



## United States Department of the Interior

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Memorandum

December 18, 1998

To: GARD, North Pacific Coast Ecoregion, Region 1, Portland, Oregon

From: Acting Supervisor, North Pacific Coast Ecoregion, Western Washington Office, Lacey, Washington

Subject: Reinitiation of the Biological Opinion and Conference Opinion on the Amendment of an Incidental Take Permit (PRT-812521) for the Washington State Department of Natural Resources' Habitat Conservation Plan to Include Bull Trout (*Salvelinus confluentus*) on the Permit (FWS Reference: 1-3-96-FW-594; X-Reference 1-3-9-HCP-013)

This correspondence constitutes the U.S. Fish and Wildlife Service's (Service) reinitiation of a Biological Opinion (BO) and Conference Opinion (CO) on amendment of a section 10(a)(1)(B) permit previously issued to the Washington State Department of Natural Resources (WSDNR). On January 30, 1997, the Service issued an Incidental Take Permit (ITP) (PRT-812521) to the WSDNR, pursuant to section 10(a)(1)(B) of the Endangered Species Act of 1973 (Act), as amended (16 USC 1531 et seq.). That permit authorizes the incidental take of the Federally threatened northern spotted owl (*Strix occidentalis caurina*) and other listed species in the course of the otherwise lawful forest-management and other land-use activities within the range of the spotted owl. Pursuant to the Habitat Conservation Plan (HCP) and the Implementation Agreement (IA), WSDNR received assurances from the Service that the then unlisted species occurring in their lands west of the Cascade Crest would be added to the permit upon listing of those species, in accordance with the Act, the HCP, and the IA. On May 20, 1998, the Service received a request from the WSDNR that bull trout (*Salvelinus confluentus*) be added to its ITP (PRT-812521).

This document reinitiates consultation under section 7 (a)(2) and initiates conference pursuant to section 7(a)(4) of the Act to determine whether adding bull trout that occur west of the Cascade Crest to the WSDNR permit would be likely to jeopardize the continued existence, or destroy or modify critical habitat of any listed species. This document addresses the listed bull trout distinct population segment (DPS) that occurs in the Columbia River west of the Cascade Crest and the proposed Coastal/Puget Sound bull trout DPS which may be impacted by the issuance of an ITP pursuant of section 10 of the Act. Bull trout populations east of the Cascade Crest are addressed in this BO as

part of the environmental baseline, but will not be added to WSDNR's ITP as part of this opinion. Critical habitat has not been determined for this species.

## CONSULTATION HISTORY

A complete description of the consultation history is contained in the January 27, 1997, BO (USFWS 1997a, USFWS 1997b) which is herein incorporated by reference. A Conference Report, signed January 29, 1997, was also developed by the Service to address adverse effects to *Castillejo levisecta*, bull trout, Oregon spotted frog (*Rana pretiosa*), and *Sidalcea oregano* var. *calva* (USFWS 1997b) and is also incorporated by reference. A notice advising the public of the proposed permit amendment was published in the June 17, 1998, Federal Register (63 FR 33090). The Service will respond to comments in the Service's Findings document.

## EFFECT DETERMINATIONS

The Service determined that bull trout was likely to be adversely affected and, as such, potential effects to the species are addressed in this BO/Conference Opinion (CO). Other species listed on the ITP will not be affected by this action.

WSDNR requested and received multiple-species coverage (including bull trout) for areas west of the Cascade Crest. Bull trout also occur east of the Cascade Crest. The WSDNR HCP does not contain a conservation strategy for bull trout or riparian-obligate species east of the Cascade Crest, nor does WSDNR receive any protection under the HCP for bull trout east of the Cascade Crest. The impacts of issuing a permit for spotted owls, grizzly bears, gray wolves, and other species listed as of January 30, 1997, was assessed in a CO conducted at the time of initial permit issuance, and is further assessed in this BO as part of the environmental baseline affecting bull trout.

## DESCRIPTION OF THE ACTION

A complete description of the covered activities and bull trout mitigation measures can be found in the Washington State Department of Natural Resources Final Habitat Conservation Plan (WSDNR 1997) and the January 27, 1997, BO (USFWS 1997a). The final HCP is herein incorporated by reference. In summary, WSDNR is seeking coverage for bull trout for their timber harvest activities and nontimber actions on their lands west of the Cascade Crest comprising five planning units and the Olympic Experimental State Forest (OESF). This constitutes 1,448,600 acres of WSDNR ownership in western Washington. The unlisted species provisions of the HCP and IA did not include WSDNR lands east of the Cascade Crest. Therefore, only west side planning units will be considered in this analysis. Covered activities and the riparian management strategy for the five west side planning units and the Olympic Experimental State Forest are summarized below.

