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United States Department of the Interior

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NOV 1 3 2001

Memorandum

To: Assistant Regional Director, Ecological Services, Portland, Oregon
(Attention: Larry Salata)

From: Manager, Western Washington Office, Lacey, Washington

Subject: Biological Opinion (1-3-01-FR-2100), Following Reinitiation of Consultation for the Proposed Amendment of the Incidental Take Permit (PRT-808398) for Plum Creek Timber Company (FWS Reference: 1-3-98-FR-0357; X-Reference: 1-3-96-FW-190), to Include the Puget Sound/Coastal Distinct Population Segment of Bull Trout (*Salvelinus confluentus*), and to Include Evaluation of Electrofish Monitoring on Both the Columbia River and Puget Sound/Coastal Distinct Population Segments of Bull Trout, King and Kittitas Counties, Washington

This memorandum constitutes the U.S. Fish and Wildlife Service's (Service or we) Biological Opinion (BO) on the proposed amendment to the section 10(a)(1)(B) Incidental Take Permit (ITP or permit) previously issued to Plum Creek Timber Company (Plum Creek). This BO follows reinitiation of consultation, in accordance with section 7(a)(2) of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1536 et seq.). The extant ITP and this proposed amendment are based upon Plum Creek's Habitat Conservation Plan (HCP) (Plum Creek 1996) and Implementation Agreement (IA) (Plum Creek et al. 1996). The reinitiation of consultation and this subsequent BO are for our proposed action of amending the subject ITP, in order to address the potential effects of adding the Puget Sound/Coastal Distinct Population Segment (DPS) of bull trout (*Salvelinus confluentus*) to ITP PRT-808398, and the effects of that permit amendment on the Puget Sound/Coastal DPS of bull trout.

Additionally, this BO addresses the potential effects of electrofishing for HCP monitoring, an activity covered by the permit and included in the HCP. But section 10 permit coverage for potential take of listed species, specifically both Puget Sound/Coastal and Columbia River DPSs of bull trout potentially found in the Project Area, has not been necessary until the recent listing of bull trout. In addition, electrofishing was not included in our analysis when we added Columbia River bull trout to the Plum Creek ITP in 1998, as explained below.

The IA between Plum Creek, the Service, and the National Marine Fisheries Service (NMFS) included unlisted species provisions for all vertebrate species that may be found in the HCP

Planning Area ("Planning Area"; Plum Creek's lands and surrounding public/private lands within the larger action area). At the time of initial permit issuance, it was assumed that consultation would be reinitiated prior to adding any additional species to the ITP. This BO assesses whether the proposed addition of the Puget Sound/Coastal DPS of bull trout to the ITP is likely to jeopardize the continued existence, or destroy or modify the critical habitat, of any listed species, and analyzes the effects of the covered activity of electrofishing, on both bull trout DPSs.

We have also considered whether the proposed action of adding this DPS of bull trout to the ITP, or the activity of electrofishing, are likely to adversely affect the northern spotted owl (*Strix occidentalis caurina*), a federally-listed threatened species; the marbled murrelet (*Brachyramphus marmoratus marmoratus*), a federally-listed threatened species; the grizzly bear (*Ursus arctos - U. a. horribilis*), a federally-listed threatened species; the gray wolf (*Canis lupus*), a federally-listed endangered species; the bald eagle (*Haliaeetus leucocephalus*), a federally listed-threatened species; and the peregrine falcon (*Falco peregrinus*), a former federally-listed endangered species. We have concluded that the proposed action would not likely adversely affect any of these species. These species will not be mentioned further herein.

We have also considered whether the proposed action of adding the Puget Sound/Coastal DPS of bull trout, or electrofishing, are likely to adversely affect of the Columbia River DPS of bull trout, a federally-listed threatened species. We have concluded that the proposed action of adding the Puget Sound/Coastal DPS of bull trout would not affect the Columbia River DPS of bull trout. We have concluded that electrofishing, which has not been analyzed for effects to any listed species under our purview to date, would likely adversely affected the Columbia River DPS of bull trout. Thus, potential effects of electrofishing on both the Columbia River DPS and Puget Sound/Coastal DPS of bull trout will be included herein.

In addition, we do not expect the proposed action to result in effects to Canada lynx (*Lynx canadensis*), a recently listed federally-threatened species, for the following reasons. The proposed action is an administrative action with respect to bull trout, and there would be no authorization of take with regard to lynx at this time. The will be reassessed through the ongoing separate consultation process (Biological Opinion 1-3-01-FR-2099) designed to add Canada lynx to the permit. The potential effects of the subject HCP on Canada lynx will be addressed in that process and will not be further discussed herein.

No significant changes in circumstances or actions have occurred since completion of the BO dated June 24, 1996, for Plum Creek's HCP (ITP PRT-808398), with respect to these species. No significant changes in circumstances or actions have occurred since the reinitiated consultations and resulting BOs completed on July 13, 1998 (USFWS 1998), for addition of the Columbia River DPS of bull trout, and December 22, 1999 (USFWS 1999), for modification of the HCP to accommodate a land exchange.

No critical habitat is currently designated or proposed in the Project Area (lands owned by Plum Creek per the subject ITP, within the larger Planning Area and even larger action area). Within the action area (all areas to potentially affected directly and indirectly by the ITP action

considered), critical habitat has been designated for the northern spotted owl (spotted owl) and marbled murrelet on lands adjacent to Plum Creek's ownership. Potential effects to critical habitat were analyzed as part of our 1996 and 1998 BOs associated with the original Plum Creek HCP/ITP and 1998 amendments. No effects to critical habitat are anticipated as part of the proposed actions of adding bull trout to the ITP, or through monitoring with the use electrofishing as analyzed herein. Potential effects to critical habitat will not be further discussed herein.

CONSULTATION HISTORY

A complete description of the consultation history is contained in the original June 24, 1996, BO (USFWS 1996a) developed for the subject HCP, most of which is repeated below for convenience. A notice advising the public of the proposed permit amendment was published in the June 25, 1999, *Federal Register* (64 ***FR*** 34216). We will respond to public comments in our Reassessment of Section 10 Findings document.

Consultation on the original HCP action was initiated on February 13, 1996. As part of this consultation, we conducted an Unlisted Species Assessment: *Analysis of Effects on Unlisted Species from Implementation of the Plum Creek I-90 HCP* (USFWS 1996b). On June 27, 1996, we issued an ITP (PRT-808398) to Plum Creek, pursuant to section 10(a)(1)(B) of the Act. That permit authorized the incidental take of the spotted owl, marbled murrelet, grizzly bear, and gray wolf, in the course of the otherwise legal forest-management and related land-use activities in portions of King and Kittitas counties, Washington. Pursuant to the HCP and the IA, Plum Creek received assurances that then-unlisted vertebrate species would be added to the permit upon listing under the Act, if doing so were consistent with the IA.

On June 13, 1997, (62 ***FR*** 32268) we proposed to list the Klammath River population of bull trout as endangered and the Columbia River population of bull trout as threatened. On September 11, 1997, Plum Creek requested that bull trout be added to its permit. On May 4, 1998 (63 ***FR*** 24565), we published a notice of proposed amendment.

To determine whether adding the Columbia River DPS of bull trout to Plum Creek's permit would appreciably reduce the likelihood of the survival and recovery of that bull trout population segment or any other species, we reinitiated consultation on the subject HCP on May 30, 1998. Comments received as a result of the notice of permit amendment were considered during this process. On June 10, 1998, we announced the listing of the Columbia River and Klammath DPSs as threatened, followed by publication of a final rule (63 ***FR*** 31647) with an effective date of July 10, 1998. We found that designation of critical habitat for these population segments was not determinable at that time.

On July 13, 1998, we completed a BO on an amendment of the ITP to include the Columbia River DPS of bull trout (USFWS 1998). We also determined that the permit amendment continued to meet each of the issuance criteria described in section 10(a)(2)(B) by preparing a

Statement of Findings. The permit was amended to include the Columbia River DPS of bull trout on July 14, 1998. These documents are incorporated herein by reference.

At the same time the Klammath and Columbia River DPSs were listed, June 10, 1998, we proposed listing as threatened the remainder of the bull trout species within the lower 48 states (63 ***FR*** 31693), which included the Puget Sound/Coastal DPS. On July 8, 1998, we proposed to list the Canada lynx range-wide within the conterminous 48 states as threatened (63 ***FR*** 36993).

The September 11, 1997, request from Plum Creek to add bull trout to the permit was only partially fulfilled when we included the Columbia River Basin DPS of bull trout on the permit. That request was not fulfilled with respect to the Puget Sound/Coastal DPS of bull trout at that time, which is at issue herein. While we had not yet made final listing determinations for its species, on June 25, 1999 (64 ***FR*** 34216), we gave notice that Plum Creek had requested the addition of four proposed species (two of which are NMFS species) to their permit. These species included the Puget Sound/Coastal DPS of bull trout and Canada lynx.

On November 1, 1999, the Puget Sound/Coastal DPS of bull trout was listed as threatened (64 ***FR*** 58910) with an effective date of December 1, 1999.

On December 22, 1999, we completed formal consultation on another modification of the subject HCP. The Interstate-90 Land Exchange Act (105 P.L. 277-(112 Stat. 2681-326), Title VI, §§ 601-612 (1998)), as amended by the Interior Appropriations Bill, November 1999 (H.R. 2466 – amendment number 1630), resulted in a decrease of Plum Creek ownership within the Planning Area, but a slight increase in Plum Creek ownership within the Green River (west side of the Planning Area).

As noted above, a notice advising the public of the proposed permit amendment was published in the June 25, 1999, *Federal Register* (64 ***FR*** 34216). We will respond to the comments received from the public in our Reassessment of Section 10 Findings document.

In 1998, we assumed that Plum Creek would seek a section 10(a)(1)(A) scientific permit whenever it conducted electrofish fish surveys at any location within the Project Area. Conversely, to date, Plum Creek has relied on the expectation that State of Washington's scientific sampling permit process would sanction their electrofishing monitoring efforts for the subject HCP. According to Plum Creek, the Washington Department of Fish and Wildlife (WDFW) has recently decided that their state permits will not provide coverage for federally-listed species and therefore special permits are required (e.g., from the Service). NMFS has already provided coverage for electrofishing as proposed, in their ITP for the subject HCP, for the listed species under their purview. In a letter to us dated July 12, 2001, Plum Creek requested electrofishing as described in the HCP be included in our analysis for amending their permit to add the Puget Sound/Coastal DPS of bull trout. When the Columbia River DPS of bull trout was amended to the subject ITP on July 14, 1998, electrofishing was not included on our permit as it was expected that coverage for potential take would be forthcoming to Plum Creek through other processes. We are performing the analysis of electrofishing as described in the HCP herein. Thus, the potential effects to the Columbia River and Puget Sound/Coastal bull trout DPSs are

included herein as part of the proposed action. In a letter to us dated October 15, 2001, Plum Creek specifically described electrofishing as they proposed for it to occur under the HCP and this proposed ITP amendment.

The subject reinitiation of consultation and this BO are based upon: information contained in our 1996 BO for the original Plum Creek permit; information accumulated and analyzed during the bull trout listing process: the previous reinitiated consultations and BOs of July 13, 1998, and December 22, 1999; and other information cited later in this document and listed in the Literature Cited section. This BO also incorporates by reference portions of the final documents associated with the original Plum Creek section 10 application package.

BIOLOGICAL OPINION

It is our biological opinion that the proposed action of adding the Puget Sound/Coastal DPS of bull trout to Permit PRT-808398 is not likely to jeopardize the continued existence of the Puget Sound/Coastal DPS of bull trout. It is our biological opinion that electrofishing for HCP monitoring, a proposed activity covered by Permit PRT-808398 and included in the HCP, is not likely to jeopardize the continued existence of Puget Sound/Coastal or Columbia River DPSs of bull trout. It is also our biological opinion that the proposed action is not likely to result in destruction or adverse modification of critical habitat for any species.

DESCRIPTION OF PROPOSED ACTION

We propose the addition of the Puget Sound/Coastal DPS of bull trout to Permit PRT-808398. We also propose including electrofishing as a permitted activity on the subject permit (electrofish activity was not analyzed for its potential effects to the Columbia River DPS of bull trout in our 1998 BO, and, thus, will be analyzed for both Puget Sound/Coastal and Columbia River DPSs herein). Plum Creek was issued a permit authorizing take of the spotted owl, marbled murrelet, grizzly bear, and gray wolf on June 27, 1996. At that time, the Service and National Marine Fisheries Service (Services) signed an IA with provisions to conserve currently unlisted fish and wildlife species that may be associated with habitats on their properties in the Planning Area. The IA provided that Plum Creek may request that these species be added to the permit, should any of these species be listed in the future. In such an event, we would reinitiate consultation and make a determination that the species may be added, that additional mitigation be required from Plum Creek before such species may be added due to extraordinary circumstances, or that the species cannot be added because to do so would appreciably reduce the likelihood of survival and recovery of the species in the wild.

Plum Creek committed to manage its lands within the Planning Area pursuant to the HCP and IA that were developed and finalized as part of their 1996 permit application. The term of the HCP and permit are 50 to 100 years. Some aspects of the HCP and IA may terminate at year 50 (Phase I) while others (Phase II) may continue for an additional 50 years. The HCP and IA allow for the possibility of early termination of the permitted activity by the applicant subject to the permit condition requiring that any past incidental take of listed species has been sufficiently mitigated prior to termination. Other provisions for revocation by the Services or amendment are included in the IA, including a provision for termination of the HCP due to a material violation of the HCP with respect to any unlisted species.

Covered Area Location and Description

Plum Creek's ownership within the Planning Area is located both east and west of the Cascade Mountains crest along the Interstate-90 (I-90) corridor in central Washington, approximately 60 to 100 miles east of Seattle. In selecting the geographical boundaries for implementation of the HCP (HCP Figure 1), Plum Creek considered the then-proposed Growth Management Act

zoning in King and Kittitas counties, the potential habitat of the species to be protected, and the anticipated future activities that might result in incidental take of the above mentioned species. Plum Creek's lands in the Planning Area incorporate portions of 11 Townships on the western slopes of the Cascade range, and 19 Townships on the eastern slopes of the Cascade range (HCP Appendix 1).

For purposes of consultation under the Act, "action area" is defined at 50 CFR 402 to mean "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." Although the proposed activities that would potentially cause effects to listed and other covered species are restricted to the area owned by Plum Creek and covered by the ITP (termed the "Project Area" in the IA and the "HCP area" in the HCP; the area subject to direct effects), the indirect effects of these actions on these species extend beyond this area. For purposes of this consultation on the Puget Sound/Coastal DPS of bull trout, we have defined the action area to include: 1) the original HCP Project Area; 2) the streams and rivers withing adjacent and interspersed federal, state, and private lands described as the Planning Area in the HCP and Environmental Impact Statement (EIS); 3) streams downstream or upstream of these areas. These areas are described in greater detail below.

The subject ownership occurs in a "checkerboard" pattern in an area commonly referred to as the I-90 Corridor. The outer boundaries of the HCP "Planning" or "Analysis" Area encompass 418,900 acres; but, because of the checkerboard configuration of land ownership, the area includes 270,600 acres of other ownership. Approximately 29 percent of the Planning Area is west of the Cascade crest, and 71 percent is east of the Cascade crest. This portion of the Planning Area (of which the HCP Project Area is a subset), plus the streams upstream or downstream of this area, is the action area being analyzed in this BO. More detail on the action area is provided in the Environmental Baseline below.

Covered Activities

The proposed ITP amendment of adding Puget Sound/Coastal DPS of bull trout would only authorize incidental take in connection with those aspects of commercial forest management considered in the HCP. These activities include timber harvest (cutting, felling, experimental silviculture, limbing, yarding and yarding corridors, construction and use of landings, loading and hauling); road construction, maintenance, decommissioning, and administrative and commercial road use; road access; site preparation including slash and residual treatment; firewood cutting; planting; fertilizing; brush control; fire and erosion control; thinning and pruning; administration and monitoring; surveying, conducting stand examinations and inventory, and cruising timber; painting or marking of timber or stand boundaries; entry by silviculturalists, wildlife biologists, foresters, management, enforcement, and other personnel for miscellaneous activities such as assessments, land surveys, and general reconnaissance; and all other activities related to the conduct of the timber-management program and required actions of the HCP (e.g., research). Also included are administrative and commercial use of gravel pits and rock quarries necessary for forest management; and administration and maintenance of all

existing (as of 1996) buildings, radio towers, and associated telecommunication facilities; and ecosystem-based forest planning on 148,300 acres of its ownership in the I-90 corridor of the central Cascades Mountain Range in Washington.

Aquatic resource monitoring activities, including electrofishing, are also covered activities. The proposed inclusion of electrofishing on the permit would only authorize incidental take in connection with those aspects of monitoring and assessment considered in the HCP.

The HCP includes commitments by Plum Creek to provide specific amounts of forest stand structural classes and covered species habitat types. As specified within the HCP, timber harvest and road construction must be consistent with maintaining those habitat levels. In general, the HCP does not make silvicultural prescriptions outside of some minimal leave-tree requirements and relatively few situation-specific standards and guidelines pertaining to special habitats, such as strict limitations to activities within the riparian zones. It is a programmatic-style plan. No predictions of the number of acres to be treated per decade are made in the HCP because the HCP does not limit the amount of timber harvest in uplands so long as the required conditions are met.

Individual management units are not scheduled for harvest at any particular time and individual road locations and management are not specified. The HCP focuses on timber management as the primary landscape-influencing factor, as well as the factor with the most influence on covered species. As long as Plum Creek's activities are consistent with the HCP, the permit provides a mechanism to authorize incidental take of listed species under section 10 of the Act. In addition, under the HCP, Plum Creek is required to comply with State Forest Practices Rules and Regulations throughout the ITP period. However, WAC 222-16-080-7(a) and other State regulations exempt activities covered under an HCP from the similar provisions of State regulations; these are the major actions that occur under the HCP. Other actions, such as road-building for access, are conducted in support of timber harvest and management.

