationists, but may not eliminate all potential for disturbance especially at perch sites.

Expansion of campgrounds and improvements in recreational facilities are expected to increase the number of recreationists in the action area and especially the number of boaters and anglers. The management of dispersed camping sites is anticipated to decrease disturbance of bald eagles as sites near bald eagles would be closed. If a hardened dispersed camping site is in close proximity to an occupied bald eagle site appropriate closures would be implemented to eliminate disturbance of bald eagles (Naylor, PacifiCorp, pers. comm. 2006). The expansion of campgrounds is expected to reduce the pressure on dispersed camping sites. Campground expansion will increase the number of sites at Cougar/Beaver Campground from 108 to at most 198 sites and from 93 sites at Swift Campground to at most 143 sites. These increases are expected to some degree to increase the number of boaters and anglers on the reservoirs which have the potential to disturb and disrupt bald eagle behavior associated with nesting or foraging. Of the day-use and campground users, it is estimated that 50 percent are water-based recreationists (Shrier, PacifiCorp, pers. comm. 2006).

There is a partial timing overlap between the bald eagle breeding season and the boating season. In the action area, bald eagles remain near nest sites from February through August, but eggs tend to hatch in April and bald eaglets typically fledge in June (D. Anderson, WDFW, pers. comm. 2006). Few boats are present from September through late April. On Swift Creek Reservoir, the rainbow trout fishery opens on the last weekend in April, causing the highest visitor use; then use tapers off through the summer. Lake Merwin and Yale Lake are open year-round for fishing, but the high-use season is from June through August (Naylor and Olson, PacifiCorp, pers. comm. 2006). The peak recreation season at all reservoirs begins in June and lasts through August (D. Anderson, WDFW, pers. comm. 2006). Thus boating and fishing during late spring and early summer would avoid the sensitive period of nesting and incubation, but would coincide with the period when bald eagles are feeding young at the nest. Bald eagles are susceptible to disturbance by boat traffic but the affect of disturbance depends on proximity to nest and perch trees and foraging sites, as well as time of year. Foraging bald eagles on the Columbia River estuary maintained an average distance of 400 m from stationary boats, and they responded to boat presence by reducing feeding time and the number of foraging attempts (McGarigal et al. 1991). The closest nests to the water's edge in the action area are the Swift No. 2 Powerhouse and Drift Creek East nest sites. The Swift No. 2 Powerhouse nest site is located near the confluence of the Lewis River Bypass Reach with Yale Reservoir and boating in this area is low year-round because the water is shallow even at full pool. Disturbance from recreation is also likely to be low in the vicinity of the Drift Creek East nest site because boating and camping access to Drift Creek during the peak fishing season is prohibited by the >20-foot drawdown of Swift Creek Reservoir typical at this time of year. Therefore, we do not anticipate boat use on the reservoirs will result in abandonment of nests or flushing from nests.

However, bald eagles may shift foraging areas based on boat traffic (Anderson, WDFW, pers. comm. 2006; McGarigal et al. 1991). Grubb and King (1991) found bald eagles were more often flushed from perches than nests and were most easily disturbed when foraging. Stalmaster and Kaiser (1998) found that bald eagle feeding on the Skagit River declined exponentially with increases in disturbance events associated with recreation. When more than 40 recreational events occurred per day there was an 89 percent reduction in bald eagle feeding time. Bald eagles also fed 30 percent less on the weekends when the recreational use was highest. Although increased boat use is not expected to change current traffic patterns or boat use areas associated with the reservoirs, an overall increase in boat traffic may cause disturbance of foraging bald eagles. Therefore, the FWS anticipates individual foraging bald eagles are likely to be flushed from perches or reduce their foraging efforts associated with increased boat traffic over the terms of the licenses.

Wintering bald eagles are also susceptible to disturbance on their foraging grounds. Human activity that results in disturbance of wintering bald eagles on foraging areas can have a wide range of effects on bald eagles from brief disturbance flights to displacement from a local area (Stalmaster and Kaiser 1998). Disturbance that causes bald eagles to flush reduces their food intake, increases energy expenditure during critical winter periods and forces bald eagles to use marginal habitats (Stalmaster and Kaiser 1997). Knight et al. (1991) determined anglers influenced scavenging behavior of bald eagles at gravel bars along the South Fork of the Toutle River. Bald eagles were more frequently observed on the ground during days when anglers were not present, and more frequently in trees on days when anglers were present. Feeding periods shifted to late afternoon and less fish was consumed on days when anglers were present. The proposed reintroduction of salmon and steelhead will result in large numbers of these fish returning to the upper Lewis River basin to spawn. It is expected these reintroduced fish will spawn above Swift Creek Reservoir, most likely in the Pine Creek, Rush Creek and Muddy River. There is a known winter roost site in close proximity to this area. The FWS believes both bald eagles and anglers would be attracted to these spawning fish. So although the reintroduction of salmon and steelhead are likely to provide an enhanced prey base, it will also bring in anglers that are likely to disturb those bald eagles trying to forage on the spawning fish. The co-occurrence of foraging bald eagles and anglers are likely to flush bald eagles or reduce their foraging efforts.

Summary of Effects

Construction activities would not result in the loss of suitable bald eagle habitat except for possibly the expansion of Cougar Creek and Swift Forest Campgrounds which may remove large standing trees that could be providing now or in the future roost or perch trees. These campgrounds do not currently occur within 800 m of a bald eagle nest or roost site and the provision of maintaining a 200-foot riparian buffer along the reservoirs will likely limit the removal of present or future perch or roost trees; future nesting in the immediate vicinity of active campgrounds in not anticipated. Although forest management activities pose a risk of removing unknown bald eagle perch or roost trees, the standards and guidelines for the WHMPs greatly reduce this risk. Because danger trees will be felled in areas of high human use and the provision to not fall existing bald eagle use trees, there is a low likelihood that danger tree management would substantially reduce available perch, roost or nest trees now or in the future. The reintroduction of salmon and steelhead over the dams, restoration of salmon and steelhead habitat, provisions for upstream and downstream fish passage, stocking of salmon and trout above the dams, provision of instream flows in the Bypass Reach, and regulating instream flows below Merwin Dam to enhance Chinook salmon reproduction (Table 13) will increase the distribution and abundance of fish in the Lewis River Basin. This increase in prey for bald eagles is likely to appreciably improve foraging conditions for resident, nesting, and overwintering bald eagles.