## Covered Activities

The ITP amendment would authorize incidental take of bull trout for management activities on 1,448,600 acres of WSDNR-managed lands in the State of Washington, including commercial forest-management and nontimber resource activities. Commercial forest management includes administration and monitoring, road access, road building and maintenance, site preparation, planting, thinning, fertilizing, brush control, timber harvest, slash control, fire control, administrative and commercial use of roads, and gravel pits and rock quarries necessary for forest management. Forest management also includes research activities conducted in the OESF Planning Unit and other planning units to achieve the conservation objectives of the HCP and to meet other management goals. Aerial application of pesticides may also be a covered forest-management activity after review and approval of site-specific plans by the FWS, but it is not considered a covered activity with respect to this opinion.

The ITP amendment would also authorize incidental take of bull trout in connection with WSDNR management of nontimber resource activities which include granting rights-of-way on WSDNR-managed lands, harvesting of special forest products such as western greens and Christmas trees, extracting sand and gravel, prospecting and mining, exploration for oil and gas, grazing, establishing electronic sites, and maintaining recreational sites, including off-road vehicle (ORV) sites. WSDNR states in the HCP that, at the 1996 level of these activities, no take or insignificant take of the listed species was occurring. Information received by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service (Services) from WSDNR in a meeting on September 18, 1997, provided additional data as to the extent of these activities on WSDNR-managed lands. The Services responded to this information in a letter (USDI and USDC 1998) to Jennifer Belcher, Commissioner of Public Lands, concurring with WSDNR's conclusion that sand and gravel mining activities and other mineral contracts on WSDNR lands at 1996 levels will have a negligible impact on anadromous salmonids and bull trout. As such, the Services in their letter extended coverage for these species at the 1996 levels for these activities for the full length of the HCP terms.

## Riparian Management Strategy

Under the HCP, riparian management zones would be established on Type 1 through Type 4 Waters, defined in Washington State Forest Practices Rules (WAC 222-16-030) (WSDNR 1995a). Type 1 Waters are typically large rivers and are defined by WSDNR as "shorelines of the state." Type 4 Waters are upstream of Type 2 and Type 3 Waters, are greater than or equal to 2 feet in width between the ordinary high-water marks, and may be perennial or intermittent streams. Riparian management zones consist of riparian buffers (interior-core buffers in the OESF Planning Unit) and, where applicable, wind buffers (exterior-core buffers in the OESF Planning Unit). These zones protect habitat and provide the structures and vegetation necessary to maintain a healthy riparian ecosystem and to provide an adequate amount of habitat for species that require riparian and aquatic habitat. Such habitat includes large woody debris for in-stream fish habitat, trees and vegetation for shading and moisture retention to maintain amphibian and fish habitat, a broad zone of trees and vegetation to filter sediments for maintenance of aquatic habitat, large trees for use as roosts and

nests by bats and birds, and travel corridors and foraging opportunities for most species that inhabit the HCP area.

1. West-side Planning Units Riparian Strategy

- A. Riparian management zones would be established that consist of riparian buffers of one site potential tree or 100 feet, whichever is greater, measured on the horizontal, which would be applied to both sides of Types 1, 2 and 3 Waters. These buffers are expected to average 150 to 160 feet.
- B. Forest-management activities in riparian management zones (100-year flood plain as the inner margin) would be limited as follows: (1) 25-foot (horizontal distance) no-harvest area (ecosystem restoration activities are allowed); (2) the next 75 feet would be a minimal-harvest area for ecosystem restoration and/or selective single tree removal; (3) remaining portion of riparian buffer would be a low-harvest area for selective removal of single trees or groups of trees and thinning and salvage operations.
- C. Riparian buffers of 100 feet measured on the horizontal, would be applied to both sides of Type 4 Waters.
- D. All Type 4 and Type 5 Waters classified prior to January 1, 1992, would be verified in the field or assumed to be Type 3 Waters and would be buffered accordingly.
- E. Type 5 Waters would be protected by buffering for steep and unstable slopes, where applicable. These buffers are expected to be applied to approximately 50 percent of Type 5 Waters.
- F. In addition to the riparian buffers described above, Type 1 and Type 2 Waters would receive a 100-foot wind buffer along the windward side, and Type 3 Waters wider than 5 feet would receive a 50-foot buffer along the windward side, where there is at least a moderate potential for windthrow.
- G. Harvest activity within the wind buffer would be on a site-specific basis that may include activities such as single tree or group selection and thinning and salvage operations.