As part of aquatic resources monitoring, fish populations and aquatic insect communities will be monitored. Electrofishing would occur for fish monitoring purposes as described in the HCP (section 5.1.6).

Please see our 1996 BO, the HCP, and the IA for more specific information regarding covered activities.

HCP Mitigation Measures

"Mitigation measures" include actions taken by Plum Creek to avoid, minimize, and mitigate impacts to species addressed in the HCP. These actions include management actions as well as actions to monitor and address impacts during implementation of the HCP. Mitigation in a multi-species, habitat-based plan is woven into the HCP itself. The following constitute some basic elements of the HCP. A majority of these actions contribute directly to the biological

success of the HCP and are quantifiable. They also may constitute the measurable criteria that Plum Creek uses to monitor and evaluate the biological success of the HCP. We considered only the mandatory measures and elements of the HCP in its evaluation of mitigation and resulting impacts. Some mitigation actions outlined in the HCP were completed prior to its implementation. Measures contained in the HCP to monitor and mitigate for impacts to listed species, as well as unlisted species, are described in the 1996 BO, pages 4 through 11.

These minimization and mitigation measures described below represent the minimum level of riparian/aquatic conservation that Plum Creek has committed to implement. Several aspects of the HCP, including watershed analysis and riparian protection, are subject to adaptive management as described in the HCP and our 1996 BO. If additional actions are necessary to protect bull trout, adjustments would be made to watershed analysis-derived prescriptions and to the interim and minimum buffer prescriptions.

Please see the HCP, the IA, and our 1996 BO for more details.

Mitigation Relative to Bull Trout

One of the stated goals of the HCP is to develop and retain healthy riparian and aquatic systems. This includes increasing instream and riparian ecosystem function so as to develop properly functioning habitat for (or capable of supporting) both resident and anadromous fish species. The actions prescribed under this HCP are intended to result in fish habitat conditions that provide for increases in salmonid population numbers (Note, herein when using the term "salmonid", we are referring to salmon, trout, and char). The HCP was specifically designed to protect instream fish habitat and maintain functional riparian systems, and utilizes a combination of conservation measures expected to protect bull trout.

The Riparian Management Strategy includes the maintenance and protection of riparian habitat areas (RHAs). RHAs are important for both watershed and wildlife habitat protection. RHAs and wetlands total more than 8,500 acres on Plum Creek's lands in the Planning Area, with about 3,100 acres in Plum Creeks RHAs west of the Cascade Crest.

Interim and Minimum Guidelines for Riparian Habitat Areas

Plum Creek is implementing the following interim (i.e., these guidelines are considered interim until completion of watershed analysis) and minimum guidelines in RHAs:

1. Fish-bearing streams - Establish 200-foot RHAs (measured as horizontal distance from the edge of the stream) on each side of all fish-bearing streams. In terms of stream systems in the Planning Area, Plum Creek's major consideration is whether a particular stream is fish-bearing or nonfish-bearing, and perennial or intermittent).

The entire RHA is retained as spotted owl habitat, or if not currently functioning as spotted owl habitat, the area is managed to provide forest conditions equal to or greater than foraging and/or dispersal (FD) habitat for spotted owls (Quadratic Mean Diameter of 10 inches and Relative Density of 48) (see HCP Section 2.4, Habitat Definition Table on page 59). A 30-foot (horizontal distance), "no-harvest" area is situated in RHAs adjacent to fish-bearing streams to maintain bank integrity, provide nutrients, and contribute large woody debris to the stream (No-harvest is defined as: no commercial harvest of conifer trees; limited silvicultural prescriptions for conifers and harvest of deciduous trees are allowed to address watershed and wildlife concerns (e.g., excessively high tree density or undesirable course woody debris species)). Beyond the 30-foot, no-harvest zone, management objectives are to meet large woody debris goals, maintain a late-successional forest structure, accommodate channel migration, slope stability, and/or additional wildlife considerations, and to implement a "feathering treatment" whereby more "large trees" are left at the inner portion (i.e., the area closest to the stream) of the RHA. Structural features within RHAs are tracked to determine the extent and distribution of structural stand stages. One-time (i.e., one harvest during the Permit period) selective or partial harvests are allowed in RHAs, if Plum Creek can ensure that post-harvest conditions in the RHAs will provide, at a minimum, the equivalent of spotted owl habitat (i.e., FD habitat or greater). These harvests incorporate removal of no more than 50 percent of the merchantable (commercial) timber volume available for harvest in the 200-foot RHA. However, it is expected that far less than 50 percent of the volume will be removed, if any is able to be removed, because the management of these buffers is dictated by post-harvest criteria as well as by stand-level amounts of various forest stages. For instance, over the 50-year duration of the HCP, these areas are scheduled to improve from 30 to 32 percent mature forest or better on Plum Creek lands to 43 to 45 percent mature forest or better. For all ownerships in the Planning Area the expected improvement is from about 54 percent to 64 to 66 percent in year 2045. Any RHA entered for selective harvest must retain minimum standards designed to maintain riparian functions (on the west side of the Cascade Crest, a quadratic mean diameter of 10 inches and a Relative Density (Curtis 1982) of 48 must be retained).

2. West-side nonfishbearing, perennial streams - Along perennial streams (includes spatially intermittent streams containing perennial subsurface flow), Plum Creek provides 100-foot RHAs on each side of these streams within Late Successional Reserves (including lands interspersed with Congressionally and Administratively withdrawn lands), Adaptive Management Areas, and where elevation (up to 5,000 feet) and topography are suitable for spotted owl dispersal. Harvest-exclusion zones are not maintained on nonfishbearing streams, but a 30-foot equipment exclusion zone is established. The primary purpose of the RHAs along nonfishbearing streams is to protect downstream fish habitat, water quality, and habitat for other aquatic and riparian-dependent wildlife species, such as frogs and salamanders (i.e., Lifeform 2). These RHAs are also managed to maintain nesting/roosting/foraging or foraging/dispersal spotted owl habitat through harvest deferral or partial harvesting.

Along perennial nonfishbearing streams outside of Late Successional Reserves, Adaptive Management Areas, or in drainages where spotted owl habitat maintenance is not feasible, Plum Creek will provide 25-foot wide Riparian Leave tree Areas (RLTA) on each side of the streams. Plum Creek will retain a minimum of 25 live conifer trees, greater than 12 inches diameter at breast height, per 1,000 feet of stream (i.e., about 44 conifer trees per acre). Plum Creek will also retain all snags, culls, and "leaners" that do not present a safety hazard. The RLTA will be designated for a distance of at least 2,000 feet upstream from the junction of a perennial nonfishbearing stream with a fishbearing stream. RLTA requirements may be met alternatively through "clumping" the required number of leave trees into Upland Management Area (UMA) -like patches adjacent to streams. Shrubs, small streams, and other streamside vegetation within the areas between the clumps will be retained. The width of each patch will not exceed 150 feet from the stream. Ground-based equipment will be excluded from the 25-foot RLTA. Because of the Environmental Principles established in the HCP, Plum Creek will cluster some leave trees in areas adjacent to many smaller streams, that otherwise would receive no specific protection under State Forest Practices Rules and Regulations.

In perennial, nonfishbearing streams that may be susceptible to landslides or debris flows (e.g., inner-gorge topography), appropriately sized riparian buffers will be determined through watershed analysis. In the interim, harvest and road construction will be prohibited on slopes at risk of failure. In completed watershed analyses in the Green River, over 50 percent of the streams not receiving 100-foot RHAs were prescribed at least 50-foot no-harvest buffers due to concerns surrounding mass-wasting.

3. Seasonal/Ephemeral Streams - Plum Creek's HCP leave-tree strategy precludes counting trees already left within RHA. Because of this fact, logistics, and their Environmental Principles, Plum Creek clusters some leave trees in areas adjacent to many smaller streams which otherwise would receive no specific protection under State Forest Practices Rules and Regulations. Nonfish-bearing streams that may be susceptible to landslides or debris flows (e.g., inner gorge topography) are protected by deferring timber harvest within those areas until, and after, completion of watershed analysis. Appropriate-sized riparian buffers are also determined through watershed analysis. Almost 50 percent of the mapped seasonal streams were prescribed at least 50-foot no-harvest buffers due to concerns surrounding mass-wasting. Seasonal streams found to be fish-bearing will receive fishbearing buffers and receive special consideration under watershed analysis.

4. Yarding Corridors - Yarding corridors may be necessary in RHAs to accommodate full-suspension or, if necessary, partial suspension cable yarding systems. All yarding corridors are placed at the discretion of Plum Creek. Plum Creek minimizes the removal of trees from corridors. During yarding operations, normal breakage of trees may occur and provides snags and downed material. In addition, the post-harvest yarding corridors will be comprised of young forest and residual trees which provide multi-structural forests. As an overall objective, Plum Creek attempts to disturb no more than 15 percent

of a 1,000-foot stream reach. If site-specific conditions or safety considerations require larger yarding corridors, Plum Creek can, at its discretion, expand the yarding corridors, but disturbs no more than 20 percent of the 1,000-foot stream. Plum Creek also avoids, where possible, placing yarding corridors across fish-bearing streams. Plum Creek attempts to minimize the necessity of yarding corridors. However, in some areas, yarding corridors are preferable if the only alternative is construction of additional roads or landing areas.

Wetlands

The riparian wetlands on Plum Creek's HCP lands will be identified during watershed analysis and appropriate prescriptions to protect the functions and values of these wetlands will be developed. Most of the wetlands within the Planning Area are spatially and functionally associated with rivers and streams. Plum Creek implements, as minimum and interim guidelines, the Riparian Management Strategy and standard State Forest Practices Rules and Regulations to protect all wetlands. Please see the subject HCP and our 1996 BO for more details on wetlands and associated mitigation.

Road Management

Plum Creek's management objective for roads is to minimize disturbance of RHAs and to prevent sediment delivery to streams. If a road is required to be built through an RHA, Plum Creek will implement the Company's road building/ maintenance practices (HCP Section 1.2.3.4) and implement specific measures to reduce the potential effects of road construction and use on streams and RHAs. Please see the subject HCP and our 1996 BO for more details on road management.

Harvest Deferrals for 303(d) Stream Segments and Wetland Management Zones

To address specific water-quality concerns, special consideration is given to fish-bearing streams and adjacent habitat areas that have been listed by the Washington State Department of Ecology (WDOE) as water-quality limited. Within the action area, stream segments in four drainages (i.e., Big Creek, West Fork Teanaway, Lookout Creek, and Gold Creek [tributary to Naches River]) are considered as water-quality limited under section 303(d) of the Clean Water Act. All stream segments were listed because stream temperatures exceeded State water-quality standards.

Watershed Analysis

Watershed analysis is used regularly by Plum Creek in watersheds on its lands in the central Cascade Mountain Range. Watershed analysis is also a major component of the HCP. Habitat function for salmonids is also being assessed through the watershed analysis process, as practiced according to the HCP (Toth 1995). Please see our 1996 BO for more detailed information on the watershed analysis program implemented with the subject HCP.

RHA Design and Fish Habitat Protection

All species of fish are sensitive to thermal fluctuations, suspended sediment, and alterations in streamflow regime; salmonids (such as bull trout) are especially sensitive to any changes in the freshwater environment. For this reason, Plum Creek assumed that by addressing the biological needs of the most-sensitive fish species (i.e., bull trout and other salmonids), the environmental requirements for successful spawning and rearing of all other fish species in the Planning Area would be adequately protected as well. Watershed analysis will identify prescriptions that may be implemented to further protect streams. Please see our 1996 BO for more details concerning watershed analysis.

Aquatic Resources Monitoring

To help ensure that the mitigation and minimization strategies are effective, the HCP incorporates a variety of aquatic monitoring components, including electrofishing, to provide feedback for adaptive management. Where appropriate, monitoring methods used by Plum Creek conform to the Timber/Fish/Wildlife (TFW) survey methodology protocol (Shuett-Hames et al. 1993). Fish-habitat-monitoring methods include some combination of inventory assessment (baseline monitoring) and measurements over time (trend monitoring).

As described in HCP Section 5.1.6, all aquatic-resources monitoring is directed at specific technical questions and concerns addressed by the riparian-management strategy. Plum Creek will conduct monitoring of riparian, steam channel and fish habitat conditions in stream segments in the Green River and Yakima River subbasins. Parameters will be measured in at least two 245-foot long (75-meter) sites within each segment. Fish populations and aquatic insect communities will be monitored through community surveys conducted in permanent integrated monitoring study reaches (four in Green River subbasin, four in the Yakima River subbasin). Please see our 1996 BO for greater information on the Aquatic Resources Monitoring Program implemented as part of the subject HCP. A complete description of the aquatic monitoring protocols is in Section 5 of the HCP. A schedule of monitoring and reporting is presented in HCP Table 31.

Electrofishing

Backpack electrofishing surveys are used by Plum Creek to gather fish distribution and abundance data for the aquatic monitoring and adaptive management commitments in the HCP. The surveys are used for four main purposes. The first and most widespread use is for verification of fish presence and absence in streams. This typically involves electrofishing in smaller headwater streams, at or near the upstream limit of fish distribution. Plum Creek will use standard methods sanctioned by the WDFW (Washington Forest Practices Board Manual 2000), with supplementary protocols described in the HCP Field Implementation Manual (Plum Creek Timber Company 2000). Between 1996 and 2001, nearly 250 miles of streams in the Project Area have been surveyed for this purpose. The need for these surveys (as compared to 1996) has

apparently diminished due to this past work; it is expected that approximately six electrofish surveys (each covering about 2,000 feet of stream) will be conducted each year, on average, for the remainder of the HCP term.

The second purpose of electrofish surveys is to quantify fish population abundance trends in selected monitoring reaches. As few as sixteen, and as many as forty 250 foot (75-meter) fish population monitoring reaches distributed throughout the Project Area. These encompass a total of 4,000 feet or 9,840 feet of linear stream length, for the minimum and maximum number of reaches, respectively. About half of these reaches are located in the headwaters of the Green River, and half are located in the upper Naches and Yakima River drainages within the bounds of the Project Area (see the Aquatic Monitoring section 5.1.6 of the HCP). "Multiple-pass removal" estimates of fish populations in these reaches are conducted annually for the first three years that a reach is surveyed, then every other year for four years, and then every fifth year until the end of the ITP term. Surveys will be conducted using standard multiple-pass removal electrofishing techniques, with block nets. Electrofishing effort (duration in seconds) will be recorded. Areal and lineal densities for each species will be reported in addition to population estimates. Habitat surveys will be conducted concurrently.

The third and fourth purposes for electrofishing are to survey for the presence or absence of bull trout (*Salvelinus confluentus*), and to move fish during stream channel relocation projects, respectively. These types of projects are infrequent.

Regardless of the purpose, when electrofishing is conducted, Plum Creek will follow procedures that minimize injury to fish or other aquatic organisms. Only trained and experienced professionals perform electrofishing surveys in the Project Area. All electrofishing is conducted in accordance with guidelines developed by NMFS (see attached) and the WDFW. Additional specific features of our electrofishing surveys include:

1) Plum Creek will obtain all applicable state and federal permits.

2) Plum Creek will sample at times and locations that avoid disturbing spawning fish (native salmonids).

3) Plum Creek will not sample in known bull trout spawning tributaries during the fall spawning period (September-November).

4) Plum Creek's survey crews will avoid stepping on areas that may be used as salmonid spawning sites (i.e., gravel deposits in typical salmonid spawning areas) during the spawning and incubation periods.

5) Plum Creek will avoid sampling during springtime in areas occupied by bull trout, so as to avoid harming developing eggs, alevins, and newly emerged fry.

6) Electrofishing activities that involve extensive shocking or handling of fish will be conducted at times (before mid-July or after mid-August) or in locations (e.g., cold, groundwater-dominated streams) that avoid temperature stress of fish.

7) If bull trout or other listed fish species are encountered by Plum Creek during electrofishing surveys, then:

a) All live specimens are released as soon as possible, and as close as possible to the point of capture.

b) Fish are held in live wells in the natural stream environment during measuring and weighing. The fish are inspected periodically to ensure they are not being crowded or stressed.

c) Bull trout fry and larger individuals are held separately to prevent predation.

d) Any incidental injury or killing of bull trout or other listed fish species will be reported within 3 working days to the Service's Regional Office and Western Washington Office. Reports of incidental injury or killing will include the date, time, precise location of the injured animal or carcass, and any other pertinent information such as the cause of death or injury. All incidental mortalities will be preserved in a fashion to best provide maximum scientific information.

e) Any specimen killed will be kept whole and put on ice or frozen as soon as possible.

f) A small tissue sample (e.g., fin clip of 0.2 square inch (1 square centimeter) will be preserved in a vial of 95 percent ethanol and sent to the Western Washington Office for storage or processing.

g) Plum Creek will send a written description of the year's sampling plans to the Service during the spring of each year. Notification will be sent to the Western Washington Office, with updates as necessary to reflect changes in sampling plans.

h) Results of the year's surveys will be reported annually (in winter) to the WDFW as part of the State permitting requirements. Copies of this report will be made available to the Service. In addition, if bull trout are encountered, a report will be submitted to the Western Washington Office and the Upper Columbia Basin Field Office. This special bull trout report will contain the following information:

i) A summary of the findings relevant to bull trout and their recovery in the context of the HCP.

ii) Maps and descriptions of locations sampled where bull trout were encountered.

iii) Estimates of the fish population in the bull trout-occupied reach, if possible.

iv) Estimated quantification of take, including numbers of fish incidentally killed or injured, and the locations where this take occurred.

v) Other pertinent observations that are relevant to the status and ecology of bull trout, including size and presumed life history form.

vi) Planned future activities in light of the discovery of bull trout.