Construction and activities at these sites within 800 m of known nest or roost sites may disturb bald eagles due to the movement of people and equipment, and associated noise, but conservation measures described in the WHMP standards and guidelines are expected to reduce these disturbances to a level that is not expected to significantly disrupt normal behaviors. That is, the FWS assumes if these construction activities occurred within 400 m or in 800 m line-of-sight of an active nest or roost site that the activities would not occur during the critical nesting period or key winter period, as appropriate. Management actions conducted under the WHMPs could disturb bald eagles, but the conservation measures are expected to reduce these disturbances to a level that is not expected to significantly disrupt normal behaviors. In particular, the FWS assumes the statement "appropriate measures to protect these sites" implies if these management activities occurred within 400 m or in 800 m line-of-sight of an active nest or roost site that the activities would not occur during the critical nesting period or key winter period, as appropriate. Of the areas not managed under a WHMP, the Speelyai Bay and Swift No. 2 Powerhouse bald eagle nest sites are within 800 m line-of-sight of the Speelyai Bay Day-Use Area and Beaver Bay Campground, respectively. The Swift No. 2 Powerhouse bald eagle nest is also within 800 m line-of-sight of the Swift No. 2 project works property. Both of these nest sites have been established in the past 5 years despite ongoing activities in these areas, including year-round reconstruction of the Swift No. 2 project. Continued ongoing activities at the Swift No. 2 project, Speelyai Bay Day-Use and Beaver Bay Campground are not expected to disturb nesting bald eagles to such an extent as to appreciably alter their behaviors or nesting success due to their relative acclimation to activities in this location. Proposed trail and road management actions will reduce the intensity of noise and activity in the vicinity of bald eagle nests and perches, thus reducing recreational disturbance of bald eagles, but they may not eliminate all potential for disturbance especially at perch sites. Expansion of campgrounds and improvements in recreational facilities are expected to increase the number of recreationists in the action area and especially the number of boaters and anglers. Over the terms of the licenses, boat traffic associated with these increases is anticipated to be likely to flush from perches or reduce the foraging efforts of individual bald eagles. The propose reintroduction of salmon and steelhead will result in large numbers of these fish returning to the upper Lewis River basin to spawn. It is expected these reintroduced fish will spawn above Swift Creek Reservoir, most likely in the Pine Creek, Rush Creek and Muddy River. There is a known winter roost site (Eagle Cliff) in close proximity to this area. The FWS believes both bald eagles and anglers would be attracted to these spawning fish. So although the reintroduction of salmon and steelhead are likely to provide an enhanced prey base, it will also bring in anglers that are likely to disturb those bald eagles trying to forage on the spawning fish. The co-occurrence of foraging bald eagles and anglers are likely to flush bald eagles or reduce their foraging efforts.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area. This section does not consider future Federal actions unrelated to the proposed action because they require separate consultation pursuant to section 7 of the ESA.

Bull Trout

Cumulative effects to bull trout may result from timber harvest, recreation, and land development in the action area not associated with Federal or Utility-owned lands (FEIS 3.2). Timber harvest and land development have the potential to increase the peak-to-base flow ratio and to deliver sediment to streams (FEIS 3.3.1.3). Timber harvest and road building in the upper Panamaker Creek basin also could have a downstream effect on bull trout habitat in Cougar Creek (Interim BO; BE 5.1.3). The upper watershed of Panamaker Creek, a major tributary of Cougar Creek, is owned by private timber companies.

Increased recreational use both at developed and dispersed sites has the potential to affect bull trout. The effects include large wood removal by recreationists for firewood, and trampling along bull trout streams (BE 5.1.2).

Land development is reasonably certain to occur along the east and west banks of Pine Creek for several miles upstream beginning at its confluence with the Lewis River, the north bank of the Lewis River from Pine Creek to the Muddy River, and along approximately 1 mile of the right bank of the Muddy River between the Lewis River and U.S. Forest Service land in Cedar Flats. Skamania County has approved several new wells in the Pine Creek East area, a planned 200-house recreation community opposite the Three Rivers Resort. Other lands farther upstream in the Pine Creek subwatersheds are also being considered for conversion from forest to rural homes. Skamania County has permitted 100 building lots on logged-over commercial timberland north of Swift Creek Reservoir since 2000 (Durbin 2006).

Land management along lower Pine Creek poses the most immediate cumulative threat to bull trout in the Lewis River subbasin. Future road construction would continue to affect aquatic habitat (FEIS 3.3.3.3). The Three Rivers Resort may affect bull trout in Pine Creek, the Muddy River, and Lewis River (WDFW *in litt.* 2005). To ensure enough groundwater to serve the area under a full build-out of available property, the developers have asked for a "reservation" of water in the upper Lewis River adequate to supply 500 lots (Environmental Technology 2005). In this report the developers have identified potential environmental effects. "Probably the most serious source of erosion and sedimentation would be the use of any motorized vehicles to access the streams. Direct particulate movement and sedimentation would occur where vehicles were operated across or within the watercourses. Indirect effects would be disturbed soil adjacent to streams that would be transported by high water or precipitation events...ATVs and motorcycles would destroy existing vegetation, compact soils...The possible changes in hydrology during the summer months could lower the river flows due to groundwater withdrawal by developed water wells serving the site." The report contains detailed recommendations to mitigate these and other effects. Additional concerns include loss of riparian functions including shade, large woody debris, bank stability, and capture of upland runoff in new roadside ditches (WDFW *in litt.* 2005). Water quality degradation and improper stormwater management may also result.