2. OESF Planning Unit Riparian Strategy

- A. All Type 1 through Type 4 Waters would be protected with interior-core buffers on each side; Type 5 Waters would receive site-specific protection necessary to protect identifiable channels and unstable ground.

- B. Interior-core buffers on Type 1 and Type 2 Waters would average 150 feet on each side; interior-core buffers on Type 3 and Type 4 Waters would average 100 feet on each side.
- C. Type 1 through Type 4 Waters, and Type 5 Waters when an interior core is established, would receive exterior-core wind buffers to protect the integrity of the interior-core buffers from damaging winds. Wind buffers would be applied to all riparian segments for which stand wind-firmness cannot be documented.
- D. Exterior-core buffers on Type 1 through Type 3 Waters would average 150 feet where applied; exterior-core buffers on Type 4 and Type 5 Waters would average 50 feet where applied.
- E. Thirty-three percent or less by volume of the riparian trees in the designated exterior buffer may be removed for commercial purposes during each harvest rotation on 75 to 85 percent of the riparian buffers. Site-specific experimentation may occur on the remaining 15 to 25 percent.

## STATUS OF THE SPECIES

### Bull Trout

The Service listed Columbia River DPS of bull trout as threatened under the Act on June 10, 1998 (63 FR 31647). The Coastal/Puget Sound DPS of bull trout was also proposed as threatened by the Service, on June 10, 1998 (63 FR 31693). The Service has up to one year from the date of the proposal to review comments and make a final listing determination.

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 believe bull trout to be 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).

Rieman and McIntyre (1993) stated that bull trout appear to have more specific habitat requirements than other salmonids. They list the habitat characteristics of channel stability, substrate composition, cover, temperature, and migratory corridors as important influences in bull trout distribution and abundance. In general, it is believed bull trout need habitat providing cold water, complex cover, stable substrate with a low percentage of fine sediments, high channel stability, and stream/population connectivity.

Rieman and McIntyre (1993) state water temperature is consistently recognized by researchers more than any other factor as influencing bull trout distribution. Distribution is thought to be limited by temperatures above 15°C, while optimum incubation and juvenile rearing temperatures are thought to be much lower, 2 to 4°C and 4 to 8°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 is shown to cause negative effects on 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 there are higher percentages of fine sediment 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

The Service has 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 there 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.

Genetic analysis has been conducted on 9 of the 35 native char subpopulations. Samples from six of the nine subpopulations were determined to contain only bull trout. Of the remaining three subpopulations sampled, two were determined to contain only Dolly Varden, and one had both bull trout and Dolly Varden. No samples had evidence of hybridization.

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). There are currently two subpopulations where collected samples have been identified only as Dolly Varden by both morphometric data and genetics (Upper Sol Duc River and Canyon Creek). There has been no case where a native char subpopulation, identified as containing only bull trout based on LDF methodology, was subsequently determined to contain Dolly Varden based on genetic analysis.

The Service believes 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 believed 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.

The Service 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. The Service 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, the Service rates 9 of the 35 delineated native char subpopulations as "depressed," 25 as "unknown," and one as "strong."

The Washington State Department of Fish and Wildlife (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. The Service believes 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 are relatively numerous, the Service believes this one year of distributional and abundance information is insufficient to conclude a "healthy" or "strong" status in this subpopulation. The Service believes that the Upper Dungeness River subpopulation should be rated "unknown" at this time. The Service believes the Lower Skagit River subpopulation meets the criteria described above for a status rating of "strong."

## Coastal and Strait of Juan de Fuca

Only limited efforts have been made, so far, to determine identity and current abundance of native char subpopulations in coastal areas of Washington. Based on the Service's assessment, the Service believes that 3 of 15 subpopulations of native char in the Coastal and Strait of Juan de Fuca analysis area are "depressed" (Hoh River, Lower Elwha River, and Lower Dungeness River/Gray Wolf River). The remaining 12 subpopulations of native char are of "unknown" status.