STATUS OF THE SPECIES

Bull trout were listed under the Act as threatened within the coterminous United States on November 1, 1999 (64 ***FR*** 58910) (effective December 1, 1999). This listing encompasses five previously recognized DPSs of the bull trout: Klammath River, Columbia River, Jarbidge River, Coastal-Puget Sound, and St. Mary-Belly River. Factors contributing to the decline of bull trout populations are identified in the listing rule and include: restriction of migratory routes by dams and other unnatural barriers; forest management, grazing, and agricultural practices; road construction; mining; introduction of non-native species; and residential development resulting in adverse habitat modification, overharvest, and poaching.

The listing rule specifies that, in recognition of the scientific basis for the identification of bull trout DPSs (i.e., population segments are disjunct and geographically isolated from one another with no genetic interchange between them due to natural and man-made barriers), for the purposes of consultation and recovery planning these DPSs will serve as interim recovery units in the absence of an approved recovery plan. On that basis, the geographic scope of jeopardy analyses for actions under formal consultation will be at the DPS level as opposed to the entire coterminous United States range of this species.

The State of Washington classifies bull trout as a State Priority Species. This Priority designation is given to those wildlife species that are of concern due to their population status and their sensitivity to habitat alteration (Mongillo 1993). Oregon has classified the bull trout as a sensitive/critical species, whose existence is being threatened in Oregon (Oregon Department of Fish and Wildlife 1993, Oregon Department of Fish and Wildlife 1995). California listed bull trout as an endangered species in October 1980 (California Department of Fish and Game 1995), but the species is now extinct in California. The American Fisheries Society listed bull trout as a species of concern in all of its range (California, Idaho, Montana, Nevada, Oregon, Washington, Alberta and British Columbia) except Alaska, as a result of present or threatened destruction, modification, or curtailment of its habitat or range, and introduction of exotic species (Williams et al. 1989). Bull trout have been categorized by some as an indicator species of forest and ecosystem health, since many biologists have concluded that bull trout are particularly sensitive to environmental change (Mongillo 1993, Rieman and McIntyre 1993).

Bull trout are a member of the char family. Bull trout are closely related to Dolly Varden trout (*Salvelinus malma*) and are sympatric with Dolly Varden over part of their range, most notably in the Coastal/Puget Sound Region of Washington State. The taxonomic classification between these two char has been fraught with difficulty. Characteristics distinguishing the two species as well as a taxonomic description of bull trout are presented by Haas and McPhail (1991). Two distinct life history forms, migratory (fluvial or adfluvial) and resident exist throughout the range of the bull trout (Rieman and McIntyre 1993). Bull trout are generally not anadromous (Meehan and Bjornn 1991), although anadromy may have been important in the past (Bond 1992) and is currently known to occur in Puget Sound (Kraemer 1994). Resident populations are generally found in small headwater streams where they spend their entire lives, whereas migratory

populations rear in tributary streams for several years before migrating downstream into a larger river or lake to mature (Rieman and McIntyre 1993). Bull trout become sexually mature from 4 to 9 years old (Shepard et al. 1984). They spawn in the fall (August through October) (Shepard et al. 1984, Rieman and McIntyre 1996), typically in cold, low-gradient second- to fourth-order tributary streams, over loosely compacted gravel and cobble having groundwater inflow (Shepard et al. 1984, Brown 1992, Rieman and McIntyre 1996). Spawning sites also seem to be near cover (Brown 1992). Bull trout spawn in consecutive or alternate years (Shepard et al. 1984, Pratt 1992). Post-spawning mortality, longevity, and repeat-spawning frequency are not well known (Rieman and McIntyre 1996).

Bull trout appear to have more specific habitat requirements than other salmonids (Rieman and McIntyre 1993). Habitat characteristics of channel stability, substrate composition, cover, temperature, and migratory corridors are important influences in bull trout distribution and abundance (Rieman and McIntyre 1993). In general, bull trout have been identified as needing habitat consisting of cold water, complex cover, stable substrate with a low percentage of fine sediments, high channel stability, and stream/population connectivity.

Water temperature is consistently recognized by researchers more than any other factor as influencing bull trout distribution (Rieman and McIntyre 1993). Distribution is thought to be limited by temperatures above 15 degrees C (Celsius), while optimum incubation and juvenile rearing temperatures are thought to be much lower, 2 to 4 degrees C and 4 to 8 degrees C, respectively (Goetz 1989, Pratt 1992). Water temperature seems to be an important factor in determining survival in the early life history of juvenile bull trout, with cool water temperatures resulting in higher egg survival and faster growth rates for fry and juveniles (Pratt 1992).

Sedimentation has been shown to cause negative effects to bull trout, although no thresholds can be set as clear tolerance limits for population maintenance (Rieman and McIntyre 1993). Emergence success of fry appears to be affected by the proportion of sediment in the substrate (Pratt 1992). Rearing densities of juvenile bull trout have been shown to be lower when higher percentages of fine sediment occur in the substrate (Shepard et al. 1984). Young bull trout are closely associated with the stream bed, this association appearing more important to bull trout than for other species (Pratt 1992; Rieman and McIntyre 1993). Due to this close connection to substrate, bed load movements and channel instability can also negatively influence the survival of young bull trout.

Bull trout distribution and abundance is also positively correlated with complex forms of cover and with pools (Rieman and McIntyre 1993). Cover that bull trout are usually associated with consists of large or complex woody debris and undercut banks, but may also include coarse substrates (cobble and boulder). Studies conducted with closely related Dolly Varden showed that population density declined with the loss of woody debris after clearcutting or the removal of logging debris from streams (Bryant 1983, Murphy et al. 1986, Dolloff 1986, Elliott 1986).

Coastal/Puget Sound DPS

Bull Trout Status in the Coastal-Puget Sound DPS

At least 22 of the 35 subpopulations of the bull trout within this DPS are affected by past and/or present forest management activities such as timber harvest and road construction (64 ***FR*** 58910). Other subpopulations within this DPS occur in National Parks or Wilderness Areas and are generally not affected by such activities. Agriculture, urbanization, and man-made barriers to fish passage are also significant factors affecting habitat utilized by bull trout. Over 35 percent of natural forested areas in the Puget Sound region have been eliminated (WDFW 1997 *in* 64 ***FR*** 58910). Of the 35 subpopulations identified within the DPS, 11 are likely to be adversely affected by elevated stream temperatures resulting from past forest practices (Phinney and Bucknell 1975; Hiss and Knudsen 1993; WDOE 1997 *in* 64 ***FR*** 58910). Within National Forests in Washington, large deep pools have been reduced by 58 percent due to sedimentation and loss of pool forming structures (USDA et al. 1993 *in* 64 ***FR*** 58910), resulting in significant habitat loss for bull trout (particularly from loss of large woody debris).

We have identified 35 subpopulations of native char (bull trout and/or Dolly Varden) within the Coastal/Puget Sound population segment. These subpopulations were grouped into five analysis areas based on their geographic location: Coastal, Strait of Juan de Fuca, Hood Canal, Puget Sound, and Transboundary Independents. These groupings were made in order to identify trends that may be specific to certain geographic areas. In subpopulations where it is not known whether the native char that occur are bull trout, Dolly Varden or both, they are addressed together as "native char" in this assessment. This does not imply that both exist within a subpopulation when the words "native char" are used, but merely that the subpopulation of char has not been positively identified as either bull trout and/or Dolly Varden.

In four subpopulations where both bull trout and Dolly Varden individuals were identified using morphometric measurements, subsequent genetic sampling from the subpopulations confirmed only the presence of bull trout (i.e., Queets River, Upper Elwha River, Cushman Reservoir and Lower Skagit River). Currently, two subpopulations exist where collected samples have been identified only as Dolly Varden by both morphometric data and genetics (Upper Sol Duc River and Canyon Creek). In no case has it occurred where a native char subpopulation, identified as containing only bull trout based on Linear Discriminate Function (LDF) methodology, was subsequently determined to contain Dolly Varden based on genetic analysis.

We conclude that the current identification trend of subpopulations within the Coastal/Puget Sound population segment indicates the high likelihood of bull trout being present in the majority of remaining subpopulations identified either as native char or as bull trout through the Haas methodology.

Within the Coastal/Puget Sound population segment, 12 of the 35 native char subpopulations are known to contain bull trout based on either genetic or morphometric measurement data. In seven

of these 12 subpopulations, Dolly Varden are also expected to be present. In three out of the remaining 23 subpopulations, only Dolly Varden are currently known to be present. It should be noted that in most cases, identification was based on a limited number of samples, so it is possible that bull trout may also occur in the three subpopulations that to date, have only yielded Dolly Varden.

We rated a subpopulation as either "strong", "unknown", or "depressed," modified after Rieman et al. (1997). A "strong" subpopulation was defined as having all life history forms that once occurred, abundance that is stable or increasing, and at least 5,000 total fish or 500 adult fish present. A "depressed" subpopulation was defined as having either a major life history form eliminated, abundance that is declining or half of the historic abundance, or less than 5,000 total fish or 500 adults present. We rated a subpopulation's status as "unknown" if insufficient information currently exists to determine whether the status of the subpopulation is either "strong" or "depressed." Within the Coastal/Puget Sound population segment, we rate 9 of the 35 delineated native char subpopulations as "depressed," 25 as "unknown," and one as "strong."

The WDFW also has a rating system for native char subpopulations. Within the Coastal/Puget Sound population segment, 4 of the 35 delineated native char subpopulations are rated as "healthy" by WDFW, and the remaining 31 are of "unknown" status. The 1997 Washington Salmonid Stock Inventory for bull trout and Dolly Varden (WDFW 1997) states, "The Healthy category covers a wide range of stock performance levels, from consistently robust production to those stocks that may be maintaining sustainable levels without providing any surplus production for directed harvests. In other words, the fact that a stock may be classified as Healthy in the inventory process does not necessarily mean that managers have no current concerns about its production status" (WDFW 1997).

WDFW (1997a) defines a stock as "unknown," if "sufficient trend information was not available or could not be used to assess stock status." WDFW further states that, "Stocks rated as Unknown may be rated as Healthy, Depressed, Critical, or Extinct once more information is available."

Native char subpopulations rated as "healthy" by WDFW are: 1) Queets River, 2) Upper Dungeness River, 3) Cushman Reservoir on the Skokomish River, and 4) the Lower Skagit River. Currently, all but the Upper Dungeness River subpopulation have been determined to consist of bull trout. It is our opinion that the "healthy" status designation for the Queets River, Cushman Reservoir, and Upper Dungeness River subpopulations is not appropriate. Because of information indicating recent declines in the Cushman Reservoir subpopulation (WDFW 1997) and the lack of recent information for the Queets River subpopulation (general decline indicated by fish/day seining data between 1977 and 1991, and no trend information for 1991 to 1997) (WDFW 1997), an "unknown" rating better describes their status. The Upper Dungeness River subpopulation status is "tentatively considered healthy" by WDFW based on a single distributional and abundance survey conducted in 1996 (WDFW 1997). Although the calculated linear densities for the areas sampled on the Upper Dungeness River appear to indicate that char

Native char in southern Puget Sound are likely greatly reduced in number, and subpopulations are likely doing poorly. Historical accounts from southern Puget Sound indicate anadromous char populations entered the river mouths there in "vast numbers" in the fall and were harvested until Christmas (Suckley and Cooper 1860). Char are now rarely taken in these southern drainages and populations are small (USFWS 1998). Only one actual record is known of a native char being caught in the Nisqually River. This was a juvenile fish caught in the mid 1980s from the lower reach of the river by the Nisqually Tribe, while stream sampling for juvenile salmon (USFWS 1998; WDFW 1997). The fish was identified as a Dolly Varden (USFWS 1998). In the Puyallup River, native char are only occasionally caught by steelhead anglers (WDFW 1992). In the Green River, native char are now observed only rarely (USFWS 1998). Total counts of less than 10 redds in 1995 and 1996, and corresponding low fry counts in the following springs (D. Paige, SWD, unpub. data 1997), indicate that the Chester Morse Reservoir subpopulation has recently experienced 2 years of extremely poor reproductive success. Only two native char have been documented in the past 10 years in the Issaquah Creek drainage (USFWS 1998), while none have been seen in the Sammamish River system in this period of time (WDFW 1997). The Sammamish River and Issaquah Creek drainages have been negatively affected by extensive urbanization and road building, and the associated poor water quality (WDFW 1997). We rate the status of the Nisqually River, Puyallup River, Green River, Chester Morse Reservoir, and Sammamish River/Issaquah Creek subpopulations as "depressed."

Drainages in northern Puget Sound appear to support much larger subpopulations (USFWS 1998). The two index areas monitored by the WDFW in Puget Sound, the upper South Fork Sauk (tributary to the Skagit River), and the upper North Fork Skykomish, are located in northern Puget Sound and were chosen in part because they represented particularly healthy systems with strong char populations. On the upper South Fork Sauk River, redd counts have been conducted since 1988. A large increase in redds was reported in 1991, a year after WDFW imposed a 20-inch minimum harvest size limit, and numbers have been relatively stable since then. Redd counts were at a low of 4 in 1990, and increased to 55 in 1991. The redd count in 1996, the most recent year with survey information, was 56 (WDFW 1997). The Lower Skagit River subpopulation contains 28 documented or probable spawning tributaries in the Sauk River Basin alone, and at least 10 tributaries to the mainstem Skagit are suspected of containing spawning native char. The adult population is thought to number between 8,000 and 10,000 fish (USFWS 1998). Surveys have also been conducted on the upper North Fork Skykomish River since 1988. Redd counts range from a low of 21 in 1988 to a high of 159 in 1993 (WDFW 1997). Numbers have declined since 1993, with only 35 redds counted in 1994 (although poor weather conditions prevented complete surveys that year), 75 redds in 1995, and 60 in 1996 (WDFW 1997). A trend is difficult to determine from these data for the Snohomish River/Skykomish River subpopulation, and the status remains "unknown" at present.

There appears to be only one river basin in Hood Canal that currently supports subpopulations of native char. The subpopulation of bull trout in Cushman Reservoir, located on the Skokomish River, is now isolated and restricted to an adfluvial and resident life history forms due to the construction of Cushman Dam. Foot survey counts and snorkel surveys indicate a decline of bull

trout spawners through the 1970s, an increase from 1985 (4 adults) to 1993 (412 adults), and in recent years, a decline (250 to 300 adults) (WDFW 1997). The increase in spawners between 1986 and 1993 is likely the result of the harvest closure on Cushman Reservoir and upper North Fork Skokomish River in 1986. Because of recent declines in spawner returns, a "healthy" status rating may be premature at this time. Surveys conducted on the South Fork Skokomish River have located bull trout and native char in a number of creeks in addition to the mainstem, but in very low numbers. Bull trout concentrations, for this part of the river system, appear to be highest in a 2.4 km section from the anadromous barrier to the confluence of Church Creek (L. Ogg, USFS, in litt. 1997; WDFW 1997). It is unknown whether bull trout are currently present in the Lower North Fork Skokomish River. Habitat conditions that were able to support bull trout here in the past, likely no longer exist. Based on the extremely low numbers of char recorded in recent surveys, the South Fork/Lower North Fork Skokomish River subpopulation has a "depressed" status. The bull trout subpopulation of the South Fork/Lower North Fork Skokomish River is likely depressed due to severe habitat degradations within these parts of the basin (Hood Canal Coordination Council (HCCC) 1995; WDFW 1997). The Upper North Fork Skokomish River subpopulation lies completely within the Olympic National Park, and habitat is likely in pristine condition. Very limited survey information exists for this subpopulation.

Transboundary Independents:

Native char are known to occur in the Chilliwack River basin. No specimens have been collected for identification. This subpopulation is part of a transboundary system flowing into the Canadian province, British Columbia. The portions of the Chilliwack River and Selesia Creek that are within Washington State, occur entirely within the North Cascades National Park and the Mount Baker Wilderness Area, respectively. The habitat conditions are considered pristine in these areas (WDFW 1997). We determined that the status of the Chilliwack River/Selesia Creek subpopulation of native char is unknown at this time. Little to no information is available for this subpopulation regarding life history forms, abundance, or status.

Information on the status and trends for native char subpopulations in coastal British Columbia is incomplete. While some contend that populations in the southern part of the province tend to be in decline and those in the northern part of the province are of unknown status (USFWS 1998), McPhail and Baxter (1996) stated that British Columbia contains relatively healthy bull trout populations throughout most of the province.

The status of bull trout in Alaska is generally unknown. The only documented bull trout subpopulation is in the Taku River Basin in southern Alaska (B. Wing, NMFS, *in litt.* 1996).

Columbia River DPS

Reductions in the historical distribution of bull trout has occurred mainly in Eastern Washington. As an example, bull trout populations are currently absent from the Chelan, lower Yakima, and Okanogan basins (Brown 1992). Although it is presumed that bull trout were once widely

distributed throughout the Columbia basin, presently they are only occasionally observed in the Columbia and Snake Rivers (Brown 1992). The Columbia River DPS encompasses the entire Columbia Basin and all its tributaries, excluding the isolated bull trout populations found in the Jarbridge River, and does include the Eastern Cascades. We recognize 141 subpopulations in the Columbia River DPS within Idaho, Montana, Oregon, and Washington with additional subpopulations in British Columbia (63 FR 31647) (USFWS 1998b).