Skamania County is in the process of completing the 2006 Critical Areas Update as required under the Washington State Growth Management Act. This entails amending the county-wide Comprehensive Plan, and developing a Swift Subarea Plan. The Subarea Plan will determine where the best locations are for future residential development, taking into considerations the terrain, access roads, location of critical area resources, location of commercial forest lands, future service needs of residents, and future water usage for residential development. The Subarea Plan is expected to provide for streamside buffers, to locate most new roads outside of riparian areas, and to implement low impact development concepts which would minimize some of the anticipated cumulative effects. However, for purposes of this Biological Opinion, to be conservative, we consider as cumulative effects the potential adverse effects that such activities may involve, but we do not rely on any potential beneficial effects from these endeavors because we cannot reasonably determine whether such benefits will in fact accrue to bull trout.

Two large timberland owners, Pope Resources and United Fruit Growers, own a total of 18,000 acres in Skamania County north of Swift Creek Reservoir and are starting the process of converting their holdings from timber to rural residence (Durbin 2006). The United Fruit Growers has approached the county about developing one section of logged-over land at the headwaters of a fish-bearing Pine Creek tributary.

Although the SA commits to a fixed poundage of rainbow trout being stocked in Swift Creek Reservoir, the Washington Department of Fish and Wildlife (WDFW) makes all decisions regarding what size fish to stock and therefore this aspect of stocking is considered a cumulative effect and not an effect of the proposed action. The stocking until 2004 was about 40 fingerling rainbow trout per pound, corresponding to an average length of about 4 inches (http://wdfw.wa.gov/fish/plants/weekly/archive05.htm). These fish were expected to grow to catchable size in the reservoir within one year and support the 2005 sport fishery. No additional rainbow trout were stocked in 2005. In 2006 WDFW began a new program by stocking catchable-sized rainbow trout at three fish per pound, corresponding to an average length of about 9 inches. These fish were expected to contribute to the 2006 sport catch. This catchable rainbow trout program is reasonably certain to continue in the coming years unless monitoring demonstrates that the program is adversely affecting bull trout or may do so in the future.

Increasing the body size of stocked rainbow trout may have a positive or negative effect on bull trout due to potential changes in predation and competition in Swift Creek Reservoir. The increase in body size of rainbow trout stocked in Swift Creek Reservoir may result in increased predation on bull trout fry and less availability of rainbow trout as prey for subadult bull trout. The amount of bull trout fry that rainbow trout may prey on may increase as a result of stocking larger rainbow trout than in the past. A 9-inch rainbow trout would be more likely than a 4-inch rainbow trout to prey on bull trout fry. However, this type of predation is unlikely in either the reservoir or the Lewis River because rainbow trout at all sizes have a strong preference for insects over fish as prey and most rainbow trout stocked in Swift Creek Reservoir remain in the reservoir and do not ascend the Lewis River where bull trout fry are present. In addition, bull trout fry are not readily available as prey to other fish species because bull trout are benthic, cryptic, and nocturnal.

The increase in rainbow trout size might make the species less available as prey for subadult or smaller adult bull trout. Juvenile bull trout are thought to enter the Lewis River primarily at 1 year of age (Byrne *in litt.* 2006b), probably at a length of about 4 inches. Eventually, they move into the Swift Creek Reservoir where they soon grow large enough to prey on fish. Bull trout usually remain in Swift Creek Reservoir until they migrate up the Lewis River at a length ranging from 12 to 30 inches (Lesko 2006), either to feed or to spawn at an average age of 6 years.

Several outcomes are possible if the catchable rainbow trout program has any effect on bull trout growth in the reservoir. First, the catchable rainbow trout program could negatively affect bull trout of all sizes. This would happen if bull trout of all sizes depended on fingerling rainbow trout for their primary prey; we know that bull trout eat a variety of prey in the reservoir from rainbow trout to mountain whitefish and suckers. Alternatively, the catchable rainbow trout program could negatively affect smaller bull trout that can not feed upon the larger rainbow trout, but may positively affect larger bull trout that can consume these larger rainbow trout. These effects could lead to diminished growth of subadult bull trout or improved growth of larger bull trout. The result could be a change in the size and age structure of bull trout in the reservoir. However, alternate prey is available in the Swift Creek Reservoir. The two most abundant fish species in Swift Creek Reservoir, with all or some individuals small enough for smaller bull trout to consume, are three-spined stickleback and suckers (F. Shrier, PacifiCorp, pers. comm. September 5, 2006).

The Hatchery and Supplementation Plan will include measures to minimize the potential negative impacts of hatchery fish on bull trout and other ESA-listed species (SA 8.2.2.10). Also, because WDFW must prepare a Hatchery Genetics Management Plan (HGMP) and a Fish Management and Evaluation Plan (FMEP) which assesses impacts of hatchery programs on listed fish, impacts to bull trout will be considered and hatchery actions selected for implementation are expected to minimize impacts. Therefore, we expect hatchery rainbow trout programs to minimally affect bull trout.

Spotted Owl

Cumulative effects to the spotted owl may result from timber harvest and land development which removes suitable spotted owl habitat or dispersal habitat, or disturbs nesting spotted owls from noise generated by construction activities. The majority of spotted owls and spotted owl habitat in the action area is believed to occur on U.S. Forest Service lands or in the Siouxon SOSEA. Therefore, only limited cumulative effects to the spotted owl are anticipated.