The WDFW rated the status of 13 out of 15 coastal and Strait of Juan de Fuca subpopulations of native char as "unknown" (WDFW 1997). The Queets River and Upper Dungeness River subpopulations are the sole exceptions, and have been rated "healthy" by WDFW. As mentioned above, the Service questions whether the Queets River subpopulation is indeed healthy, due to the type of data used to make this determination and the lack of additional data for the past 5 years (Quinault Indian Nation (QIN), *in litt.* 1995; WDFW 1997a).

The identity of native char (bull trout or Dolly Varden) has been determined for 3 of 10 coastal subpopulations, and 3 of 5 Strait of Juan de Fuca subpopulations. Bull trout are known to occur in two coastal subpopulations (Upper Quinault River, and Queets River), and two Strait of Juan de Fuca subpopulations (Upper Elwha River and Dungeness River/Gray Wolf River) (Leary and Allendorf 1997; WDFW 1997a). Only Dolly Varden have been identified in the Upper Sol Duc River and the Upper Dungeness River subpopulations (Cavender 1978; Cavender 1984; WDFW 1997a).

The subpopulations of native char on the southwest Washington coast appear to be in low abundance based on anecdotal information. This is thought to be the southern end of the range for coastal bull trout and Dolly Varden in this DPS, and abundance may be naturally low in systems like the Chehalis, Moclips, and Copalis rivers. These basins are relatively low gradient which is not ideal for bull trout and Dolly Varden (WDFW 1997). There is scant historical and current information to compare, although there have been adverse impacts from past habitat degradation to other salmonid species in these systems (Phinney and Bucknell 1975; Hiss and Knudsen 1993), and these same impacts have likely affected native char (WDFW 1997). Although status information for the Lower Quinault River is limited, native char in this system are said to be at low levels of abundance or in a depressed state (Meyer and Averill 1994). The majority of the lower Quinault River basin lies outside of Olympic National Park and has been severely degraded as a result of past forest practices (Phinney and Bucknell 1975; WDFW 1997). The Upper Quinault River subpopulation of bull trout is likely in much better condition since it occurs completely within Olympic National Park.

Northwest Washington coast and Strait of Juan de Fuca subpopulations appear to be relatively more abundant compared to southwest Washington based on limited data. Most of these subpopulations lie partially within the Olympic National Park and benefit from the excellent habitat conditions that exist within park boundaries. However, large portions of the Queets River, Hoh River, and Dungeness River basins also lie outside of the Olympic National Park, and have been severely degraded as a result of past forest practices (Phinney and Bucknell 1975; Williams et al. 1975; WDFW 1997). Non-native brook trout are also present in some park waters, and pose an ongoing

threat to bull trout populations from competition and hybridization. The Lower and Upper Elwha River subpopulations have been fragmented by dams. The Service believes the Lower Elwha River subpopulation is depressed based on the extremely low number of char observed in this system in recent years. It is generally believed that the Hoh River may have the largest subpopulation of native char on the Washington coast, even though it is thought to have been greatly reduced since 1982 (Washington Department of Wildlife (WDW) 1992; WDFW 1997). Although the reasons for this decline are unknown, some believe over fishing contributed to the decline (WDFW 1997). It has been noted that native char were historically very common and widespread throughout the lower Dungeness and Gray Wolf rivers. They are still widespread, but "greatly reduced in numbers" (WDW 1992; WDFW 1997). The Service concludes that the Hoh River and the Lower Dungeness River/Gray Wolf River subpopulations are "depressed."

### Puget Sound and Hood Canal

The Service believes 6 of 19 subpopulations in the Puget Sound and Hood Canal analysis areas are of "depressed" status (South Fork/Lower North Fork Skokomish River, Nisqually River, Puyallup River, Green River, Chester Morse Reservoir, and Sammamish River/Issaquah Creek), 12 subpopulations are "unknown," and one subpopulation (Lower Skagit) is "strong."

Of the 19 subpopulations within Puget Sound and Hood Canal, two (the Lower Skagit River and Cushman Reservoir) are rated as "healthy" by the Washington Department of Fish and Wildlife (WDFW), with the remaining 17 assigned an "unknown" status (WDFW 1997). For reasons previously mentioned, the Service believes the "healthy" designation of the Cushman Reservoir population may be premature. Anadromous, fluvial, adfluvial, and resident native char all occur in the Puget Sound/Hood Canal subpopulations, although the construction of dams in the majority of river basins within this region has undoubtedly reduced the anadromous component from historical times.