Rangewide, populations are generally isolated and remnant. The Columbia River DPS has declined in overall range and numbers. Though still relatively widespread in distribution, there have been numerous extirpations reported throughout the Columbia River Basin with bull trout eliminated from areas ranging in size from relatively small tributaries of currently occupied, though fragmented, habitat, to large river systems comprising a substantial portion of the species' previous range. Migratory life histories have been lost or limited throughout the range (Goetz 1994; Jakober 1995; Montana Bull Trout Scientific Group 1998; Pratt and Huston 1993; Ratliff and Howell 1992; Rieman and McIntyre 1993, 1995) and fluvial bull trout populations in the upper Columbia River portion of the DPS appear to be nearly extirpated. Resident populations existing in headwater tributary reaches are isolated and generally low in abundance (Thomas 1992). Bull trout in Flathead Lake and Lake Pend Oreille appear to be declining, while the Swan Lake adfluvial population appears to be the healthiest remaining population and is increasing (USDI 1998b). Generally, where status is known and population data exists, bull trout populations in the entire Columbia River DPS are declining (Thomas 1992; Pratt and Huston 1993; Schill 1992). Presently bull trout in the Columbia basin occupy about 45 percent of their estimated historic range (Quigley and Arbelbide 1997). The population segment is composed of 141 subpopulations, which indicates the level of habitat fragmentation and geographic isolation. Of the 141 subpopulations, 75 are at risk of natural extirpation through physical isolation. Many of the remaining bull trout occur as isolated subpopulations in headwater tributaries, or in tributaries where the migratory corridors have been lost or restricted. Few bull trout subpopulations are considered "strong" in terms of relative abundance and subpopulation stability. Those few remaining strongholds are generally associated with large areas of contiguous habitats such as portions of the Snake River basin in Central Idaho, the Upper Flathead Rivers in Montana, and the Blue Mountains in Washington and Oregon. The decline of bull trout is due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, and the introduction of non-native species. Most bull trout subpopulations are affected by one or more threats (63 FR 31647).

Please see our 1998 BO for more information on the Columbia River DPS of bull trout.

Rangewide Conservation of Bull Trout

Relative to other salmonids, bull trout survival is likely to be more dependent on habitat conditions that more closely resemble the historical, undisturbed environment because: (1) they are top carnivores (first order; top of the food chain) that are more vulnerable to environmental disturbances and more prone to extinction than species at lower trophic levels (M.Gilpin *in litt.*

1996); (2) their delayed sexual maturity (5 to 7 years; Rieman and McIntyre 1993) is likely to prolong recovery time from the effects of adverse actions; (3) unlike anadromous salmon, bull trout display little or no anadromy (i.e., none for the Columbia River, Jarbidge River, St. Mary-Belly River, and Klammath River DPSs) and, therefore, spend their entire life cycle in freshwater habitat, making them especially vulnerable to habitat disturbance; (4) bull trout require a long incubation and nursery period of time (220+ days) prior to fry emergence, making them especially vulnerable to water temperature changes, sediment deposition, and bedload movement; (5) bull trout juveniles are strongly associated with cover, including the interstitial spaces in the substrate, which makes them especially vulnerable to effects of sediment deposition, bedload movement, and changes in channel morphology (Weaver and Fraley 1991); (6) bull trout are vulnerable to hybridization with brook trout, a widely introduced species, as well as competition with other introduced exotics (e.g., lake trout) that can displace native bull trout; and (7) bull trout require colder water temperature than other native salmonids (Rieman and McIntyre 1993), thus restricting the available habitat compared to other salmonids (because most streams are affected by increased temperatures due to artificially decreased shade) and making them especially vulnerable to habitat alterations that affect stream temperatures.

The status of bull trout is highly dependent upon the Northwest Forest Plan. Please see Environmental Baseline below for more details.

Relationship of Subpopulations to Survival and Recovery of Bull Trout in a DPS

Evidence of genetic divergence has been reported among bull trout subpopulations, indicating relatively little genetic exchange between them (Leary and Allendorf 1997). Re-colonization of stream systems where isolated bull trout subpopulations have been lost is either unlikely to occur (Rieman and McIntyre 1993) or will only occur over extremely lengthy time periods. Remnant or regional populations without the connectivity to refound or support local populations have a greater likelihood of extinction (Rieman and McIntyre 1993, Rieman et al. 1997, Montana Bull Trout Scientific Group 1998).

Because phenotypic diversity is a consequence of the genotype interacting with the habitat, the conservation of phenotypic diversity is achieved through conservation of the subpopulation within its habitat (Healy and Prince 1995). Adaptive variation among salmonids has been observed to occur under relatively short time frames (e.g., changes in genetic composition of salmonids raised in hatcheries; rapid emergence of divergent phenotypes for salmonids introduced to new environments) (Healy and Prince 1995). While the loss of a few subpopulations within an ecosystem might have only a small effect on overall genetic diversity, the effect on phenotypic diversity and, potentially, overall population viability could be substantial (Healy and Prince 1995). This concept of preserving variation in phenotypic traits that is determined by both genetic and environmental (i.e., local habitat) factors has also been identified as an important component in maintaining intraspecific adaptability (i.e., phenotypic plasticity) and ecological diversity within a genotype (Hard 1995). Adaptive processes are not likely entirely encompassed by the interpretation of molecular genetic data; in other words,

phenotypic and genetic variation in adaptive traits may exist without detectable variation at the molecular genetic level, particularly for neutral genetic markers (Hard 1995). Therefore, the effective conservation of genetic diversity necessarily involves consideration of the conservation of biological units smaller than taxonomic species (or DPSs). Reflecting this theme, the maintenance of local subpopulations has been specifically emphasized as a mechanism for the conservation of bull trout (Rieman and McIntyre 1993).

Based on this information, we conclude that each bull trout subpopulation is an important phenotypic, genetic, and distributional component of its respective DPS. Therefore, adverse effects that compromise the functional integrity of a bull trout subpopulation will be considered an appreciable reduction in the likelihood of survival and recovery of the DPS by reducing its distribution and potential ecological and genetic diversity.

Please refer to Biological and Conference Opinion 1-3-00-FWF-2098 BO (Simpson Washington Timberlands Habitat Conservation Plan) for more details on bull trout status.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the past and present impacts of all federal, state, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed federal projects in the action area which have undergone section 7 consultation, and the impacts of State and private actions which are contemporaneous with the consultation in progress.

Plum Creek's ownership in the Planning Area is generally intermingled with federal lands, and currently (following the Interstate-90 Land Exchange) consists of 148,300 acres of alternating sections (1 square mile) of Plum Creek lands bordered, mainly, by federal lands administered by the U.S. Forest Service (USFS). Ownership in the upper watershed is divided between National Forest (30 percent) and nonfederal land (70 percent). The principal nonfederal landowners include Plum Creek and the City of Tacoma. The City of Tacoma owns 13,000 acres within the watershed; these lands are primarily along the mainstem and in somewhat of a checkerboard pattern. Plum Creek's ITP associated "ownership" consists of 148,300 acres, which includes lands that they own in fee title, and 1,400 acres of Tacoma lands for which Plum Creek retained timber rights. These lands are hereinafter referred to as Plum Creek ownership.

The land-designations for the federal lands are presented in Figure 10 and Table 4 of the HCP. Within the Planning Area, about 49 percent of the federal land is designated as Adaptive Management Areas (AMA), 31 percent as Late-successional Reserve (LSR), and the majority of the remaining federal lands are Matrix. Approximately 71 percent of the HCP Planning Area is east of the Cascade Crest. Plum Creek's ownership covered by the ITP on the east side of the Cascade Crest is approximately 117,473 acres. Plum Creek's ownership covered by the ITP on the west side of the Cascade Crest is approximately 53,000 acres. Within the west-side Planning Area, about 29 percent of the federal land is designated as AMA, 10 percent as LSR, 11 percent are Administratively or Congressionally Withdrawn lands, and the majority of the remaining federal lands (50 percent) are Matrix. The west side Planning Area is primarily composed of the upper Green River, but also includes minor amounts of land in the Snoqualmie River drainage. East of the Cascade crest, the Planning Area drains into the Yakima River Subbasin.

The predominant nonfederal land use in the I-90 corridor and surrounding areas is commercial timber production. Federal lands are managed for multiple uses, but logging has traditionally been the most significant land use that has affected fish habitat in the action area.

Natural Setting

The action area characteristics (such as climate and dominant vegetation) were described in the HCP, the 1996 BO (USFWS 1996a), and the 1998 reinitiation BO for the Columbia River DPS of bull trout (USFWS 1998); please refer to these opinions for greater detail. A description of other features of the area such as vegetative types, land form, slope, aspect, and parent material is

presented in Jensen (1995). Distribution of stand structures and future projections were presented in HCP Figures 46-48 and HCP Tables 30 and 30b, these were replaced by HCP modification document Figures 46A-48A and Tables 30A and 30bA. Habitat categories for forested lands are defined and described in HCP Section 2.3. Recently completed watershed analyses in the Green River, such as the Lester Watershed analysis, contain additional site-specific information, especially with regard to vulnerabilities of resources to forest management.

Subbasins

Two major subbasins are located within the Planning Area. The Yakima River and its tributaries drain the east side (of the Cascades) and the Green River drains most of the west side of the Planning Area. Other smaller west-side drainages in the Planning Area are isolated from anadromous fish by waterfalls, and are not discussed further herein. The Green River is located on the west side of the Cascade crest in the southernmost portion of the North Cascades Ecoregion in the Puget Sound basin.

Riparian areas and streamside wetlands occupy over 61,000 acres within the Planning Area. 12,000 acres of riparian areas/ streamside wetlands occur on Plum Creek's property in the Planning Area; of this, 10,900 acres are riparian and 1,100 acres are streamside wetlands. Approximately 7,100 acres of Plum Creek's riparian buffers, called Riparian Habitat Areas (RHAs), occur within the Project Area.

More information on the Planning Areas east of the Cascade crest and Columbia River DPS of bull trout can be found in our 1998 BO.

Subbasin Characteristics

The upper Green River basin is defined as the area generally above the Howard Hanson Dam (completed in 1962) and the City of Tacoma's diversion dam, also known as the headworks dam (completed around 1911 to 1912) and encompasses 103,028 acres in the Planning Area.

While rural activities and urban development dominate the lower portions of the watershed, land use in the upper Green River basin consists mainly of timber farming/logging and the water supply for the City of Tacoma, as well as recreation and wildlife. However, recreation use of the area is minimal because much of the upper basin is access limited to protect it as a water supply. The upper Green River basin is an area of special concern to the Muckleshoot Indian Tribe. It has historically been used, and continues to be used, for hunting, picking and preparing berries, and a variety of other purposes.

The Green River subbasin encompasses 483 square miles, with the Green River as the main river system in the subbasin. The Green River begins on the western slopes of the Cascade Mountains near Blowout Mountain, and terminates at Elliott Bay in Puget Sound, 90 miles to the northwest (HCP Figure 3). Thirty miles downstream from its source, the Green River encounters the

Howard Hanson Dam at river mile (RM) 65 (river kilometer (rkm) 105) and the Tacoma Water Diversion Dam at RM 61 (rkm 98). Two major tributaries, Newaukum Creek (RM 41/rkm 66) and Big Soos Creek (RM 34/rkm 55) enter the Green River above the City of Auburn, and below Howard Hanson Dam. Downstream of its junction with the Black River, the Green River becomes the Duwamish River. The Duwamish consists of 12 miles of channel from the Black River to Elliott Bay.

Approximately 49 percent of the Green River subbasin has been harvested within the past 50 years with an associated road density of about 4.5 miles per square mile. Timber harvesting has occurred within the riparian zone of many streams throughout the basin resulting in the preclusion of recruitment for new large woody material.

The Yakima River Subbasin encompasses 6,155 square miles and contains approximately 1,900 river miles of perennial streams. The Planning Area drains into the Yakima River Subbasin East of the Cascade crest. Mainstem and most tributary streams in this Subbasin were historically accessible to anadromous fish. Predominant land use within the Yakima Subbasin includes irrigated agriculture (1,000 square miles), urbanization (50 square miles), timber harvesting (2,200 square miles), and grazing (2,900 square miles). Riparian corridors range from severely damaged to nearly pristine. Natural riparian corridors are generally located along forested, headwater reaches in the upper portion of the subbasin, whereas degraded riparian habitat is concentrated in the valleys in the lower portion of the subbasin, in areas frequently associated with agricultural operations (YIN et al. 1990).

The Yakima River originates near the crest of the Cascade range above Keechelus Lake at an elevation of 6,900 feet and flows southeastward for 214 miles to its confluence with the Columbia River at river mile (RM) 335.2. Thus, dams have played a fundamental role in shaping the health of the remaining fish stocks over the last few decades. Major tributaries to the Yakima River include Kachess, Cle Elum, and Teanaway Rivers in the northern portion of the subbasin, and the Naches River in the west. The Naches River has four major tributaries including the Bumping, American, Tieton, and Little Naches Rivers. Ahtanum, Toppenish, and Satus Creeks enter the Yakima River in the lower portion of the subbasin.

The Yakima Subbasin contains six major reservoirs. The Yakima River flows out of Keechelus Lake (157,800 acre feet), the Kachess River flows from Kachess Lake (239,000 acre feet), the Cle Elum River flows from Cle Elum Lake (436,900 acre feet), the Tieton River flows from Rimrock Lake (198,000 acre feet), and the Bumping River flows from Bumping Lake (33,700 acre feet). The North Fork of the Tieton River connects Clear Lake (5,300 acre feet) with Rimrock Lake. All reservoirs except Rimrock and Clear Lakes were natural lakes prior to impoundment (YIN et al. 1990).

The mainstem of the Yakima River contains six major diversion dams, and several smaller dams are located along the Naches River. The dams on the Yakima River include Easton (RM 203), Roza (RM 128), Wapato (RM 107), Sunnyside (RM 104), Prosser (RM 47), and Horn Rapids

(RM 18). The primary dams on the Naches River include Wapatox (RM 17) and Naches Cowiche (RM 4).

Please see our 1996 BO for more detail on the Green River, and our 1998 BO for more information on the Yakima River.

Water Use in the Green River

The primary human use of water in the Green River Subbasin is for public supply and irrigation. Other uses include rural domestic and industrial demands. The City of Tacoma built the Tacoma Diversion Dam on the Green River in 1911. The City of Tacoma began diverting water in 1913 and subsequently limited human access and fish access to upper watershed for public health reasons. Unfortunately, this blocked fish access to about 70 to 110 miles of fish habitat.

Tacoma owns about 10 percent (15,000 acres) of the upper watershed, primarily around the mainstem and major tributaries. Tacoma's Forest Management Plan is currently being revised and currently calls for 40 percent of Tacoma's ownership closest to Green River to be in preserves with no active forest management; 35 percent to be managed to accelerate development of late-seral habitat; and 25 percent to be managed for commercial timber production. In addition, their plan calls for maintenance of riparian buffers in a natural state. Road construction and maintenance is designed to minimize impacts and road miles are expected to be kept to a minimum.

A battery of actions is currently being initiated as the result of more than 15 years of discussions with federal, state, and local resource agencies, and the Muckleshoot Indian Tribe regarding the Green River area. These actions are expected to provide improved both up-stream and down-stream fish passage for anadromous fish, which will likely result in renewed use of the watershed by species such as bull trout and increased use by fish species such as salmon and steelhead. Large woody debris and gravel augmentation in the Green River and fish-habitat restoration efforts are expected to somewhat improve instream habitat below the dams. Tacoma plans to make a number of needed improvements to the head-works diversion facility. Many of these actions will require close coordination between the City of Tacoma and the U.S. Army Corps of Engineers (Corps). Also, Tacoma will voluntarily reduce its 400-cfs (cubic feet per second) claim (established in 1912) to the use of the Green River to the 113-cfs developed flow of its First Diversion. This claim is not subject to Washington State's 1980 minimum instream-flow regulations and dates back to 1906 to 1908. Tacoma currently diverts that 113 cfs from its first diversion water right claim, will exercise a second diversion water right of up to 100 cfs, and will also amend its water rights to incorporate the higher instream flows previously agreed to with the Muckleshoot Indian Tribe in a 1995 settlement agreement. Tacoma will provide for an additional 5,000-acre feet of water storage for stream flow augmentation during summer months from the Howard Hanson Dam by working cooperatively with the Corps.

The Howard Hanson Dam was built at RM 65 (rkm 105) by the Corps in 1961. It was originally authorized for flood control and conservation storage to augment low summer/fall flows for fishery enhancement. The Corps delays filling the dams as long as practicable (per the flood season and other concerns) each year to allow downstream passage of coho and chinook salmon, and steelhead trout smolts.

Water Use in the Yakima River

Withdrawal of water from the Yakima River and restriction of inflow during reservoir filling are the most significant factors limiting fish production in the Yakima Subbasin (YIN et al. 1990). Water supplies are severely overtaxed by the demands of irrigation that compete with flows needed for fish production. Except for a minimum flow below Prosser dam and a court-ordered minimum flow maintained for egg incubation in the Yakima from Easton dam to the Teanaway River, there are no binding minimum instream flows for fish (YIN et al. 1990). Consequently, instream flows are rarely optimal anywhere in the subbasin, including the streams and tributaries in the Action Area, and may be critically low for fish production in drought years. In an average year, the total available water supply in the subbasin is barely adequate for irrigation and never adequate for maximum fish production (YIN et al. 1990).

The effect of water diversions and water withdrawal in tributary streams is more severe than in the mainstem of the Yakima River, because the diversions frequently lack effective fish passage and protective devices, and because proportionately more water is diverted. Water diversions in tributary streams can affect the entire life cycle of salmonids, from egg to returning adults. The effects are more significant on fish that spend an appreciably greater proportion of their life cycle as juveniles in the smaller tributary streams.

Stream Types/Characteristics:

Approximately 3,224 miles of streams occur across the Planning Area. Approximately 412 miles (33 percent of the total stream miles) occur within the AMA, 296 miles (24 percent) occur within the LSR, and 266 miles (22 percent) occur in the Matrix. The remaining 21 percent of these streams occur on Plum Creek lands which are not interspersed with federal lands. Based on Washington Department Natural Resource's (WDNR) stream classification system, 350 miles of fish-bearing streams (Types 1 through 3 streams) occur within the Planning Area (11 percent of all streams within the Planning Area). Approximately 509 miles of nonfish-bearing streams, 1,527 miles of seasonal streams, and 838 miles of unclassified streams are found in the Planning Area.