Bald Eagle

Cumulative effects to the bald eagle may result from timber harvest, recreation activities, and land development in the action area (FEIS 3.2). Timber harvest and development of non-Federal and non-Utility-owned lands will reduce the amount of mid-successional, mature, and old-growth timber (FEIS 3.3.4.3) that would otherwise supply trees suitable for roosting, nesting, and foraging. Noise during construction at new sites or timber harvest "could cause disturbance if implemented during the breeding season at locations within…[the disturbance radius]…of nest sites" (BE 5.5.1.3). The requirement by the State to prepare bald eagle management plans would be expected to minimize these effects.

As recreational demand for boating and camping increases "some visitors may be displaced to dispersed sites [outside] the projects" (FEIS 3.3.6.3). Recreational use "may increase independent of the construction of new facilities, due to expected population increases in nearby urban areas, such as Portland and Vancouver" (FEIS 3.3.6.3). PacifiCorp estimates "the demand for boating-related activities will increase by at least 100 percent during the term off the new licenses…and …the demand for trail-related activities will increase by well over 100 percent (BE 5.4.2.2). Long-term increases in human activity will occur along the shorelines. Increased recreation, especially boating, is expected to cumulatively affect bald eagle foraging at the reservoirs.

Land development is reasonably certain to occur across the Lewis River from Eagle Cliff, a documented winter roost since 1985. This land development site is within 1,000 feet of the roost on the North Fork Lewis River in Section 24. The WDFW (*in litt.* 2005) stated "Concerns [exist] regarding visual disturbance from home sites; disturbance from human access along the [Lewis] river and adjacent to nest and roost sites, [and] disturbance from vehicular traffic." In response, Environmental Technology (2005) stated that "The impact...on...communal roosts is estimated to be minimal due to the distance...from the nearest cabin site."

CONCLUSION

Bull Trout

After reviewing the best scientific and commercial data available, the current status of bull trout in their coterminous range, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWSs biological opinion that implementation of the proposed action is not likely to jeopardize the continued existence of the bull trout.

Bull trout were listed and continue to be threatened throughout their range due to the combined effects of habitat degradation and fragmentation, population isolation, and nonnative species (64 FR 58910). Poaching and incidental mortality of bull trout during other targeted fisheries are additional factors in the species' decline.

The action area encompasses the Lewis River core population of bull trout, including its three local populations. Bull trout numbers are estimated to be low, but increasing. This core population has been at risk of extirpation due to poor connectivity, few local populations, and low overall abundance.

In the Environmental Baseline section of this Biological Opinion, we established that bull trout habitat within the action area has been degraded and population connectivity has been reduced, due to land management activities, nonnative fish introductions, and the construction and operation of Merwin, Yale, and Swift Dams. Adverse effects from non-Federal activities in the action area have contributed to habitat degradation and population declines, and are reasonably certain to occur in the future. These activities include timber harvest, road construction, recreation, and land development.

The following bull trout conservation needs are applicable to the action area: 1) provide fish passage at Swift, Yale, and Merwin dams, 2) reduce entrainment, 3) standardize and implement a sampling protocol, 4) assess nutrient levels and cycling, 5) maintain quality spawning habitat in Rush and Cougar Creeks, 6) protect and restore habitat in Pine Creek, Muddy River, and the Lewis River, 7) reduce impacts of roads, 8) minimize adverse effects of dam operations to bull trout in reservoirs and downstream, 9) eliminate or reduce negative effects of nonnative fishes, and 10) minimize incidental or illegal catch of bull trout (USFWS 2002).

The proposed action is anticipated to result in a small annual reduction in bull trout numbers and reproduction from three project elements: 1) anadromous steelhead and salmon reintroductions (long-term competition, predation, and redd superimposition), 2) passage, capture, and handling (long-term injury or mortality), and 3) instream construction and elevated suspended sediments (short-term injury). Bull trout distribution in the action area will be improved over the long-term through significant improvements in connectivity and restoration of the forage base. Our analysis establishes the likelihood that the Lewis River core population will be sufficiently resilient to the adverse effects of the action to benefit from long-term improvements, all of which address key core population recovery needs.

We base this conclusion on the fact that despite the construction of Merwin Dam over 70 years ago and the subsequent construction of other hydroelectric facilities on the Lewis River, which have likely caused annual mortality of bull trout, and the eruption of Mt. St. Helens in 1980 which had significant effects to Pine Creek, the Pine and Rush Creek bull trout local populations have been slowly increasing over the past 20 years while the Cougar Creek local population appears to be somewhat stable at low numbers. Despite historic impacts to bull trout in this core area, the bull trout population continues to slowly increase. As a result of the proposed action, the annual mortality and injury associated with the facilities would be less than historically, further supporting the conclusion that bull trout local populations would likely be resilient enough to withstand small annual losses, particularly in light of the recovery actions designed to support a healthier bull trout core area population. These improvements include fish passage and connectivity between reservoirs, habitat enhancement and protection, angler education, protective instream flows, nutrient enrichment, and an expanded prey base. Consequently, we do not anticipate a reduction in the likelihood of survival and recovery of bull trout in the Lewis River core population or in the coterminous range as a result of the proposed action.

Spotted Owl

After reviewing the best scientific and commercial data available, the current status of the spotted owl, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWSs biological opinion that implementation of the proposed action is not likely to jeopardize the continued existence of the spotted owl.

Much of the spotted owl habitat that occurs on Utility-owned lands is widely scattered in small patches, and much of this habitat does not exist in sufficient quantities to support territorial spotted owls on Utility-owned lands. However, these lands do support spotted owl territories with active nest sites off of Utility-owned lands, and these small patches of habitat are potentially important for spotted owl connectivity by providing important dispersal and foraging habitat functions for spotted owls dispersing across these lands between areas with large blocks of habitat on adjacent State and Federal lands.

The only potential action that may occur within suitable nesting habitat on Utility-owned lands is snag creation. This action is not expected to reduce the available quantity of nesting habitat or result in the loss of a nest tree. Use of Limited Operating Periods would preclude the risk of felling an active nest site.