Of the 19 subpopulations from these two analysis areas, species identification through either morphometrics or genetic analysis has been made for nine of the subpopulations. Bull trout have been identified in all but one of these subpopulations. Subpopulations with known bull trout are: South Fork/Lower North Fork Skokomish River; Cushman Reservoir; Carbon River; Green River; Chester Morse Reservoir; Skykomish River/Snohomish River; Lower Skagit River; and Upper Middle Fork Nooksack River (Brown 1992; Leary and Allendorf 1997; WDFW 1997). Only one of the eight subpopulations where char samples were collected for analysis resulted in a determination of only Dolly Varden (Canyon Creek, tributary to the North Fork Nooksack River).

Native char in southern Puget Sound are generally believed to have been greatly reduced in number, and subpopulations are thought to be 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 impacted by extensive urbanization and road building, and the associated poor water quality (Williams et al. 1975; WDOE 1997a). The Service rates 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 (WDFW et al. 1997). 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 (250-300 adults) (WDFW 1997). The increase in spawners between 1986 and 1993 is believed to be the result of the harvest closure on Cushman Reservoir and upper North Fork Skokomish River in 1986. Because of recent declines in spawner returns, the Service believes 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 Service believes 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 (Williams et al. 1975; 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 believed to be 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). The Service 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 believe 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

The Columbia River DPS includes bull trout residing in portions of Oregon, Washington, Idaho, and Montana. Bull trout are estimated to have occupied about 60 percent of the Columbia River Basin, and presently occur in 45 percent of the estimated historical range (Quigley and Arbelbide 1997). Based on our analysis, the Columbia River population segment is composed of 141 existing bull trout subpopulations in four geographical areas; (1) Lower Columbia River Geographical Area, (2) Mid-Columbia River Geographical Area, (3) Upper Columbia River Geographical, and (4) the Snake River Geographical Area. Of these, the Lower Columbia River Geographical Area is the only geographical area that lies within the scope of this BO.

Bull trout in the Columbia River basin, despite their relatively widespread distribution, have declined in both their overall range and numbers. Numerous extirpations of local subpopulations have been

reported, 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. Bull trout in the Columbia River population segment are currently limited to 141 isolated subpopulations, which indicates habitat fragmentation and geographic isolation. Many remaining bull trout occur as isolated subpopulations in headwater lakes or tributaries with migratory life histories lost or restricted. Few bull trout subpopulations are considered "strong" in terms of relative abundance and subpopulation stability. These remaining important strongholds tend to be found in large areas of contiguous habitats in the Snake River Basin of central Idaho Mountains, Rock Creek a tributary of the upper Clark Fork and 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).

#### The Mid-Columbia River Geographical Area

The Mid-Columbia River area includes watersheds of four major tributaries of the Columbia River in Washington, between the confluence of the Snake River and Chief Joseph Dam. The Service identified 16 bull trout subpopulations in the four watersheds (number of subpopulations in each watershed: Yakima River (8), Wenatchee River (3), Entiat River (2), and Methow River (4)). Historically, bull trout occurred in larger areas of the four tributaries and Columbia River. Bull trout are thought to have been extirpated in 10 streams within the area: Satus Creek, Nile Creek, Orr Creek, Little Wenatchee River, Nepecqua River, Lake Chelan, Okanogan River, Eightmile Creek, South Fork Beaver Creek, and the Hanford Reach of the Columbia River. Most bull trout in the Mid-Columbia River geographic area are isolated by dams or unsuitable habitat created by water diversions (Federal Register/Vol. 63, No. 111/Wednesday, June 10, 1998/Rules and Regulations).

Bull trout in the Mid-Columbia River area are most abundant in Rimrock Lake of the Yakima River basin and Lake Wenatchee of the Wenatchee River Basin. Both subpopulations are considered "strong" and increasing or stable. The remaining 14 subpopulations are relatively low in abundance, exhibit "depressed" or unknown trends, and primarily have a single life-history form. The Service considers 10 of the 16 subpopulations at risk of extirpation because of naturally occurring events due to isolation, single life-history form and spawning area, and low abundance (Federal Register/Vol. 63, No. 111/Wednesday, June 10, 1998/Rules and Regulations).