Approximately 1,233 total miles of streams occur in the Project Area (HCP Table 29). Approximately 100 miles of fish-bearing streams are located on the Project Area. Approximately 196 miles of perennial, nonfish-bearing streams occur on the Project Area. About 596 miles of streams in the Project Area are ephemeral streams, and 341 miles are unclassified streams of unknown status.

About 36 miles of fishbearing streams, and 755 miles are seasonal, intermittent, or unclassified. occur on the Project Area west of the Cascade crest.

More detail on streams east of the Cascade crest can be found in our 1998 BO.

Fish Resources in the Green River

Major fish-bearing streams in the upper Green River Subbasin include Sunday Creek, Snow Creek, Tacoma Creek, Pioneer Creek, East Creek, West Creek, Intake Creek, and Twin Camp Creek.

Historically, the upper Green River supported coho (*Oncorhynchus kisutch*) and chinook salmon (*O. tshawytscha*), and steelhead trout (*O. mykiss*), with an estimated total of 107 miles of accessible salmonid habitat above the two dams with a productive capacity of 3,500 steelhead trout, 37,240 coho, and 8,060 chinook adult salmon.

At RM 65 (rkm 105), Howard Hanson Dam is operated for flood control. It is federally owned and operated and was originally authorized and constructed without fish passage facilities in 1962. At RM 61 (rkm 38), Tacoma Head-works Diversion Dam is operated to supply municipal and industrial water to the City of Tacoma and surrounding communities. The Head-works Diversion Dam and associated facilities also interfere with fish passage.

Since 1982, juvenile coho salmon, chinook salmon, and steelhead trout have been re-established into the upper watershed under Tribal and State management. The City of Tacoma currently operates a temporary adult fish trap at the Head-works Diversion Dam. Trapped adult steelhead trout are either released above the Howard Hanson Dam located 3.5 miles upstream of the Diversion, or a selected few are used to rear fry for out-planting in the upper watershed. Adult salmon are not currently released above Howard Hanson Dam, but such releases are planned to begin when downstream passage facilities at Howard Hanson Dam are completed as part of the proposed Additional Water Storage project.

The Tacoma Diversion Dam (at RM 61/rkm 98) currently blocks all upstream migration of adult fish. Currently, no natural spawning by anadromous fish, except steelhead, occurs upstream of the diversion dam. Wild steelhead are trapped at the diversion dam and released upstream of Howard Hanson Dam. These steelhead have successfully spawned in the upper basin. However, hatchery produced coho and chinook fry, as well as steelhead, are out-planted into tributary streams in the upper basin for overwinter rearing. In the early years, the Muckleshoot Indian Tribe planted approximately 2 million coho and chinook and 50,000 steelhead per year. In recent years, these numbers have been about 500,000 coho and chinook and 80,000 steelhead. The Corps is currently conducting a feasibility study to redesign and reconstruct the existing dam outlets to improve downstream fish passage.

Currently fish habitat in the upper basin is degraded. Stream surveys conducted in the subbasin by an interagency team of resource scientists from the Forest Service, Muckleshoot Tribe, WDFW, City of Tacoma, and WDNR, have indicated low number of pools, poor pool function, lack of adequate cover, lack of riparian vegetation, and a low number of stable side channels. These same surveys also indicate that the limiting factors for salmonids in streams in the upper Green River Subbasin appear to be scouring of steelhead redds, lack of pools for holding adult steelhead trout, and lack of rearing and over-winter habitat for all species. In addition, sediment scour-chain studies, conducted by the Muckleshoot Tribe, indicate that extensive scouring of redds is occurring during moderate flow events.

Fish Resources in the Yakima River

Within the Yakima River system, the two extant anadromous salmonid species are the chinook salmon (*Onorhynchus tshawytscha*) and summer steelhead (*O. mykiss*). Native coho salmon (*O. kisutch*) have been extinct from the Yakima River since 1984 (Watson and Toth 1995; YIN et al. 1990). Adfluvial populations of bull trout exist in portions of the Yakima River basin within the action area in Keechelus Lake/Gold Creek, Kachess Lake/Box Canyon Creek (and possibly Mineral Creek), and Cle Elum Lake - Waptus Lake/Waptus River (HCP Figure 32). Fluvial populations also exist in the mainstem Yakima River. It is assumed that bull trout were historically distributed throughout the mainstem Yakima River and all accessible larger tributary streams. The current distribution of bull trout suggests that the assumed historic population has been severely fragmented (Mongillo 1993), or that the assumption is wrong regarding the historic distribution. No long-term population trend data is available. Bull trout are able to inhabit higher- gradient streams than coho or chinook salmon and can occupy streams with gradients greater than 20 percent (Watson and Hillman 1997).

Please see our 1998 BO for more details on Columbia River bull trout.

Action Area Threats

Populations of salmonids including bull trout are at risk or already extinct in many river basins in Washington, leading to the numerous Act listings and proposed listings for salmonids. These populations have declined due to a variety of human activities and natural events including hydropower development, extensive logging, other land-management activities, artificial propagation, disease, predation, competition from introduced species, and climatic variation leading to temporarily unfavorable ocean conditions (Spence et al. 1996). Fish access to a substantial portion of historical habitat for all Evolutionary Significant Units (ESU) in the action area has been precluded or limited locally and cumulatively by various dams. Local habitat problems also occur related to irrigation diversions, degraded riparian and instream habitat from urbanization, land conversion to crops and orchards, livestock grazing, and timber harvest.

Federal Land Management

Bull trout are the subject of a recent listing decision. At the landscape level, the effects of current forest and watershed management activities by the USFS is a consideration that has been addressed through participation in the development of, and formal consultation on the Northwest Forest Plan. Implementation of the Northwest Forest Plan is highly important to the long-term survival of bull trout.

Northwest Forest Plan

FEMAT (USDA et al. 1993), the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Spotted Owl (USDA 1994a) (FEIS), the Record of Decision for Amendments to USFS and Bureau of Land Management Planning Documents Within the Range of the Spotted Owl (USDA et al. 1994b) (ROD), and the BO on the Federal Environmental Impact Statement (FEIS) preferred alternative (USDI 1994b) also provide information relevant to addressing the environmental baseline for this action. The Northwest Forest Plan has completed section 7 consultation with respect to bull trout.

Past land-management activities have degraded habitat conditions throughout the range of many late-successional and aquatic habitat-dependent species in the Pacific Northwest. The Northwest Forest Plan was developed to address the conservation of a number of species. The basic conservation strategy in the Northwest Forest Plan for riparian areas was designed to protect the natural processes upon which salmonids depend and to address other riparian and upland species. The Northwest Forest Plan provides for the protection of extensive forest reserves in federal ownership, and also placed considerable emphasis on riparian systems.

In the Pacific Northwest, federal forests within the range of the spotted owl are managed in accordance with the ROD for the Northwest Forest Plan. Under the ROD, riparian areas will be managed in accordance with the Aquatic Conservation Strategy, that sets up a system of riparian reserves, key watersheds, watershed analysis, and watershed restoration. The streamside protection within the riparian reserves is summarized below in slope distance:

- Fishbearing streams - greater of two tree heights or 300 feet.
- Perennial nonfishbearing streams - greater of one tree height or 150 feet.
- Seasonal streams - greater of one tree height or 100 feet. Buffers are also established for lakes, ponds, and wetlands. Also, management strategies differ depending on whether a watershed is "key" or "non-key" (for more details, see ROD). In general, these riparian areas are expected to mature and become older "functional" forest during the next 50 to 100 years.

This strategy for riparian management will improve riparian and instream native fish habitats on federal lands, compared to management over the last few decades, and greatly assist in restoring instream habitat features on the adjacent HCP ownership. This will be accomplished by reducing mast wasting, reducing artificial sediment delivery, and increasing the amount of large woody debris from upstream sources (federal lands).

With implementation of the Northwest Forest Plan and a variety of dependent HCPs in the associated area, federal lands are relied upon to carry out the major responsibilities of conserving species that utilize late-successional forests, such as the bull trout. However it is also anticipated that nonfederal lands will provide some necessary habitat functions, including migration corridors. The Northwest Forest Plan only covers a portion of the bull trout's range. However, other federal efforts such as the Interior Columbia Basin Ecosystem Management Project being undertaken in the Interior Columbia River Basin will address bull trout and other species. While contributions from nonfederal land remain important in many areas, implementation of the Northwest Forest Plan as designed allows considerable flexibility in the management of these nonfederal lands, as evidenced in the subject HCP. Continued implementation of the Northwest Forest Plan is imperative to the functioning of many HCPs in the Pacific Northwest, and is the key feature of the Status of the Species and Environmental Baseline utilized in this BO for bull trout. Continued implementation of the Northwest Forest Plan is imperative to complimentary amount of function afforded by the subject HCP and the conclusions herein. Significant changes in implementation of the Northwest Forest Plan would likely adversely affect these conclusions.

Habitat Conservation Plans

Washington Department of Natural Resources

Subsequent to the approval of Plum Creek's HCP (1996), the WDNR received approval for a HCP covering 1.8 million acres in the State. The WDNR HCP and associated IA and ITP cover forestry and other activities on those State-managed lands. The complexity of the WDNR HCP precludes Plum Creek or the Services from being able to model the specifics for the relatively small amount of WDNR ownership in the Plum Creek Planning Area. The WDNR HCP does cover lands that are lower in the Green River watershed (than the Plum Creek Planning Area) and will affect Puget Sound stocks of anadromous fish. A recent land exchange has added to the WDNR lands within the Green River. These additional lands will receive the same management under the WDNR HCP.

The WDNR HCP on the west side of the crest addresses unlisted, as well as listed species. The HCP primary land management strategy for listed species is based on protections of spotted owl life forms (as an umbrella strategy), including one section of WDNR land in the upper Green River that is managed for nesting spotted owl habitat. Because the HCP addressed unlisted species on the west side of the crest, riparian areas and other special habitat areas receive enhanced protection. West of the crest the HCP provides enhanced riparian and special habitat requirements compared to current State regulations (in other words it exceeds current State

regulations in this regard). Fishbearing streams (WDNR Type 1-3) receive site-potential tree height buffers and perennial streams (Type 4) receive 100-foot buffers.

City of Seattle

The HCP developed for the City of Seattle's Cedar River Watershed by Seattle Public Utilities (SPU) provides information regarding the environmental baseline in that area. The SPU HCP is a complex plan addressing reservoir management, instream flows, artificial production of salmon, forest management, watershed restoration, and road management and decommissioning just to the north of the Green River watershed.

Other Pertinent Federal Actions and Permits

Snoqualmie Pass Ski Area

The Summit at Snoqualmie Ski Area has proposed to update its master plan to include additional chair and surface lifts, addition of a multi-user gondola and restaurant, addition of new lifts and ski terrain within existing special-use permit boundary, adjustments of the boundary for crossover trails, expanded night skiing, additional of parking lots, day lodges and other related facilities, maintenance facilities and utilities to support the ski area operations and other year-round recreational opportunities.

Howard Hanson Dam

At RM 65 (rkm 105), Howard Hanson Dam is operated for flood control. It is federally owned and operated and was originally authorized and constructed without fish passage facilities in 1962. At RM 61 (rkm 98), Tacoma Head-works Diversion Dam is operated to supply municipal and industrial water to the City of Tacoma and surrounding communities. The Head-works Diversion Dam and associated facilities also interfere with fish passage.

Withdrawal of Pipeline Proposal

A cross-Cascades pipeline was proposed that would have been buried under existing right-of-ways for the majority of its length through the Planning Area. It was proposed to be buried under streams at crossing sites that are currently undisturbed, as power lines merely go overhead at many such streams and low-topographical-relief areas. Removal of forest at such crossing sites was anticipated. The pipeline would have carried petroleum products under high pressure in a general northwest-to-southeast direction across the Plum Creek Planning Area. A draft EIS was released by the USFS with regard to this project, but the project has been suspended due to safety concerns. The Plum Creek HCP considered the potential cross-Cascades oil pipeline that was proposed. This proposal was much criticized for the adequacy of its effects analysis and proposed mitigation. As a result of these criticisms and other events, the proposal was withdrawn.

Reversal of Huckleberry Land Exchange

In an opinion filed on May 19, 1999, in Muckleshoot Indian Tribe and Pilchuck Audubon Society vs. U.S. Forest Service, No 98-35043, the Ninth Circuit Court reversed a previous favorable opinion on National Environmental Policy Act (NEPA) and National Historic Preservation Act grounds regarding the Huckleberry Land Exchange. This opinion resulted in an injunction on "further activities" on lands exchanged even though the exchange occurred over a year earlier (March 1998). The Huckleberry land exchange involves a small amount of acreage relative to the Planning Area and the consequently will have a small effect (on a landscape level) on fish habitat function.

Status of the Species (in the Action Area)

The riparian strategies in the subject HCP are being applied to the Project Area west of the Cascade crest. Approximately 107 miles of streams classified as fish-bearing occur on the westside that could support bull trout and which will be managed according to the HCP riparian prescriptions. It is expected that the amount of streams classified as fishbearing would increase as additional surveys are completed and some percentage of perennial nonfishbearing streams are reclassified. These streams and the status of bull trout inhabiting these streams are discussed below.

The electrofish monitoring activities described in the HCP and herein are being applied to the entire Project Area, east and west of the Cascade crest. The status of bull trout east of the Cascade crest of more fully described in our 1998 BO.

Anadromous salmonids were historically found throughout the Planning Area that includes two major river systems. Naturally divided by the Cascade Crest, these subbasins drain vastly different eco-regions. Physiographically, the 483 square mile Green River system is typical of many subbasins that drain western slopes of the Cascades to the inland marine waters of Puget Sound. Distinct differences in evolved life histories of salmonids exist in the two major subbasins of the Planning Area, due in large part to vast differences in the distance to the ocean. The present day salmonid distribution reflects these natural and human-induced factors, and the HCP was designed to conserve these species and life-history types. However, both Green and Yakima subbasins share a contemporary distribution and abundance of salmonid species shaped by artificial fish passage limitations (e.g., dams, water diversions, etc.), reduction and simplification of freshwater and estuarine habitats, genetic and other effects from the introduction of, and management for, artificially produced salmonids, and harvests in river and ocean fisheries.

Very limited information is available on the status of the bull trout in the Green River drainage. Bull trout are presumed to occur in very low numbers in this system, but no spawning locations are known. The life history forms of bull trout in this drainage are not known. A historical account suggests that bull trout were once common: "As early as the first of June this beautiful

fish is found running up the Nisqually, Duwamish, and other rivers emptying into Puget Sound. They are taken sparingly from those waters until October, when they enter the mouths of the rivers in vast numbers, and are taken by hook and line, nets, traps etc., until near Christmas." (Suckley and Cooper 1860). Creel counts on the Green River dating from 1940 indicate bull trout are extremely rare, with only four char taken by over 35,500 anglers checked between 1940 and 1973. A native char was caught in May 1994 in the Duwamish River that was positively identified as a bull trout both by Haas measurements and by genetic work. Watson and Toth (1994, in WDFW 1997) state that although native char have apparently been harvested in the Green River as far upstream as RM 40 (rkm 64), there is insufficient evidence to determine whether these are bull trout, and that no spawning of bull trout has been documented in the Green River. Plum Creek has conducted presence/absence surveys for bull trout in the upper Green River watershed, with no presence documented (USFWS 1997).

Mongillo (1993) listed bull trout in the Green River as a remnant population, with status unknown, and with an immediate need for data. WDFW (1997) lists the Green River population as unknown status. We contend that the status of this subpopulation is depressed, based on available information that indicates native char occur in very low numbers in comparison to historic levels.

Howard Hanson Dam, located at RM 65 (rkm 105), has been a complete barrier to upstream passage of salmonids since its construction in 1961 (WDFW 1997). The City of Tacoma's municipal water diversion, at RM 61 (rkm 98), has also been an anadromous fish barrier since 1911 (WDFW 1997). It is unknown whether bull trout historically occupied the upper watershed above the dam. WDFW (1997) opines that perhaps the native char reported anecdotally to have been caught in the Green River may in fact be fish that have strayed into the Green but that were produced in a different river basin.

The Green River Basin contains approximately 36,300 acres (12 percent) in federal ownership (Forest Service); 21,700 acres (7 percent) in State ownership; 244,000 acres (81 percent) in private ownership (includes City and County lands); and 970 acres (< 1 percent) in Tribal ownership (USGS 1996).

Please see our 1996 and 1998 BOs for a discussion of the Yakima River basin and the watershed basins in the action area that surround the Planning Area.

Project Area Lands – Limiting Factors and Silviculture Methods

Past forest practices (that occurred regionally under less-conservative management regimes than the present HCP or state forest practices) have contributed to the current legacy of degraded conditions of instream and riparian fish habitat function. The Green River drainage is no exception. Extensive logging in riparian zones, logging of unstable slopes (and resultant mass wasting), and inadequate road building practices over the last century have all contributed to this situation (PCT 1994, 1996a).

To predict the relative benefits and impacts of Plum Creek Timber's HCP on fish stocks of concern, a Limiting Factors Analysis (LFA) was conducted for bull trout, spring chinook salmon, coho salmon, and steelhead trout in the Green River and Yakima River Subbasins. The LFA Teams (fisheries agencies, tribes, and others with pertinent experience) attempted to ensure that all appropriate methods or approaches to limiting factors were considered, that the assumptions required in evaluating the significance of the limiting factors on each species were widely accepted and that all experience and data were evaluated from the widest possible perspective. Watson and Toth (1995) present a listing of the factors that potentially affect fish populations in the Green River and Yakima River drainages. Analysis of these factors provides the basis for evaluation of the factors thought to be essential to the fish populations in the Planning Area. The findings of the Assessment Teams indicate that the primary factors contributing to the decline of anadromous salmonid stocks in both the Green River and Yakima River Subbasins include: 1) degradation and loss of spawning and rearing habitat resulting from many activities including dam placement and operation, agriculture, logging, road construction, urban development, water withdrawals and diversions; 2) over-exploitation in open-ocean and in-river fisheries; and 3) migratory impediments such as dams and water diversions.