The creation of small clearcuts in mid-successional and upland mix vegetation would adversely affect the spotted owl through removal of suitable spotted owl roosting and foraging habitat. Commercial thinning in roosting and foraging stands may cause short-term degradation of these stands, but would not result in the loss of these stands. Commercial thinning may enhance stand structure thereby benefiting spotted owls especially through the increase in prey habitat in treated stands.

Cowlitz PUD proposes to clearcut harvest no more than 10 acres of upland mix vegetation on their properties. PacifiCorp proposes to harvest 65 acres per year of mid-successional and upland mix vegetation over the term of their license (50 year). This would equate to 3,283 acres or 63 percent of the 5,238 acres of extant suitable spotted owl habitat on PacifiCorp-owned lands being harvest over the next 50 years. The distribution of the loss of suitable spotted owl habitat on PacifiCorp-owned lands is anticipated to be approximately 2,047 acres surrounding Lake Merwin, predominately on the north side of the reservoir; approximately 878 acres surrounding Yale Lake, predominately on the west side of the reservoir; and approximately 358 acres near Swift Creek Reservoir with most of the harvest occurring on the north side of the reservoir.

Although nesting is not known to occur on Utility-owned lands, many acres of Utility-owned lands occur within known spotted owl home ranges, especially along the eastern shore of Yale Lake, and between Yale Lake and Swift Creek Reservoir. Some of these lands also occur within the Siouxon SOSEA. Due to a lack of spotted owl surveys on Utility-owned lands, Utility-owned lands proposed for timber management may be providing suitable spotted owl habitat to unknown spotted owl home ranges. Therefore, all Utility-owned lands proposed for harvest are considered unsurveyed suitable spotted owl habitat for purposes of our analysis.

Clearcut harvesting would not remove spotted owl nesting habitat and would not impact any known spotted owl 70-acre core area. All removal of spotted owl roosting and foraging habitat would occur on the outer peripheries of known spotted owl home ranges or in unsurveyed suitable spotted owl habitat. Given the unlikely occurrence of nest sites on Utility-owned lands, removal of small patches of roosting and foraging habitat across the landscape over a 50-year period of time is not expected to result in the abandonment of known or potential home ranges, but may reduce the foraging opportunities for nesting spotted owls adjacent to Utility-owned lands or for those spotted owls dispersing through the action area.

For clearcuts to be conducted in dispersal habitat, at least 50 percent of the Utility-owned lands would need to provide dispersal habitat at any point in time. Therefore, if 50 percent of the Utilities landscape is retained in at least a dispersal habitat condition or better spotted owl dispersal through this landscape would not be precluded.

For all activities with the potential to disturb nesting spotted owls a LOP would be applied which would preclude the risk of spotted owl nest failure due to disturbance from activities conducted during the breeding season in close proximity to the activities.

Therefore, the conservation role of Utility-owned lands (landscape-level connectivity and support to SOSEAs) would be maintained. In addition, there would be no direct loss of spotted owl individuals, and no anticipated loss of reproduction due to disturbance or significant losses of habitat.

Bald Eagle

After reviewing the best scientific and commercial data available, the current status of the bald eagle, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWSs biological opinion that implementation of the proposed action is not likely to jeopardize the continued existence of the bald eagle.

Since 1989 the bald eagle nesting population has increased at an average rate of approximately 8 percent per year (USDI 1999). Bald eagle recovery goals have generally been met or exceeded throughout its range (USDI 1999). In the Pacific Recovery Area population delisting goals have been met since 1995, the productivity objective of an average of 1.0 young per occupied breeding area has been met since 1990, and the average success rate for occupied breeding areas of 65 percent has been exceeded since 1994 (USDI 1999). However, as of 1999, the distribution objective among management zones had not yet been fully achieved.

Bald eagles were first observed nesting at the reservoirs in the action area in 1991. The number of bald eagle nests has increased since then to 10 in 2005. Productivity (number of young per occupied territory) in 2005 was 0.60 and it has ranged from 0.60 to 1.5 over the last 9 years. WDFW has recorded 17 bald eagle communal roost sites with the number of wintering bald eagles ranging from 5 to over 80.

Construction activities would not result in the loss of suitable bald eagle habitat except for possibly the expansion of Cougar Creek and Swift Forest Campgrounds which may remove large standing trees that could be providing now or in the future roost or perch trees. These campgrounds do not currently occur within 800 m of a bald eagle nest or roost site and the provision of maintaining a 200-foot riparian buffer along the reservoirs will likely limit the removal of present or future perch or roost trees; future nesting in the immediate vicinity of active campgrounds is not anticipated. Because danger trees will be felled in areas of high human use and the provision to not fall existing bald eagle use trees, there is a low likelihood that danger tree management would substantially reduce available perch, roost or nest trees now or in the future.

Conservation measures described in the WHMP standards and guidelines are expected to reduce the potential of significantly disrupting normal behaviors of nesting and roosting bald eagles from management-related activities. Of the areas not managed under a WHMP, the Speelyai Bay and Swift No. 2 Powerhouse bald eagle nest sites are within 800 m line-of-sight of the Speelyai Bay Day-Use Area and Beaver Bay Campground, respectively. The Swift No. 2 Powerhouse bald eagle nest is also within 800 m line-of-sight of the Swift No. 2 project works property. Both of these nest sites have been established in the past 5 years despite ongoing activities in these areas, including year-round reconstruction of the Swift No. 2 project. Continued ongoing activities at the Swift No. 2 project, Speelyai Bay Day-Use and Beaver Bay Campground are not expected to disturb nesting bald eagles to such an extent as to appreciably alter their behaviors or nesting success due to their relative acclimation to activities in this location.