#### Lower Columbia River Geographical Area

The lower Columbia River area includes all tributaries in Oregon and Washington downstream of the Snake River confluence near the town of Pasco, Washington. Bull trout occur in watersheds of nine major tributaries of the lower Columbia River, the Walla Walla, Umatilla, John Day, Deschutes, Hood, Klickitat, White Salmon, Willamette, and Lewis rivers. The Service identified a total of 20 subpopulations in these watersheds. The present distribution of bull trout in the lower Columbia River Basin is less than their historic range (Buchanan et al. 1997; ODFW 1997). Hydroelectric

facilities and large expanses of unsuitable, fragmented habitat have isolated these subpopulations. Large dams, such as McNairy, John Day, The Dalles, and Bonneville, separate four reaches of the lower Columbia River. Although fish may pass each facility in both upstream and downstream directions, the extent to which bull trout use the river is unknown. In addition, the nine major tributaries have numerous hydroelectric facilities, many of which do not provide upstream passage. Bull trout are thought to be extirpated from several tributaries in five river systems in Oregon: the Middle Fork Willamette River, the North and South Forks of the Santiam River, the Clackamas River, the upper Deschutes River (upstream of Bend, Oregon) and the Crooked River (tributary to the Deschutes River) (Buchanan et al. 1997). Only two of the 20 identified populations in the Lower Columbia River Geographical Area fall within the scope of this BO. These subpopulations are found in the Lewis River and Swift Reservoir which are located in Cowlitz, Clark, and Skamania counties. These populations were found to be adfluvial and genetically distinct (WDFW 1998). Their status is listed by the State of Washington as "depressed" due to their chronically low abundance. Cougar Creek is the only known spawning location for bull trout for the Lewis River subpopulation. The Swift Reservoir subpopulations are known to spawn in both Pine and Rush creeks.

## 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. Such actions include, but are not limited to previous timber harvests and other land-management activities, including the adoption of a late-successional forest-management strategy known as the Northwest Forest Plan (USDA et al. 1994a, 1994b). 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 Northern Spotted Owl (USDA 1994a) (FEIS), the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (USDA et al. 1994b) (ROD), and the BO on the FEIS preferred alternative (USDI 1994b) also provide information relevant to addressing the environmental baseline for this action. The Northwest Forest Plan is currently under section 7 consultation with respect to bull trout.

Inclusion of HCP prescriptions in new contracts, leases, and permits is not mandatory until January 1, 1999; however, the Service completed a CO (USFWS 1997b) on the effects that issuance of the northern spotted owl, grizzly bear, and gray wolf permit would have on bull trout, as a whole, because distinct population segments had not yet been identified. Based on the Conference Report and a GIS analysis using Washington Rivers Information Systems (WARIS), these effects are anticipated to occur on roughly 6 to 11 miles of fish bearing streams on the eastside that are known to contain bull trout. Since the WSDNR HCP did not propose riparian and wetland conservation

Interior Columbia River Basin will address bull trout and other species. While contributions from nonfederal land remain important in many areas, proper implementation of the Northwest Forest Plan should allow greater flexibility in the management of these nonfederal lands.

On June 27, 1996, the Service issued an ITP to Plum Creek Timber Company, L.P. (Plum Creek), pursuant to section 10(a)(1)(B) of the Act, for incidental take of the spotted owl, marbled murrelet, grizzly bear and gray wolf, on their ownership in King and Kittitas Counties, Washington. On July 14, 1998, the Service amended the Plum Creek permit to include the Columbia River Basin population of bull trout. The Habitat Conservation Plan that forms the basis of the permit has a term of 50-100 years and includes the following mitigation measures pertinent to bull trout: 1) a Riparian Management Strategy that includes the maintenance and protection of riparian habitat areas (RHAs). Fish-bearing streams will receive 200-foot managed RHAs, with a 30-foot "no-harvest" area. Nonfishbearing, perennial streams will receive 100-foot managed RHAs. Seasonal/Ephemeral streams will receive riparian buffers as determined through watershed analysis or clumping of upland leave trees; 2) a Wetland Conservation Strategy; 3) a Watershed Analysis; 4) an Aquatic Resources Monitoring; and 5) an Adaptive Management Process. The HCP is expected to improve habitat conditions for bull trout. The BO analyzing the effects of this HCP on the Columbia River Basin population of bull trout was completed on July, 13, 1998 (USFWS 1998).