The primary factors thought to be limiting bull trout, coho salmon, steelhead trout, and other anadromous populations in the Green River are urban development, agricultural activities, dam operations, logging, and flood control structures. Although numerous factors limit each of the species of concern to a greater or lesser degree, significant factors limiting all of the fish species of concern within the action area are water withdrawals, conversion of native habitats, and dam operations. All of the mentioned risk factors likely affect the quantity, function, or distribution of fish habitats in specific locations, but the multiple action of these factors through complex mechanisms (synergism) makes it difficult or impossible to distinguish cause-and-effect attributable to each. The limiting factors for the Planning Area are described in detail in Watson and Toth (1995), summarized in USDC & USDI (1996) and PCT (1996a), and are incorporated herein by reference.

Plum Creek has used (and continues to use) even-aged and uneven-aged harvesting techniques in its ownership in the Cascade range. In 1994, Plum Creek used even-aged harvesting techniques in approximately 17 percent of its harvest operations east of the Cascades crest, and in about 65 percent of its operations west of the Cascades crest. Please see our 1996 BO and the subject HCP for more details.

Please see our 1998 BO for a discussion of limiting factors and silviculture methods east of the Cascade crest on the Columbia River DPS of bull trout.

EFFECTS OF THE PROPOSED ACTION

Bull trout are sensitive to environmental disturbance at all life stages. The impacts that are expected to occur with HCP implementation are of several types: (1) changes in riparian habitat that may cause harm by incrementally reducing spawning, fry emergence, and/or survival of fry and juveniles by subtle interruption of the link between riparian forests and in-channel habitat. These effects are expected to be short-term to persistent in duration and usually minor in intensity; (2) changes in sediment and water delivery to the channel network that may impact juveniles, fry, and eggs by increasing sedimentation rates or modifying flow regimes. These impacts are expected to be of moderate intensity; and (3) changes to in-stream habitat resulting from road construction or triggering of other events such as mass-wasting which would result in harm to adults, juveniles, fry, or eggs. Such impacts of the third type would be more severe than the first two types. Because bull trout in the action area likely occur in very low numbers and are isolated, even minor impacts may result in local extirpation. Please see our 1996 and 1998 BOs for a detailed analysis of effects of the action.

Activity Effects to Bull Trout

Considering the existing degraded conditions of the lands throughout the Project Area, the measures prescribed in the HCP will help to maintain and restore instream and riparian habitat function for bull trout across Plum Creek's ownership. With implementation of the HCP, the function of bull trout habitat will likely increase and, therefore, the amount of potentially usable habitat should increase. Additionally, more bull trout habitat may become available/occupied through the removal of passage barriers (as prescribed) during the ITP term.

Logging

Under the terms of the HCP, 200-foot riparian buffers have been placed along all streams classified as fish bearing. These buffers are measured horizontally, and on steep slopes are nearly as wide as the 300-foot FEMAT buffers which are measured on the slope. Two hundred-foot RHAs will provide at least one tree height of protection for fish-bearing streams because the average tree height for late-seral riparian vegetation within the action area typically ranges between 140 and 200 feet for west-side conditions. Watershed analysis buffers are measured beginning on the outer edge of the channel-migration zone or channelized debris-flow zone. However, HCP interim and minimum buffers are measured from the edge of the stream (ordinary high water mark) versus the channel migration zone. Plum Creek has committed to use whichever buffer extends the farthest upslope. But the lack of consideration of these dynamic channel processes will detract from the effectiveness of the RHAs in certain situations, such as channel movement. In these situations, stream-bank integrity could be compromised as could natural flows and patterns dependent on large woody debris.

The prescribed management of these buffers is designed to be consistent with the HCP conservation objectives for bull trout, which include retaining and allowing development of some

older and larger trees in the riparian areas. Where buffers are prescribed, harvest restrictions in riparian buffers range from somewhat moderate (partial-cut) to maximum (no-harvest) buffering. The retention and (allowed) development of older forest in riparian areas as described in HCP Table 30 (e.g., 45 percent in mature forest or better by 2045; 77 percent in spotted owl dispersal forest or better by 2045) (about 65 and 76 percent across all ownerships in the Planning Area respectively) together with the commitment to only harvest down to the level of FD habitat for spotted owls is important for maintaining riparian areas that is expected to be functional habitat for bull trout, including the recruitment of large woody debris. Further, logging restrictions including the prescribed single commercial entry and the resulting "feathered" harvest treatments should allow some large woody debris development (after a legacy of large woody debris preclusion).

The HCP/ITP allows Plum Creek to log up to 50 percent of the standing volume in the riparian buffers, but this harvest level is expected to seldom be possible. We expect that the prescriptions for FD habitat require the retention of 65 to 70 percent of the volume in most cases (where entry is feasible), and that this likely means retention of over 80 percent of the trees. In many cases, harvest is neither possible nor feasible. Under the HCP, Relative Density (RD) and Quadratic Mean Diameter (QMD) requirements for FD habitat will result in a higher density stand composed of larger trees, than would occur if simple thinning of up to 50 percent of the standing volume was allowed. For example, on the west side of the Cascade crest the QMD requirement is 10 inches and the RD is 48. An RD of 48 is approximately equivalent to 70 percent canopy cover (Hicks and Stabins 1995). If the trees retained are all 10 inches in diameter, the resulting stand will contain 280 trees per acre; if they were all 25 inches in diameter, the resulting stand would contain about 70 trees per acre. One study presented two histograms of tree species, diameter, and density for dispersal forest stands with QMDs of 10.6 and 10.9 inches, and 2 histograms for stands with QMDs of 15.3 and 14.7 inches (Hicks and Stabins 1995). This depicts a common occurrence, where even stands with QMD of 9 inches, frequently have large trees of various sizes and sometimes multiple tree species. It is our expectation that, compared with no harvest in these (relatively young, dense) stands, these treatments should yield an equal or greater amount of large woody debris later in the ITP term, due to the opportunity to use silviculture to allow (fewer) larger trees to grow faster, mainly through reduced competition. However, some removal of large trees would occur, particularly on the outer margins of RHAs, which will likely affect recruitment of large wood in the interim. Pool volumes in streams in a Western Washington study were found to not differ significantly between old growth and buffered streams, but was significantly less in clearcut areas, implying that reduced recruitment of large pieces of wood reduces pool volume.

Plum Creek has committed to a 30-foot, no-harvest zone along fish bearing streams to help ensure proper riparian functions of bank stability and stream shading. This zone approximates one rooting-diameter (one tree) and should help protect bank stability. This no-harvest buffer would likely act as added insurance against unforeseen deleterious events and miscalculated experimental management actions which could negatively affect bull trout. Entries into the 30-foot zone are only allowed for restoration purposes. Restoration may involve some short term

tradeoffs in exchange for long term habitat improvement. All ground-based equipment are also excluded from this zone.

Under the HCP, the treatment of perennial streams depends on location. Perennial non fish-bearing streams (including spatially intermittent streams) receive at least a 100-foot managed buffer at the time of adjacent harvest.

Under the HCP, even-aged harvest units must contain an average of 6 snags or snag-recruitment trees per acre. Where harvest units contain ephemeral streams with definable channels, a portion of the leave trees are often aggregated in these areas due to logistical constraints. Plum Creek clusters some leave trees in areas adjacent to many small or seasonal streams and protects streams within inner gorges and similar areas of concern through watershed analysis prescriptions. Additionally, because rotations are long (65 to120 years depending on species and site) and selective harvest is used (about 35 percent of west-side harvests are uneven-aged management or partial harvest), fewer ephemeral streams are exposed to the temporary yet harsh conditions of a standard clearcut at any given time than would be observed under standard commercial forestry.

Large wetlands are also important as many of these contribute to water quality or, if associated with open water, may directly contribute to the maintenance of juvenile fish during portions of the year. The HCP incorporates no-equipment zones to protect the wetland edge and maintenance of 30 percent canopy cover for forested wetlands. These factors should contribute to maintenance of water quality, temperature, and hydrologic flow.

Yarding

Yarding across fishbearing streams is avoided, and limited when performed across other perennial streams. Yarding corridors (cleared trees in the riparian corridor/buffer may be 20 percent of a stream where site-specific considerations or safety require. Landing construction will likely increase sediment input to streams and destabilize slopes.

Road Management

Several watershed analyses completed within the Planning Area (e.g., Quartz Mountain Watershed Analysis) have established sediment targets requiring strict control of road densities and additional sediment monitoring. It is expected that watershed analyses to be completed in the future may have similar requirements in the Project Area as necessary. Sediment budgets are quantitative descriptions of rates of sediment production and transport in a drainage basin that can be used to establish the relative contribution of different delivery mechanisms and to estimate trends in the volume and rate of sediment movement over time. Construction of sediment budgets requires the identification of individual erosional processes and storage sites throughout the basin and quantification of the transport processes that link them together. The areas where bull trout are known to occur within the Planning Area will have goals of low open-

road densities (target of 1 mile per section). Roads are important contributors to sedimentation and landslides that can degrade instream fish habitat, thus lower road densities should help benefit anadromous salmonids. Open road densities are limited and total road densities will be addressed across the action area by sediment budgets and other facets of watershed analysis. Additionally, provisions for grizzly bears further address the location of roads beyond what is addressed within the riparian strategy. Visual-screening requirements on open roads are expected to serve as further incentive for reduction of open road densities even below the 1-mile-per-section target.

Roads can be a major source of management-related sedimentation in streams, especially in areas prone to mass-wasting. A small percentage of the road system is often a major source of management-related sedimentation in streams and other impacts to stream habitat. The road-management provisions and watershed analysis process in the subject HCP are designed to significantly reduce road construction and activity impacts.

Traffic by log-hauling trucks will result in road-surface wear and increased sedimentation. Road closures will decrease use by the public as part of the HCP prescriptions. Road use during saturated periods would aggravate road wear and sediment delivery, but this is largely addressed by the Road Management Plan.

An indirect beneficial effect of the net decrease in roads within these areas is the decreased accessibility by vehicles to rivers and streams containing bull trout. The potential for decreased harvest pressure and poaching on bull trout populations in these areas is another benefit. Over 25 percent of the known bull trout/Dolly Varden populations in Washington are adversely affected by poaching (Mongillo 1993). Poaching is known to occur in many portions of Western Washington (USFWS 1997), and road closures should help deter poaching. Lack of access may deter illegal stocking of non-native fish and other activities that are potentially harmful to bull trout.

Watershed Analysis

Watershed analysis examines the potential risks to the resources, such as sediment delivery, and develops prescriptions to reduce the vulnerability of the resources. Plum Creek has been completing watershed analysis on an accelerated schedule compared to what is required in the subject HCP. It is expected that all HCP watershed analysis in the Project Area will be completed by 2006.

Adaptive Management

The HCP is conservative regarding watershed analysis prescriptions. New prescriptions that exceed HCP provisions would be implemented; however, prescriptions allowing reduced conservation measures would not supplant the HCP provisions. Thus, watershed analysis can only increase the size and improve the function of the riparian buffers. The Adaptive

Management Provisions of the HCP include incorporation of results from other aspects of aquatic monitoring beyond those associated with watershed analysis. The HCP also includes the establishment of a Cooperative Landscape Adaptive Management Area in the I-90 Lakes Subunit, the general area occupied by bull trout.

The aquatic monitoring strategy will test assumptions made in some of the watershed analysis prescriptions, as well as monitor additional variables. Because these elements form the basis of adaptive management in this HCP, the incorporation of new information and the ability to change management strategy is assured. This flexibility is key to assuring this HCP would improve conditions for anadromous salmonids in the HCP area. Amendments may be suggested as knowledge is acquired regarding aquatic habitat and how to achieve comparable conservation benefit with more efficient and effective prescriptions. We would review such amendments and proposals to ensure conservation benefits would be comparable, impacts to other resources would be minor, and the take level anticipated by this BO would not be exceeded. If it is determined that such a change "may affect" bull trout, we would reinitiate consultation.

Chemical Application

Chemicals that are used in conjunction with control of broadleaf vegetation have been shown to be toxic to aquatic fauna, including salmonids (Norris et al. 1991). A number of factors contribute to the relative infrequency of Plum Creek's herbicide applications within the Project Area. Plum Creek's commitment to rapid reforestation, the stated use of high-function seedlings and high-quality seedling handling and planting techniques all contribute to low frequency of herbicide application. Uneven-aged management and partial harvests do not require as much site preparation and replanting, thereby reducing the need to control vegetative competitors. Uneven-aged and partial harvests increase the cost and decrease the effectiveness of herbicides. Vegetative competition is generally decreased at higher elevations (as in the Project Area). In addition to the low frequency of application, Plum Creek has committed to avoid sensitive areas and to not allow spraying within 100 feet of water bodies or within riparian areas. These steps are expected to reduce the frequency of use and, when use is necessary, the application rate, area, or number of repetitions. Avoiding open water bodies will reduce the entry of these chemical agents into the aquatic system.

Note: It is our policy (per Region 1 memorandum of July 27, 1998) to not consider for inclusion, pesticide and herbicide applications as a covered activity under section 10(a)(1)(B) permits, with the exception of those HCPs that address this topic and were submitted to us before July 27, 1998. Because the subject HCP was submitted to us in 1996, we are continuing to provide coverage in the subject ITP amendment for pesticide and herbicide use, and to consider and analyze their use herein.

Enhancement

Many riparian areas are currently artificially dominated by red alder or big leaf maple and contain few conifers as a result of harvest practices in the past. Active restoration may be needed in some cases in order to approach natural levels of large woody debris (as supplied by conifers versus hardwoods).

In accordance with the road maintenance and abandonment plan in the HCP, watershed analysis prescriptions require the removal of any culvert blockages to fish passage. Road closures and abandonment, combined with improved crossings and drainage, should greatly reduce artificially obstructed movement of fish both upstream and downstream through the Plan Area.

Plan Adjustments

Watershed analysis establishes prescriptions to reduce sediment inputs due to landslides, reduce the artificially frequent and/or high peak flows associated with timber harvest, assess the condition of fish habitat and riparian stands, and monitor the effects of forest practices on aquatic systems. Also, in accordance with the road maintenance and abandonment plan, watershed analysis prescriptions will likely reduce road-generated sediment to aquatic resources and cause removal of detected culverts blocking fish passage. The aquatic monitoring strategy will test assumptions made in some of the watershed analysis prescriptions, as well as monitor additional variables. Because these elements form the basis of adaptive management in this HCP, the incorporation of new information and the ability to change management strategy is ensured. This flexibility is key to ensuring this HCP will improve conditions for salmonids in the HCP area.

Should it be discovered that our assessment of the value of these prescriptions for bull trout were wrong, and the impacts to the populations are outweighing the benefits, the adaptive management provisions are designed to ensure that the necessary changes to maintain bull trout and available suitable habitats to feed, breed, shelter, and survive will occur.

Monitoring and Research, Including Electrofishing

Monitoring programs in the HCP are designed to evaluate the need for periodic road maintenance and effectiveness of remedial prescriptions and corrective actions. Under the HCP, monitoring is mandatory and provides a feedback mechanism that can be used to increase the riparian conservation measures if needed. Monitoring includes stream substrate and morphology, stream temperatures, invertebrate monitoring as indicators of biological integrity, and assessment of fish populations. Salmonid monitoring of the HCP is not intended to detect changes in the status of bull trout populations. Plum Creek will also survey streams to determine whether individual streams contain fish to determine the appropriate management prescriptions, including the use of electrofishing. Surveys of wild fish often result in the capture of non-target species as well, depending on the area sampled, time of year, time of day, etc.

Short-term impacts of electrofishing could include the taking of bull trout by means specified above in the Description of the Action, with potential harassment, direct injury and/or death of a some individuals. Electrofishing is used as described in the HCP for four purposes. The first and most widespread use is for verification of general fish presence and absence in streams. This typically involves electrofishing in smaller headwater streams. Some undetermined number of fish are exposed to electricity during these surveys. The second purpose is to quantify fish population trends in selected monitoring reaches in the Project Area. A total of sixteen 250-foot (75-meter) long fish population monitoring reaches are distributed throughout the Project Area (for a total of 4000 feet/1200 meters linear stream length). Multiple-pass removal estimates of fish populations in these reaches have been conducted by Plum Creek each year since 1999. After 2001, the re-sampling interval will widen to every third or fifth year. The third purpose of electrofishing is to specifically survey for the presence/absence of bull trout; once bull trout are detected, further surveying in a stream reach would cease. The forth purpose is to capture and move fish during stream channel relocation projects, which should involve relatively small total length of streams during the ITP period. Plum Creek has committed to using trained professionals to perform all electrofishing surveys, and to using methods designed to minimize risk of injury to fish.

Potential direct effects from electrofishing include capturing, retaining, handling, and observing bull trout in the wild for purposes of obtaining scientific information. Incidental mortality from sampling bull trout may occur, especially where bull trout are captured through electrofishing. Handling of fish usually results in fish being held out of water, and being restrained for purposes of weighing, measuring, and collection of other morphometric and biological data.