Expansion of campgrounds and improvements in recreational facilities are expected to increase the number of recreationists in the action area and especially the number of boaters and anglers. Over the terms of the licenses, boat traffic associated with these increases is anticipated to be likely to flush bald eagles from perches or reduce their foraging efforts. Although there is likely to be an increased number of boaters on the reservoirs over the period of the licenses, the pattern and timing of use of the reservoirs by boaters is not anticipated to change. Because bald eagles have only recently started nesting along the reservoirs despite fairly high on-going recreational use, these bald eagles appear fairly tolerant of humans and they have been able to successfully forage and fledge young despite these disturbances. Therefore, with an improved prey base, the increase in recreational users is not anticipated to result in the abandonment of existing nesting territories or appreciably reduce their overall productivity.

The proposed reintroduction of salmon and steelhead will result in large numbers of these fish returning to the upper Lewis River basin to spawn. It is expected these reintroduced fish will spawn above Swift Creek Reservoir, most likely in the Pine Creek, Rush Creek and Muddy River. There is a known winter roost site (Eagle Cliff) in close proximity to this area. The FWS believes both bald eagles and anglers would be attracted to these spawning fish. So although the reintroduction of salmon and steelhead are likely to provide an enhanced prey base, it will also bring in anglers that are likely to disturb those bald eagles trying to forage on the spawning fish. Currently, wintering bald eagles forage extensively at the tailraces where there is limited disturbance by boats/anglers. This condition is not expected to change as a result of the proposed action. The proposed action would, however, provide a new wintering foraging area for bald eagles where the reintroduced salmon and steelhead spawn and although angler presence may reduce the foraging efficiency of wintering bald eagles, the increased amount and distribution of prey may benefit the wintering population of bald eagles in the action area.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the FWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the FWS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Bull Trout

Upon implementation of the proposed action, bull trout may be incidentally taken through the following mechanisms:

- A small number of bull trout may be incidentally taken as a result of competition for food and space with introduced salmonids in Cougar Creek. This incidental take would be in form of harm through reduced available habitat. The amount of incidental take is difficult to quantify, but is expected to be < 10 percent of juvenile bull trout.

- A small number of bull trout redds may be excavated by coho salmon (redd superimposition) in Pine and Cougar Creek causing the loss of those eggs. This incidental take would be in form of harm through the death of bull trout eggs. The amount of incidental take is difficult to quantify, but is expected to be < 10 percent of redds.

- A small number of juvenile bull trout may be incidentally taken as a result of predation by reintroduced salmon and steelhead. This incidental take would be in form of harm through the death of individuals. The amount of incidental take is difficult to quantify, but is expected to be < 10 percent of juvenile bull trout.

- Adult bull trout may be incidentally taken as a result of permanent upstream and downstream passage at the facilities. Upstream and downstream adult bull trout survival is expected to be at least 98 percent. Injuries could occur such as descaling and abrasions from contact with the facilities or from human handling. Injuries may affect up to 10 percent of the fish captured, but will not result in mortality. This incidental take would be in form of harm through the death of no more than 2 percent of the adults and through injury of no more than 10 percent of the bull trout passing each facility. In addition, all bull trout would be incidentally taken in the form of harass from being captured, handled and transported.

- A small number of adult bull trout may be incidentally taken as a result of not being captured and moved upstream to spawn as a result of less than 100 percent adult trap efficiencies (ATE). Currently, the lowest ATE measured at Merwin Dam is approximately 52 percent. It is assumed the new designs would achieve substantially greater efficiencies although they can not be determined precisely today. Assuming a worst-case ATE of 52 percent, bull trout wanting to spawn upstream may spawn in non-natal waters or they may not spawn thereby reabsorbing their eggs to spawn another time. This may or may not result in a risk of loss of reproduction that year by some percentage of migratory bull trout. The amount of incidental take is difficult to quantify, but < 5 percent of adult bull trout may not spawn as a result of not being captured and moved upstream to their natal waters. This incidental take would be in form of harm through the reduced ability to spawn and would only likely occur downstream of Yale Lake and Swift Creek Reservoir.

- Bull trout may be incidentally taken in the form of harm ($\leq$ 1 bull trout per year) as a result of the interim upstream passage, in addition all bull trout would be incidentally taken in the form of harass from being captured, handled and transported.

- Bull trout would be incidentally taken in the form of harass from being captured, handled and transported during interim downstream passage. In addition, bull trout may be incidentally taken in the form of harm through mortality as a result of the interim downstream passage as described in Table 7 and repeated here:

Table 7. Estimated annual mortality of interim downstream passage on bull trout at the Lewis River dams.

Site	Passage through collector or turbine	Passage over spillway	Passage through Upper Release Point	Passage through Canal Drain	Passage through Surge Arresting Structure
Swift No. 1	$\leq$ 3 bull trout/year for Swift No. 1 and No. 2 together until installation of downstream collector in year 4.	$\leq$ 15 bull trout/year in years of spill; spills are expected to occur, on average, every 2.3 years.	No mortality, designed to be fish friendly	N/A	N/A
Swift No. 2		No mortality due to low head spill. Also provides avenue for bull trout to leave canal safely.	N/A	No mortality, passive exit structure	$\leq$ 3 bull trout/year

Yale	≤ 3 bull trout/year for Yale Dam until installation of an entrainment reduction device by November 2007 which would reduce the potential for entrainment.	≤ 15 bull trout/year in years of spill; spills are expected to occur, on average, every 2.3 years.	N/A	N/A	N/A
Merwin	Not anticipated due to effect of upstream dams on bull trout abundance in Lake Merwin.	Not anticipated due to effect of upstream dams on bull trout abundance in Lake Merwin.			

- Bull trout would be incidentally taken in the form of harass from being captured, handled and transported during permanent downstream passage. In addition, bull trout may be incidentally taken in the form of harm through mortality as a result of the permanent downstream passage as described in Table 8 and repeated here:

Table 8. Estimated annual bull trout mortality from downstream passage after permanent facilities are constructed at the Lewis River dams.