#### Status of the Species (in the action area)

The riparian strategies in the final HCP (WSDNR 1997) will only be applied to the HCP planning units west of the Cascade Crest (South Coast, Straits, North Puget, South Puget, Columbia, Olympic Experimental State Forest). No fish species will be covered east of the Cascade Crest. Therefore, the discussion of the status of bull trout will be limited to these planning units and associated fish-bearing streams. Approximately 1,448,600 acres of WSDNR lands make-up the westside planning units. Of these acres, 3 percent are estimated to contain bull trout. There are an estimated 501 miles of fish bearing streams on westside planning units that support bull trout (WSDNR 1997) and which will be managed according to the HCP riparian prescriptions. These streams and the status of bull trout inhabiting these streams are discussed below.

#### Chehalis River/Grays Harbor Basin:

The Chehalis River system is a large drainage, draining portions of the Olympics, the Cascades, the Black Hills, and the Willapa Hills before entering the Pacific Ocean. The entire drainage is on State, Forest Service, or private lands. Native char are believed to be distributed in tributaries west of and including the Satsop River in the Chehalis system (Mongillo 1993). A couple of native char have been caught by steelhead anglers along the Wynochee and Satsop rivers in the past (USFWS 1998). Native char have also been caught in the anadromous zone of smaller systems that flow into Grays Harbor, such as the Hoquiam and Humptulips rivers, but are speculated to be strays from the Chehalis River system (WDFW, *in litt.* 1997). The Chehalis and the Columbia rivers probably represent the southern end of the range of native char on the Washington coast (WDFW 1997). Native char in the Chehalis/Grays Harbor system may consist of anadromous, fluvial and resident life histories. No char in this basin has been positively identified as a bull trout.

Chehalis River/Grays Harbor native char are considered to be one subpopulation at this time based on the limited amount of distribution data available. There may be several subpopulations that are present in the system based on potential fragmentation by migratory barriers. However, only a few distribution surveys have been completed. A portion of the mainstem Wishkah River has been separated by a dam (river kilometer (rkm) 52) and potentially by a falls (rkm 47), although no recent surveys have been conducted on the Wishkah River above either structure to determine the presence of bull trout. Steelhead are known to spawn above Wishkah Falls (Phinney and Bucknell 1975). The Wynoochee River has been divided by a dam and a falls. The construction of the dam in 1972 created Lake Wynoochee and above the lake at approximately rkm 61 is Wynoochee Falls. Recent bull trout surveys conducted above the falls by the U.S. Forest Service did not locate any native char (USFWS 1998).

It is currently not understood how the native char of smaller systems around Grays Harbor (i.e. Hoquiam and Humptulips rivers,) may interact or relate to one another. These may be distinct subpopulations, however, there is only limited information on native char use in these streams (angler catches). These fish may enter these rivers to forage and overwinter (WDFW, *in litt.* 1997)

There is no current or historical abundance data available for native char in the Chehalis River/Grays Harbor Basin. WDFW rates this subpopulations status as unknown (WDFW 1997).

Within the Chehalis/Grays Harbor River Basin, there are approximately 128,600 acres (8 percent) in Federal ownership (Forest Service and National Park Service); 192,800 acres (12 percent) in State ownership; 1,350,800 acres (80 percent) in private ownership (includes City and County lands); and 4,600 acres (<1 percent) in Tribal ownership (USGS 1996).

The Chehalis Basin has been impacted by a wide variety of perturbations. Logging, agriculture and grazing in the basin has degraded habitat by removing riparian vegetation, increasing silt loads, and decreasing woody debris (Hiss and Knudsen 1993; WDFW 1997). A comprehensive effort to address habitat degradation within the basin was initiated in 1993 with the Chehalis Restoration Program (Hiss and Knudsen 1993). These efforts are ongoing and have yet to completely reverse past and current habitat deterioration. Pulp mills in the lower river have also impacted habitat through discharge of effluents which range from toxic to benign (WDFW 1997).

The lower mainstem of the Chehalis River has at least nine sites that are included on the Washington State's proposed 1998 303(d) list for not meeting temperature, dissolved oxygen, fecal coliform, and PCBs standards (WDOE 1997).

Dams on the Wishkah and the Wynoochee rivers have hindered access to habitat that may have been utilized by migratory forms of native char in the past. The Wishkah Dam has no fish passage facility. The Wynoochee dam has a fish trap and haul facility 3.2 km (2 miles) below the dam for returning adult salmonids. The dam also was built to allow downstream passage for smolts, however, the current arrangement has been shown to cause mortality of coho and steelhead smolts (Hiss and Knudsen 1993).