Electrofishing is a common method for conducting fish surveys; depending on the skill of the operator, the type of equipment used, the methods, and the locale. During electrofishing surveys, up to 2 to 10 percent of juvenile salmonids in the specific reach sampled can be harmed physically or killed and up to 60 percent of adult salmonids can be harmed or killed (Fredenberg 1992; Sharber and Carothers 1988). Shocked fish exhibit behavioral changes including inactivity, cessation of feeding, and a reduction in wariness that can also influence survival in the short term (Mesa and Schreck 1989). Apparent condition upon release is not always indicative of actual physical condition, as studies have shown that injuries to the vertebrae often occur, are not apparent except as indicated by x-ray, and undoubtedly cause negative long-term effects (Sharber and Carothers 1988).

Effects such as these are expected to impact a relatively small percentage of total stream mileage of the Project Area that might have bull trout during the ITP, and would not be repeated in successive years. The number of individuals affected are expected to be small. Plum Creek will conduct fish population surveys during years 4,5, 6, 8, 10, 15, and every 5 years thereafter until the end of the ITP term.

Indirect effects of the proposed actions primarily include the latent effect from handling or anesthetizing bull trout, and especially from capture of bull trout through electrofishing. Some

individuals may die after they are released as a result of stress associated with handling. Fish captured using electrofishing can suffer tissue damage from electrical current, and some fish may suffer broken vertebrae. Additional effects from scientific sampling could include infection of wounds from bruising, tissue damage, or other injuries associated with handling.

To date, Plum Creek has reported that no threatened or endangered fish species have been observed thus far during these surveys within the Project Area, and no fish have been directly killed or noticeably injured.

Effects to Bull Trout Potential Habitat

Specifically, the RHAs on fishbearing streams should provide for the development of a considerably more functional riparian zone than exists currently. These RHAs are expected to provide over the life of the HCP the following riparian functions: suitable substrates, sufficient shade, bank stability, litter inputs for healthy nutrient supply, and eventually a continual source of large woody debris for instream structural elements important to bull trout. Somewhat ideally, aquatic functions of streams potentially utilized by bull trout in the action area could be better provided by: 1) wider buffers and buffers higher up streams (providing more stream shade, reduce artificially increased peak storm flows, and/or provide greater protection from sedimentation effects of logging and roads); 2) retention (versus thinning of most size classes) of all larger trees potentially contributing to large woody debris in streams; and 3) elimination of roads contributing excessive sediment to streams.

Substrate, Sediment, and Channel Morphology

The HCP provides for buffers on fishbearing streams and on most perennial nonfishbearing streams. These buffers will likely provide increased bank stability and sediment filtering compared to management practices in the Project Area of the recent past. Management activities are substantially reduced within these buffers, and as a result mature forest characteristics would develop only partially impeded within these riparian management zones, through natural succession modified by thinning. Negative impacts to bull trout from future management activities inside and outside of the riparian buffers will be reduced compared to management that would have likely otherwise occur. Buffers on seasonal streams with unstable slopes (inner gorges) are expected to provide protection against most artificially induced mass-wasting and associated sediment inputs (as compared what would have likely occurred otherwise), which can adversely affect bull trout and their habitat downstream in larger streams. Properly functioning habitat to maintain bull trout occupation (or potential) in the Project Area is expected throughout the ITP term. Nevertheless, some human caused mass-wasting events will likely occur in the Project Area. Watershed analysis as prescribed is expected to identify problem areas, processes and pathways, and will result in modified prescriptions designed to reduce sediment inputs due to landslides, minimize the artificial frequency of peak flows associated with timber harvest, assess the condition of fish habitat and riparian stands, and monitor the effects of forest practices on aquatic communities.

Roads, which are a major source of management-related sedimentation in streams, will still create negative impacts to stream habitat (even while not actively utilized) until (and if) they are stabilized and abandoned (Cederholm and Reid 1987). It is expected that certain areas of existing roads and new road construction will contribute substantial artificially high sediment loads to potential bull tout habitat. Considering the buffering of harvest practices, road-caused sedimentation is possibly the greatest adverse effect to bull trout expected from the HCP activities.

Road construction and maintenance would likely cause long-term increased sedimentation effects to local and downstream waters. Stream buffers, as proposed, would not likely capture artificially high sediment loads expected to result from the significant road network in place proposed to be maintained and to the new roads proposed to be constructed. The increased sediment delivered to these buffered streams and the concomitant effects (i.e., sedimentation, reduction in water quantity, and elevation in water temperature) would likely be translated downstream to larger waters as well.

Logging road densities and designs are particularly important factors affecting surface erosion and subsequent stream sedimentation. Surface drainage concentrated within roadside ditches, that is not dissipated or directed to reduce its effects can lead to erosive cuts (resulting in soil erosion and stream sedimentation) and concentrated water flow onto slopes that may exceed a slope's capacity to hold the weight (resulting in mass soil movements or landslides). Surface erosion on gravel roads also can lead to high levels of suspended sediment moved into streams. Inadequate road designs, such as inappropriate placement of backfill, undersized culverts, and other factors, can lead to mass wasting events such as land slides or debris torrents. Roads and ditches can become temporary stream systems, speeding water runoff and reducing water absorption into forest soils

Logging roads, not the tree harvesting practices themselves (unless both sides of a stream bank were clear-cut), are generally found to be responsible for a majority of the artificial levels of sediment that enters an aquatic system (Everest et al. 1987). Road construction causes the stream channel network to increase, because the roads act as tributaries, creating a more efficient sediment delivery system (Castro and Reckendorf 1995). Logging roads were responsible for 61 percent of the soil volume displaced by erosion in a study performed in Northwestern California (McCashion and Rice 1983).

Recent studies have linked recent flood damage to clearcutting of timber (particularly on steep slopes) and to the extensive network of logging roads constructed in forested regions throughout the Northwest (Eugene Free Community Network 2000). One study (performed by Gordon Grant, a hydrologist with the US Forest Service's Pacific Research Station in Corvallis, Oregon) was based on 40 years of data from the Willamette National Forest in Oregon, and found that clear-cuts and logging roads increased peak flows in mountain streams by 20 to 50 percent (Eugene Free Community Network 2000). The study found that effects to streams diminished gradually, but were still apparent 25 years later. The Association of Forest Service Employees

for Environmental Ethics (1996) did an aerial assessment of the Mapleton Ranger District in Oregon following the major rainstorms of 1996, and found the following results:

> A total of 185 landslides from the February 1996 storm were recorded. Of these, 114 were in-unit slides, 68 were road-related slides, and 3 were natural, in-forest slides. On average, road-related slides appeared substantially larger than in-unit slides, which is also consistent with previous studies. Road-related slides also appeared to cause more damage to streams: several large debris torrents were triggered by road failures.

Road construction and maintenance associated with timber harvest typically increases the amount of sediment delivered to streams through surface erosion, as compared to natural delivery rates. The disturbed areas of the road "prism" include the road subgrade, cut and fill slopes, ditches, berms, turnouts, stream crossings, and any other construction features that may be present (Fitzgerald et al. 1998). "Roads, which are the major source of management-related sedimentation in streams associated with logging regionally, continue to have adverse effects to stream communities even when not actively utilized"; they continue to contribute high sediment loads until they are stabilized and abandoned (Cederholm and Reid 1987). Roads can rarely be constructed that do have not cause adverse effects to streams (Furniss et al. 1991). Roads constructed within riparian areas and parallel to streams typically have pronounced adverse effects to aquatic systems, compared to roads built in other locations.

Gravel forest roads have been found to generate up to 300 tons of sediment/mile/year from surface erosion in the Olympic Mountains of Washington (Reid and Dunne (1984). Sediment loss was found to be related to traffic intensity and was highest on heavy-use gravel roads compared to unused roads or paved roads. Sediment yield from cutbanks and ditches alongside paved roads was less than 1 percent of that from gravel roads in Washington study. Heavily used roads were calculated to produce 300 tons of sediment/mile/year over the period of study, compared to lightly used roads with 2.6 tons/mile/year and paved roads with 1.4 tons/mile/year.

Roads accelerate soil erosion rates due to surface erosion and mass soil movement such as slumps and earthflows, debris avalanches, debris flows, and debris torrents. High rates of stream sedimentation result from this increased erosion. Soil erosion rates were 30 to 360 times higher on forests with roads than undisturbed forest (Furniss et al. 1991). Roads also altered streamflow rates and volumes, which along with increased sedimentation, resulted in altered stream channel geometry (Furniss et al. 1991). Acting as new flowpaths for water, roads increased the channel network over watersheds, increasing the drainage density. By increasing the frequency, magnitude, and altering the composition of debris flows, road caused erosion and delivery can affect the long-term potential for developing complex channel morphology and aquatic habitat.

Roads can also degrade fish habitat by creating migration barriers such as inadequate culverts and temporary dams caused by landslides. Erosion results in sedimentation of streams and causes declines in spawning habitat when too high a proportion of fine sediment is deposited. Salmonid survival rates decreased after logging and road construction, as fine sediment levels in

streams increased and as important habitat characteristics, including the number of pools and winter cover, decreased (Hicks et al. 1991). Macro-invertebrates, the primary food source of juvenile fish and some amphibians, also typically decline when large amounts of sediment are added to the stream system (Furniss et al. 1991).

Sediment inputs will likely be increased by exposed soil, landings, trails, and landslide scars. Landslide scars can provide chronic sources of sediment. However in accordance with the road maintenance and abandonment plan, watershed analysis prescriptions will likely reduce road-generated sediment to aquatic resources. HCP measures are expected to substantially reduce the production and movement of fine sediment, filtering fine sediment, and the introduction of fine sediment into spawning and rearing areas. Road closures and abandonment, combined with improved crossings and drainage, will likely greatly improve passage of bedload material downstream, further protecting habitat and stream-bank integrity. It should be noted, however, that improvement will likely take considerable time (decades), as effects from roads constructed prior to the HCP are upgraded, as old harvest units with insufficient buffers significantly mature, and as mature buffers slowly begin to contribute large woody debris as a result of natural mortality and blowdown. In the meantime, large woody debris, which is not being dynamically replaced by recruitment in the short-term, will continue to decay, storage structures and complexities will decrease, and additional sediments will be routed through the system.

Juvenile densities of bull trout may decrease in local areas where embeddedness of the substrate increases. Because of the strong association with the stream bottom, bull trout can be harmed when sedimentation reduces pool depth, alters substrate, reduces interstitial spaces, and/or causes channels to braid. They will also be affected where artificially high flows result in bed-load movement and scour. The HCP actions will likely ensure substrate development capable of supporting spawning, egg development, and emergence, as well as habitat for fry in substantial portions of the Project Area.

Stream Temperature and Shade

Increases in stream temperatures may cause direct mortality, displacement by avoidance, or increase competition with species more tolerant of warm stream temperatures (MBTSG 1998).

The HCP will likely provide suitable habitat conditions and maintain the low water temperature necessary to support bull trout in portions of the Project Area. Actions under the HCP will provide cool temperatures for most fishbearing streams by maintaining 200-foot buffers [a site-potential tree height of non-managed and managed buffers] on each fishbearing stream bank in a forest-structural condition suitable at a minimum for foraging and dispersal of spotted owls. Based on site conditions, large-diameter conifers adjacent to those streams are anticipated to result from those buffer prescriptions. Selective harvest when used in RHAs, is expected to accelerate the attainment of large-diameter conifers. In addition, a no-harvest 30-foot equipment exclusion zone is adjacent to each stream bank. Perennial non fish-bearing streams are also

protected through a variety of mechanisms depending on stream type and location. Most of these streams will receive buffers of about half a site-potential tree height (100 feet).

Colder waters than currently exist in the Project Area are expected to enhance both reproduction and survival of bull trout. Cold temperatures will allow successful emergence and rearing, and will allow fish to find suitable shelter during low-flows. Bull trout need a steady flow of oxygenated water, which can be affected by temperature as well as by low flows. The RHAs in conjunction with other prescriptions are expected to provide suitable water temperatures in substantial portions of the Project Area.

Large Woody Debris

Channel characteristics determine the minimum effective sizes of large woody debris needed for bull trout habitat. Buffer widths generally prescribed in Washington are often somewhat less than a site-potential tree height from a stream. Yet on steep slopes, significant recruitment of wood will occur from gravitational forces. RHA widths (200 feet) in the subject HCP on the west side of the Cascades meets or exceeds a site-potential tree height. The RHAs alone however, do not account for large wood, which could have been recruited by gravity from further up-slope areas, and do not account for episodic recruitment of large wood from upland areas.

As the prescribed buffers mature, the benefits derived from large woody debris in the stream should: enhance the function of the habitat for adult bull trout by creating deep pools; benefit young and eggs by storing sediment, creating cover, and sorting gravels; and, therefore, increase the bull trout carrying capacity, that may in turn result in increased densities and numbers of fish. These benefits are compared to the existing degraded condition and the continued degraded condition that would be expected otherwise without the HCP. Improvement will likely take considerable time as effects from roads constructed prior to the HCP are upgraded, as past harvest units with insufficient buffers (and minimal larger/older/dead trees) mature, and as mature buffers slowly begin to contribute large woody debris as a result of mortality. Windthrow is not a currently significant factor for large wood recruitment within the Planning Area. In the meantime, large woody debris is not being dynamically replaced by recruitment and will continue to decay, storage structures and complexities will decrease, and additional sediments will be routed through the system. Thinning of RHAs will likely compound this paucity of woody debris in the short-term, but may improve the situation in the long-term.

Connectivity (Blockages)

In accordance with the road maintenance and abandonment plan, watershed analysis prescriptions is expected to require removal of any blockages to fish passage at culverts. This would open and help maintain previously unusable, albeit historic, habitat. It would increase the amount and connectivity of available bull trout habitat, which would be expected to provide bull trout with opportunities to feed, breed, shelter, survive, and migrate. This should enhance the connectivity and size of currently isolated populations. Some blockages will likely continue

undetected. Removal of blockages will likely also contribute to local delivery of sediment to streams. However, some blockages (e.g., off-site dams) are beyond the scope of the Plum Creek HCP to address.

Nutrients

Removal of alder and maple from areas close to streams, as prescribed in some areas, could decrease the amount of allochthonous (outside of stream) production and nutrient inputs. Replacement of deciduous trees and associated shrubs with conifers will alter the amount, timing, and function of detrital inputs, creating an ecosystem shift. It is expected that a higher ratio of conifers to hardwoods than currently exists in the riparian zones of the Project Area would be closer to historic (natural/desired) conditions. Returning to natural combinations/compositions of streamside vegetation would eventually return nutrient cycling and associated macro-invertebrates to natural levels, particularly if the trees allowed to mature. Maintenance of natural cycles and food supplies likely corresponds well with habitat usage by bull trout.

Hydrology

Avoidance and reduction of impacts to hydrology are fundamental goals of the HCP. Wetland buffers, ground-based equipment exclusion areas, and road standards were all designed to maintain the natural hydrologic regime. However, both roads and ground-based equipment have the potential to compact subsurface soils bringing groundwater to the surface where it travels more quickly, gravitates to collection and transport areas, and is subject to warming. Diffuse shunt of water onto the forest floor on the down-slope sides of roads should help in this regard. However, increases in surface water will potentially translate into increased sediment transport. Watershed analysis as prescribed in the HCP will focus on physical and hydrologic threats to aquatic systems, such as increased transport. The HCP buffers on perennial and spatially intermittent streams will likely protect most of the hyporheic zones, springs, seeps, and upwellings. Seeps and springs are also explicitly protected by HCP provisions. Uneven-aged management and partial harvest (where utilized) should ameliorate most of the negative effects of timber harvest on subsurface soil/groundwater. Protection of forested wetlands and the enlarged buffers of non-forested wetlands will further help protect soil and ground water.

Effects from altered hydrology would likely result in some harm to bull trout. Some contribution to warming, sedimentation, or exaggerated low and peak flows would likely result, in turn affecting young bull trout survival.

Summary of Effects

The HCP goals include maintaining the distribution, diversity, and complexity of various watershed components to ensure the protection of aquatic systems supporting bull trout. One of the primary management objectives within RHAs for aquatic resources is to provide an adequate

number of large-diameter conifers over time (predominately as large woody debris) to maintain functioning of the stream ecosystem. Given the HCP efforts to reduce adverse effects to bull trout from timber harvest and related activities, and to provide at least moderate function habitat, implementation of the HCP is not likely to compromise the continued existence of bull trout. The riparian and wetland conservation strategies are expected to result in long-term benefits to bull trout compared to management that would likely otherwise occur. This plan will provide the basic habitat components required by bull trout -- cold, clean water, and complex riparian/aquatic communities connected to each other, in portions of the plan area. These habitat attributes will likely provide for bull trout survival, reproduction, sheltering, and migration, to the extent that the occupation will likely to increase above existing numbers, if migration access for re-establishment of populations within the Planning Area is attained. Electrofishing, as specified, will likely have unimportant effects on any local populations that may become established.

CUMULATIVE EFFECTS

Cumulative effects are those effects of future State, tribal, local, or private actions, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation. These are actions, unrelated to the proposed action, that are likely to occur, bearing in mind the economic, administrative, or legal hurdles which remain to be cleared (50 CFR 402; Subpart A). Future federal actions that are unrelated to the proposed action are not considered in this section, because they require separate consultation pursuant to section 7 of the Act.

The most important cumulative effects are from forest-land management and urbanization on adjacent nonfederal land, and problems associated with fish passage in the action area caused by human activities. The 1996 BO addressed cumulative effects and that analysis is incorporated herein by reference.

The status of Columbia River and Coastal-Puget Sound DPSs of bull trout is likely to be enhanced through future reductions in the adverse effects resulting from timber harvest and road building compared to the past, including remedying legacy effects from past activities. Improved grazing practices will benefit bull trout in the Columbia River DPSs. Providing for both upstream and downstream passage at dams and culverts of all sizes will facilitate recolonization of previously occupied habitat and promote genetic exchange throughout the Columbia River and Coastal-Puget Sound DPSs. Screening water diversions will prevent entrainment of bull trout throughout the Columbia River DPS. Improvement of agricultural practices affecting water quality will benefit bull trout within the Columbia River and Coastal-Puget Sound DPSs. Similarly, improved approaches to increased urbanization, such as requiring setbacks from stream banks and floodplains, retention and/or re-establishment of riparian tree cover, retention of large woody debris, and avoiding contamination of streams, will contribute to the recovery of the Coastal-Puget Sound and Columbia River DPSs.