Site	**Passage through collector or turbine**	**Passage over spillway**	**Passage through Upper Release Point**	**Passage through Canal Drain**	**Passage through Surge Arresting Structure**
Swift No. 1	≤ 2 bull trout/year for Swift No. 1 and No. 2 together	≤ 12 bull trout/year in years of spill; spills are expected to occur, on average, every 2.3 years.	No mortality, designed to be fish friendly	N/A	N/A
Swift No. 2		No mortality due to low head spill and provides avenue for bull trout to leave canal safely.	N/A	No mortality, passive exit structure	≤ 2 bull trout/year

Yale	≤ 2 bull trout/year for Yale Dam		≤ 8 bull trout/year in years of spill; spills are expected to occur, on average, every 2.3 years.	N/A	N/A	N/A
Merwin	Not anticipated because downstream migrants at Yale Dam will be transported to below Merwin Dam.		Not anticipated because downstream migrants at Yale Dam will be transported to below Merwin Dam.			

- All bull trout within 600 feet downstream of the following construction activities may be incidentally taken through harm as a result of elevated suspended sediments, as described in Table 9 of the Biological Opinion: acclimation ponds, two upstream migrant collect and haul facilities (Yale and Swift projects), instream habitat improvement projects in the Constructed Channel, gravel augmentation in the Bypass Reach, and three instream habitat improvement projects in Pine Creek.

- Incidental take in the form of harm and harassment of bull trout may occur as a result of monitoring activities in which bull trout will be netted and captured, recorded and then transported. No more than 1 bull trout would be harmed (killed) per year as a result of these activities. All captured bull trout are assumed to be harassed.

Spotted Owl

Cowlitz PUD proposes to clearcut harvest no more 10 acres of suitable spotted owl roosting and foraging habitat, and PacifiCorp proposes to clearcut harvest 3,283 acres of suitable spotted owl roosting and foraging habitat over the life of their licenses. Given a lack of spotted owl surveys on Utility-owned lands, any of this habitat removal could occur within a known or unknown spotted owl home range. Therefore, the loss of suitable spotted owl roosting and foraging habitat is anticipated to reduce the ability of reproducing spotted owls to successfully forage which may reduce their ability to successfully rear young except for harvest that may occur along the eastern shore of Yale Lake where management cannot exceed the criteria to maintain home range viability which would apply to 5 of the 8 affected home ranges in the action area. Because it is unknown what percentage of proposed harvest would occur in the SOSEA, the FWS anticipates the incidental take of spotted owls associated with the removal of 10 acres of spotted owl roosting and foraging habitat from Cowlitz PUD-owned lands and up to 3,283 acres from PacifiCorp-owned lands. This incidental take would be in the form of harm from habitat removal. The FWS does not anticipate the incidental take of spotted owls in the form of harass due to provisions to implement LOPs.

Bald Eagle

The proposed action is expected to indirectly incidentally take bald eagles through an increase in recreational boaters and anglers which are likely to harass nesting and wintering bald eagles by reducing the amount of time they can forage or from flushing them from feeding stations. All breeding and wintering bald eagles are likely to be harassed. The FWS does not anticipate the incidental take of bald eagles in the form of harm due to habitat modifications.

EFFECT OF THE TAKE

Bull Trout

In the accompanying Biological Opinion, the FWS determined this level of incidental take is not likely to jeopardize the continued existence of bull trout.

Spotted Owl

In the accompanying Biological Opinion, the FWS determined this level of incidental take is not likely to jeopardize the continued existence of the spotted owl.

Bald Eagle

In the accompanying Biological Opinion, the FWS determined this level of incidental take is not likely to jeopardize the continued existence of the bald eagle.

REASONABLE AND PRUDENT MEASURES

The FWS believes the following reasonable and prudent measures (RPMs) are necessary and appropriate to minimize the incidental take of bull trout in the action area. The FWS believes the proposed action includes all reasonable conservation measures to minimize the incidental take of spotted owls and bald eagles and, therefore, has not identified any RPMs necessary to further minimize the incidental take of these species.

Bull Trout

RPM 1: Minimize bull trout redds excavated by coho salmon in Pine and Cougar Creeks.

RPM 2: Manage adult bull trout migration below the Swift Dam for the greatest possible reproductive success.

RPM 3: Minimize predation on bull trout by reintroduced salmon and steelhead.

RPM 4: Minimize sedimentation impacts from all construction sites.

RPM 5: Minimize harm and harassment of bull trout as a result of monitoring and capture and haul facilities.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the ESA, the FERC or its applicant must comply with the following Terms and Conditions, which implement the Reasonable and Prudent Measures described above and outline required reporting/monitoring requirements. These Terms and Conditions are non-discretionary. Because no RPMs were identified to minimize the incidental take of spotted owls and bald eagles, there are no associated Terms and Conditions for these species.

Bull Trout

T&C 1.1: In restoring coho to Yale Lake, select for early spawners, if feasible, so that Cougar Creek bull trout will spawn at least partly after coho, thus reducing coho redd superimposition on bull trout.

T&C 2.1: Conduct annual bull trout surveys in the Swift No. 2 tailrace, Bypass Reach, and Lower and Upper Constructed Channels to document presence or absence of bull trout spawning and egg survival, if appropriate, in these locations. This will occur for a minimum of 3 years following completion of the Upper Release Point and implementation of the Bypass Reach flows (as directed by the WDOE) or until it is demonstrated that bull trout spawning does not occur in these areas.

T&C 3.1: If bull trout occur in the required random sample of mixed downstream migrant species in the Swift Creek Reservoir and Yale Lake traps, smolt-sized bull trout should be placed immediately in the recovery tank and transported to the next reservoir downstream. Bull trout fry should be separated from larger fish and be transferred to a separate fry tank. If possible, bull trout fry should be separated from other fry and released back into Swift Creek Reservoir away from the surface collector.

T&C 4.1: Determine the appropriate timing windows for instream construction in the Bypass Reach based on annual patterns of flow, temperature, and adult bull trout abundance, with a view toward minimizing suspended sediment impacts on bull trout and substrate embeddedness.

T&C 4.2: Where feasible and appropriate for the type, magnitude and duration of the instream activity, isolate instream construction from the flow during the work period by installing temporary dams and pumping or diverting the water around the work zone. Dewatering may require fish rescue to avoid stranding.

T&C 5.1: The Licensees are authorized the direct take (harass by survey, capture, handle, and release) of bull trout while conducting annual monitoring activities and surveys for the purpose of enhancing bull trout survival, as well as to take bull trout in interim and permanent bull trout passage operations in accordance with the conditions stated below. Permitted activities are restricted to the Lewis River Subbasin, from the Columbia River to North Fork Lewis River Mile 72.5 (Lower Falls), including Lake Merwin, Yale Lake, and Swift Creek Reservoir, and all Lewis River tributaries up to Lower Falls.

T&C 5.2. The Utilities are responsible for assuring that the individuals conducting monitoring or collect and haul operations are properly trained and educated, and complying with the following Terms and Conditions. The Utilities shall retain a current list of such people and the list should include the following:

1) The name of each individual;
2) The resume or qualifications statement of each, detailing their experience with each species and type of activity for which they will be conducting; and
3) The names and phone numbers of a minimum of two references.

T&C 5.3: All capture, handling, and observation methods shall be implemented at times that will avoid temperature stress of bull trout being surveyed, collected, monitored, rescued, or relocated.

T&C 5.4: All live bull trout captured shall be released as soon as possible. Any bull trout captured and showing signs of stress or injury should only be released when able to maintain itself. Nurture such individuals in a holding tank until they have recovered. If bull trout are held in a tank, a healthy environment for the stressed bull trout must be provided, and the holding time must be minimized. Water-to-water transfers, the use of shaded, dark containers, and supplemental oxygen shall all be considered in designing bull trout handling operations. Any bull trout fry must be held in a separate container from other bull trout (including juvenile bull trout), to avoid predation by larger bull trout during captivity.

T&C 5.5: The period of time that captured bull trout are anesthetized shall be minimized. The number of bull trout that are anesthetized at one time shall be no more than what can be processed (biosampled) within several minutes.

T&C 5.6: Prior to conducting activities that involve handling of bull trout, the permittee shall ensure that hands are free of sunscreen, lotion, or insect repellent.

Reporting Requirements

In order to monitor the effectiveness of implementing the Reasonable and Prudent Measures, the FERC or its applicants will prepare a report describing their progress in implementing the Terms and Conditions and the licenses. An annual progress report should be sent to the FWS attention: Division Manager, Division of Conservation and Hydropower Planning. The report may be included in the Annual Report required under the SA and shall include, but not be limited to, the following:

1) Significant research results and its importance with regards to recovery of bull trout;
2) Maps or descriptions of locations sampled for each species;
3) The results of all sampling efforts including estimates of population size;
4) Quantification of take, including numbers of individuals incidentally killed, including dates, locations, and circumstances of lethal take, and an estimate of the numbers of individuals otherwise harmed or harassed (e.g., displaced during snorkeling surveys);
5) Other pertinent observations made during sampling efforts regarding the status and ecology of the bull trout, including size of individuals and presumed life-history form;
6) Progress with implementing the RPMs;
7) Activities carried out in the Conservation Covenants;
8) Activities conducted under the WHMPs;
9) Changes to dam operations that improve or protect the species or their habitat; and
10) Implementation of any Conservation Recommendations.

The FERC or its Licensees are to notify the FWS within 3 working days upon locating a dead, injured, or sick endangered or threatened species specimen. They must make initial notification at the nearest FWS Law Enforcement Office. Contact the FWS Law Enforcement Office at (425) 883-8122 or the FWS Western Washington Fish and Wildlife Office at (360) 753-9440. Notification must include the date, time, precise location of the injured animal or carcass, and any other pertinent information. Care should be taken in the handling of sick or injured specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed. Reports of incidental injury or killing must include the date, time, precise location of the injured animal or carcass, and any other pertinent information such as cause of death or injury. In regards to bull trout, all incidental mortalities shall be preserved in a fashion to best provide maximum scientific information (otoliths, scales, genetic samples, general fisheries statistics, etc.). Any specimen killed shall be kept whole and put on ice or frozen, and a small sample of tissue (fin clip approximately 1 square centimeter) shall be preserved in a vial of 95 percent ethanol for genetic analysis.

The FWS will not refer the incidental take of any migratory bird or bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 USC Section 703-712), or the Bald and Golden Eagle Protection Act of 1940, as amended (16 USC Section 668-668d), if such take is in compliance with the Terms and Conditions (including amount and/or number) specified herein.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, help implement recovery plans, or develop information. Because of the FWS's extensive involvement in the development of the SA and our continued involvement on the ACC and TCC, the FWS does not propose any conservation recommendations.

SECTION 7 REINITIATION NOTICE

This concludes formal consultation for the proposed relicensing of the Lewis River Hydroelectric Projects (Merwin (FERC No. 935), Yale (FERC No. 2071), Swift No. 1 (FERC No. 2111), and Swift No. 2 (FERC No. 2213)) by the Federal Energy Regulatory Commission and the interdependent actions contained in the Settlement Agreement (PacifiCorp et al. 2004a), dated November 30, 2004, as outlined in your request of October 11, 2005, and the 401 Certifications. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained, or is authorized by law, and if: 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered in this Biological Opinion; 3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Biological Opinion; or, 4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount and extent of incidental take is exceeded, FERC and the applicants must immediately consult with FWS regarding how to proceed and whether the operations causing such exceedance should cease pending reinitiation.

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