Forestry

It is anticipated that other non-federal forestry activities will continue at somewhat the same level as in the past, although forest practice rules and the concomitant forest management will likely improve (relative to bull trout) during the ITP period. Since issuance of the ITP and implementation of this HCP, complimentary improvements in forest land management within and adjacent to the Planning Area have been and will be realized. These improvements include passage of legislation by the Washington Legislature (ESHB 2091, June 1999) directing the revision of Washington Forest Practice Rules to contribute to the recovery of endangered and threatened salmonids. This effort should benefit anadromous salmonids (compared to management under past rules) through improved management of riparian and stream ecosystems, water quality, reduced delivery of coarse and fine sediments to aquatic systems, and overall watershed conditions on private lands within the action area. Nevertheless, it is undetermined

whether these latest forest practice rules will contribute to conservation of bull trout on the affected (non-HCP/nonfederal) lands.

The most relevant problem associated with current Washington State Forest Practice Rules is that, although an improvement over the past, these rules likely continue to place bull trout at risk from timber harvest and related activities. The most significant logging impacts are likely to occur to Type 4 and Type 5 Waters (non-fishbearing headwater streams, perennial and seasonal), which receive minimal to somewhat moderate protection under State regulations.

Even though these rules are a considerable improvement over the past, artificially high and adverse sedimentation and stream temperatures will likely continue to occur, as well as changes in seasonal flow-regimes (i.e. increases in winter peak flows and decrease of summer low flows). Due to the high sensitivity of bull trout to fine sediments and elevated stream temperatures, these habitat changes are likely to have adverse effects on bull trout.

Riparian Management Zone widths (50-foot no-harvest, plus management out to 2/3 or 3/4 site-potential tree height), as specified by the Washington State Forest Practices Rules, will not always ensure protection of the riparian components for bull trout, because the minimum widths are likely insufficient to fully protect riparian ecosystems. In some cases, current practices may not be sufficient to address salmonid habitat needs (detrital inputs, water temperature, stream bank stability, large woody debris recruitment). Current Washington State Forest Practices Rules no longer allow harvest activities throughout the whole Riparian Management Zone (up to the edge of a stream). This removes a substantial risk to bull trout. Impacts of near stream harvest still exist on perennial streams without fish, which will negatively affect bull trout, include increased stream-bank erosion, increased stream sedimentation, decreased canopy cover causing increased stream temperatures, and decreased large woody debris recruitment adversely affecting pool formation, instream cover, and sediment storage in smaller streams.

Growth and Development

The planning efforts in King and Kittitas counties have identified lands that are unlikely to be managed for forestry in the foreseeable future. These include an area from Cle Elum to the south end of Kachess Lake excluded from the Planning Area and, to a lesser degree, an area in the Snoqualmie Drainage near the town of North Bend. These areas will likely be subject to activities such as housing developments, commercial activities, and recreational developments. On these lands, these activities will have greater impacts on fish than would have occurred as a result of forestry. Such development through the removal of riparian vegetation and creation of impermeable surfaces are expected to increase peak flows and decrease function of bull trout instream habitat along with creations of barriers to bull trout.

Urbanization usually creates a more lasting effect on stream ecosystems than timber harvest activities due to the severity and permanence of the impacts. The increase in impervious surfaces in conjunction with non-point source pollution associated with development will drastically alter

water quality and quantity of urban streams. Other effects of this development likely include greater demands on the municipal water supplies, intensive recreational activity, and increased vehicle traffic. Additional nontimber activities likely to occur include valuable-materials extraction, oil and gas exploration, urban and rural development, recreational site construction and use, grazing, powerlines and pipelines. Riparian degradation, aquatic degradation, and expanded road construction and use resulting from these activities are impacts likely to adversely impact bull trout.

More detailed analysis can found in our 1996 BO.

CONCLUSION

After reviewing the current status of bull trout; the environmental baseline for the action area; the effects of the proposed plan; and the cumulative effects for the action area, it is our opinion that continued implementation of the HCP and the inclusion of the Puget Sound/Coastal DPS of bull trout on the subject ITP are not likely to jeopardize the continued existence of the aforementioned species. After reviewing the current status of bull trout; the environmental baseline for the action area; the effects of the proposed plan; and the cumulative effects for the action area, it is our opinion that electrofishing as a covered HCP activity is not likely to jeopardize the continued existence of Puget Sound/Coastal DPS or Columbia River DPS of bull trout. This is largely based on continued implementation of the Northwest Forest Plan, as well as the conservation measures committed to within the subject HCP, which both provide important conservation for this species. Critical habitat for the bull trout has not been designated at this time; therefore, none will be affected. The timber-harvest associated activities and electrofish monitoring are expected to adversely affect the bull trout and incidental take of individual bull trout is likely to occur within acceptable levels.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act, prohibits taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. ***Harm*** *in the definition of "take" in the Act means an act which actually kills or injures wildlife. Such act may include significant habitat degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering.* For bull trout, harm may include significant habitat modification or degradation where it actually kills or injures bull trout by significantly impairing essential behavioral patterns, including breeding, feeding, sheltering, such as the behavioral patterns of spawning, rearing, migrating, and smoltification. ***Harass*** *in the definition of "take" in the Act means an intentional or negligent act, or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering.* Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the federal agency or the applicant. 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 a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The HCP and its associated documents identify anticipated impacts to bull trout likely to result from the proposed taking and the measures prescribed to minimize those impacts. Covered activities with a high likelihood of causing injury or death to individual bull trout include sediments introduced to streams from routine watershed management, sediments delivered to streams through catastrophic events such as slope failures that are directly or indirectly related to forest management operations, road construction/repair/maintenance/use, and cable- and ground-based movement of logs near and through riparian areas. For example, incubating bull trout eggs downstream of road repair sites could be smothered by operations where sediment containment is ineffective or the ground-disturbing activities occur during extreme wet conditions. Bull trout could be de-watered or smothered in tributary streams next to forest road repair. Incubating eggs could be disturbed by movement of cables or logs through riparian yarding corridors, or by modifying vegetation to create the yarding corridors themselves. An example of effects beyond the egg stage might be increased avian or fish predation of rearing juvenile bull trout that have been temporarily or chronically displaced by changes in preferred or useable habitats (loss of pool complexity, depth, frequency or distribution) from sediment input and storage. The frequency, location and duration of covered activities likely to cause harm bull trout is not known specifically; the details of these activities are too speculative for us to estimate possible numbers of bull trout likely to be taken under this HCP.

This incidental take statement applies only to the Puget Sound/Coastal and Columbia River DPS of the bull trout.

The measures described below are non-discretionary, and must be implemented by the Service so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. We have a continuing duty to regulate the activity covered by this incidental take statement. If the Service: (1) fails to require the permitee to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

AMOUNT OR EXTENT OF TAKE

We expect that this action is likely to result in incidental take of Puget Sound/Coastal DPS of bull trout in the form of harm, harassment, and mortality due to effects from timber harvest and related activities, including road building, stream crossings, canopy removal, and potential increases in stream sedimentation and temperature that may adversely impact bull trout at a number of life-history stages. We also expect that this action is likely to result in incidental take of Puget Sound/Coastal and Columbia River DPSs of bull trout in the form of harm, harassment, and mortality due to effects of electrofishing. The proposed action of adding bull trout to the subject permit is contingent upon the implementation of the conservation measures in the HCP and, as such, they are part of the proposed action. Estimates of incidental take account for the operation of these conservation measures. Because of the inherent biological characteristics of bull trout, the likelihood of discovering an individual death or injury attributable to this action is very small.

We anticipate that impacts to bull trout will be difficult to detect at the individual organism level for the following reason(s): (1) bull trout are wide-ranging and are affected by factors beyond the control of Plum Creek; (2) juveniles, fry, and eggs have small body size and are, therefore, difficult to detect when alive; (3) finding dead or impaired specimens is unlikely, especially considering the often small body size of eggs and fry, denseness of vegetation/substrate, and remoteness of the area; (4) losses may be masked by seasonal fluctuations in numbers or other causes; (5) dead or impaired specimens may be washed downstream of the site where the impact occurred; (6) dead or impaired specimens may be consumed by other fish and wildlife species; and, (7) the HCP covers a large area with many stream miles to monitor. However, habitat conditions may be used as a surrogate preliminary indicator of take or impact. This assessment focused on the amounts and function of habitats provided/affected for the Puget Sound/Coastal DPS.

Therefore, even though we expect incidental take to occur from the effects of the action, the best scientific and commercial data available are not sufficient to enable us to estimate a specific number of individuals incidentally taken based on loss or injury of individuals of the species. For instance, if the bull trout population were to increase during the permit period, a larger number of individuals may become subject to some level of take. Conversely, if bull trout were to decrease, less take might occur. Bull trout are not currently known to occur in the Planning

Area and, due to the presence of several dams, downstream effects from Plum Creek actions on bull trout are unlikely until barriers are eliminated.

Consequently, take is estimated based on the quantity of habitat likely to be affected in the 50- to100-year ITP period. This impact would likely adversely affect bull trout sufficiently to result in harm, harassment, or mortality.

Selective harvest in RHAs is expected to occur at any given location only a maximum of once per 50 years. Because harvest in many older riparian stands is limited by the relative-density requirement, removal of volume, or any harvest, is not always feasible. Additionally, landscape-level targets must be reached for riparian areas. For these reasons, we expect only about 1 percent of riparian stands to be entered per year at a maximum. Due to the checkerboard pattern of the Planning Area, less than 0.5 percent of the landscape's riparian areas would be entered per year. Although there may be some occasions when entries result in impacts to additional stream mileage downstream, only a small percentage of these entries would result in impacts that could be construed as take.

We anticipate incidental take in the form of harm of bull trout associated with the selective harvest within RHA's of about 20 acres of riparian bull trout habitat along perennial fishbearing streams per year and about 10 acres of perennial nonfishbearing streams per year; restoration activities (e.g., culvert replacement, hardwoods conversion) along 1 to 2 miles of stream per year (up to 50 acres); and thinning or restoration-oriented silviculture along 30 acres of riparian bull trout habitat per year.

We anticipate that a quarter mile of perennial nonfishbearing streams may be adversely affected by adjacent harvests retaining 50-foot inner-gorge, no-harvest buffers as a result of watershed analysis. We further anticipate that less than a quarter mile of perennial nonfishbearing streams may be affected by adjacent harvest, in which either the entire reach is buffered with a 25-foot area containing 44 trees per acre, or about 15 percent of the reach has a robust patch buffer extending up to 175 feet from the stream, and the remaining 85 percent of the reach has a narrow buffer containing non-merchantable conifers, deciduous trees, and shrubs. These prescriptions represent the highest probability for non-road-related take of bull trout within the HCP.

We estimate that of the riparian areas entered each year, some percent will be in yarding corridors. We expect yarding corridors will be necessary on a portion of those entries (about 75 percent) and that 15 percent of the riparian area associated with those entries would be removed to create the corridors each year. This would result in less than 10 acres of riparian area being removed for yarding corridors per year.

Construction and maintenance of roads are anticipated to adversely affect bull trout resulting in harm or harassment, particularly during the early life-history stages. We anticipate incidental take in the form of harm of bull trout associated with the construction and maintenance of 0.2

mile of roads per year, as a result of implementing the HCP. We also anticipate some incidental take in the form of harm associated with upgrading or removing 20 miles of road per year.

Take of bull trout from electrofishing is expected to be largely minimized and avoided, as most of the Project Area will likely remain unoccupied by bull trout during the ITP (due to artificially blocked fish passage). If bull trout are established/re-established within the Project Area, and take occurs, a small number of individuals would likely be affected, as occupation of the project area is not expected to become extensive in areas where most activity would occur; for example, most electrofishing would be occurring at the upper ends of fish-bearing streams. Therefore, the number of individuals likely to be taken, is low, yet unquantifiable. Estimates of take are in terms of maximum amount of stream mileage potentially affected to the extent that take could possibly occur. Individual bull trout from both Columbia River and Puget Sound/Coastal DPSs could be taken by electrofishing.

Approximately 1,233 total miles of streams occur in the Project Area. Electrofishing could potentially occur, and thus potential take at its maximum extent, within the 100 miles of fish-bearing streams, 196 miles of (streams currently classified as) perennial, nonfish-bearing streams, and 341 miles of unclassified streams in the Project Area. Thus, take of bull trout could occur from electrofishing within 637 miles of streams. We expect that less than 10 miles of streams (of any type) will be electrofished in the Project Area any one year.

EFFECT OF THE TAKE

In the accompanying BO, we have determined (for the following reasons) that this level of anticipated take is not likely to result in jeopardy to any species or the destruction or adverse modification of critical habitat.

Take in the form of harm, harassment, and mortality (kill) may occur. The type of activities covered by the permit can in many cases result in take such as:

> Harm or mortality may occur due to habitat modifications resulting from watershed management and road management activities.
>
> Harassment or mortality may occur when instream activities are conducted where fish are present, such as the creation and use of log yarding corridors through riparian zones, road maintenance and improvements, and monitoring activities.
>
> Harm, mortality, or direct injury may occur during electrofishing for monitoring activities.
>
> Harassment may occur during instream monitoring activities, including electrofishing.

Mortality may occur due to the use of equipment in streams during construction and maintenance of forest roads and catastrophic inputs of coarse and fine sediments through management-related mass-wasting.

Direct injury may occur due to instream activities where fish are present, such as construction and maintenance and improvements of forest roads, and the conduct of forest management activities in and near fish-bearing streams.

Unknown or known redds may be subject to timber-harvest impacts during the incubation period, or young may be subject to adverse effects during the subsequent rearing period. Individuals may be subject to impacts that may inhibit their ability to survive and reproduce.

The HCP is generally expected to result in long-term benefits to bull trout. If fully and properly implemented, the HCP provides riparian and wetland-conservation strategies and road-management provisions that will play an important role in the long-term protection of bull trout on Plum Creek lands.

For the reasons stated in this assessment, implementation of the HCP should adequately address bull trout by providing for their continued existence at viable levels and with sufficient distribution, and would contribute to the recovery of the species/DPS.

REASONABLE AND PRUDENT MEASURES

The following reasonable and prudent measures, are necessary and appropriate to minimize take of bull trout:

1. Any incidental take of bull trout must comply with all the terms and conditions of the section 10(a)(1)(B) permit (including the provisions of the Implementing Agreement and the HCP) to ensure that conservation measures included to protect the various species are properly implemented.

2. Any incidental take of bull trout from fish monitoring activities shall be minimized.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, we must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions, also contained in the June 24, 1996, BO, are nondiscretionary.

1. A section 10(a)(1)(B) permit, as evaluated in this BO, must be issued by the Service. The Implementing Agreement for the HCP for the section 10(a)(1)(B) permit must be agreed

to by the Service and the permit conditioned upon implementation of the HCP and the Implementing Agreement.

2. We have provided a protocol for the handling of dead, injured, or ill listed species for pesticide analysis. When we suspect a species has been taken in violation of label restrictions, the incident(s) shall be reported to the Division of Law Enforcement or their designee in the Region in which the species is found. Instructions for proper handling and disposition of such specimens will be issued by the Division of Law Enforcement: Assistant Regional Director; Division of Law Enforcement; 911 N.E. 11th Avenue; Portland, Oregon 97232-4181; (503) 231-6125

3. We shall retain permit condition (H) which reads as follows: *The permitee will notify the Service if locations of nesting murrelets not described in the HCP are discovered, if additional owl site centers not described in the HCP are discovered, if additional stream reaches are found to contain bull trout, or if any observations of wolves or grizzly bears are made within the Planning Area during the course of the HCP.*

4. We will condition our incidental take permit to include the following: When conducting electrofishing, the permittee will abide by the "General Conditions for Native Endangered and Threatened Wildlife Species Permits," 50 CFR Part 13, 50 CFR 17.22 (endangered species) and/or 50 CFR 17.32 (threatened species), as applicable. In addition, the permittee must have any other applicable state and federal permits prior to the commencement of activities authorized by this permit. Electrofishing in the Project Area will be performed as specified in the Description of the Action above.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

We offered conservation recommendations in the 1996 BO, which are incorporated herein by reference. We offer the following additional recommendation with respect to the Puget Sound/Coastal DPS of bull trout:

> We should endeavor to cause the re-establishment of fish passage that would allow free movement (as occurred historically) of adult and juvenile bull trout within the upper and lower Green River and Yakima River watersheds.

In order to document actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, we shall provide, in writing, reports of the implementation of any conservation

recommendations at the time of the periodic reporting. The variances from the recommendations may be reported instead.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the proposed action of amending of the Plum Creek's ITP PRT-808398 to add the Puget Sound/Coastal DPS of bull trout, and to analyze the effects electrofishing as described in the HCP on both Puget Sound/Coastal and Columbia River DPSs of the bull trout. 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 maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Item 2 above, regarding new information, could include deviations from the Northwest Forest Plan. Should such deviations occur to the extent that the baseline is significantly altered or the integrity of the HCP and its assumptions are compromised, consultation will need to be reinitiated.

If you have any questions regarding this BO, please contact Jon Avery of my staff at (360) 753-5824 or the letterhead phone/address.

Ken S. Berg

cc: DOI, Portland (E. Nagle)
FWS, Portland (K. Hollar)
FWS, Lacey (J. Avery, C. Hansen, J. Michaels, W. Vogel)
NMFS, Lacey (S. Landino)
WDFW, Olympia (P. Swedeen)
Plum Creek Timber Company, Seattle (M. Collins, L. Hicks)

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