Fishing for native char in the Chehalis\Grays Harbor Basin has been closed since 1993. There may be some hooking mortality from incidental catch of native char in fisheries targeting other species.

#### Coastal Plain/Quinault River Basin:

The Moclips and Copalis rivers are two small rivers on the west coast of the Olympic Peninsula of Washington State. These two rivers flow independently into the Pacific Ocean and are accessible by anadromous fish. The Moclips River is largely on the Quinault Indian Reservation, while the Copalis River is entirely off the Reservation. Both drainages have been described as being small, low gradient and containing numerous log jams (QFD and WDW 1992). Little is known about the abundance or status of native char in these two rivers.

The Quinault River drains the western slopes of the Olympic Mountains, entering the Pacific Ocean at Taholah on the Quinault Indian Reservation. The upper Quinault River and its tributaries flow through the Olympic National Park (ONP) and a short section of the Olympic National Forest before crossing over the Quinault Indian Reservation boundary at the head of Lake Quinault. The mainstem enters the 4.8 kilometer (km) long lake at river kilometer (rkm) 57.9 and continues through the reservation until reaching the Pacific Ocean.

Little information exists on the abundance and status of native char within the mainstem East Fork drainage, but there is likely two bull trout subpopulations that are present. One subpopulation lies above the anadromous barrier on the mainstem/East Fork Quinault and is likely a resident life history form. The second subpopulation of char, potentially composed of a mixture of migratory and resident life history forms, exists below this barrier and includes the North Fork Quinault, lower Quinault River, and Lake Quinault.

**Land Ownership:** Within the Coastal Plain/Quinault River Basin, there are approximately 177,700 acres (40 percent) in Federal ownership (Forest Service and National Park Service); 10,500 acres (2 percent) in State ownership; 94,600 acres (21 percent) in private ownership (includes City and County lands); and 163,900 acres (37 percent) in tribal ownership (USGS 1996).

All of the systems have hatchery releases of at least one species of anadromous salmonid (chinook, chum, coho, and steelhead). Interaction between native char and these hatchery origin fish has not been examined (WDFW 1997). Although bull trout evolved with and continue to coexist with anadromous salmonids (Ratliff and Howell 1992), hatchery releases of certain anadromous salmonids may impose predation and competition pressures on bull trout that are above natural levels.

Brook trout (*S. fontinalis*) have been stocked in many of the high lakes in the ONP, and could potentially establish themselves in the systems below these lakes. Currently there is no indication of brook trout in these systems.

### Copalis River

Native char have been caught by anglers in the anadromous zone of the river according to WDFW (1997). It is unknown whether a resident component to the population may exist. No char has been positively identified as a bull trout. Recreational fishing for native char on this river was allowed until 1993. The status of this subpopulation is unknown (WDFW 1997). Habitat is likely limited due to low flows and associated high temperatures which can inhibit summer rearing (Phinney and Bucknell 1975).

Habitat has been degraded by past logging activities (WDFW 1997) and the system is subject to naturally low flows (WDW 1992).

Although the river is currently closed to fishing for native char, there may be incidental hooking mortality from fisheries targeting other species.

### Moclips River

Native char have been caught in the anadromous zone of the Moclips River according to WDFW (WDFW 1997). It is unknown whether a resident component to the population may exist. No char has been positively identified as a bull trout. Recreational fishing for native char on this river was allowed until 1993. The status of this subpopulation is unknown (WDFW 1997).

Habitat has been substantially degraded by past logging activities (WDFW 1997). Phinney and Bucknell (1975) noted that logging activities in the Moclips watershed had reduced the former potential of this system.

Although the lower river, which lies outside of the Quinault Indian Reservation, is currently closed to fishing for native char, there may be incidental hooking mortality from fisheries targeting other species. On the Quinault Indian Reservation, the Moclips River is closed to fishing for native char (USFWS 1998).

### Lower Quinault River

Native char have been caught in the lower river, Lake Quinault, the upper river (East Fork) below the anadromous barrier, and the North Fork Quinault. An angler survey conducted during the summer fishing season in 1994 by ONP, randomly sampled fisherman in a 64.4 km (40 mile) area in the lower river. The area included the North Fork and mainstem below the anadromous barrier. Landing rates were very low for all species with only two native char (0.007/hour) captured. Low catch rates were attributed to several possible factors with the principle factor thought to probably be "low abundance and, in some cases, the depressed status of the populations" (Meyer and Averill 1994). Preliminary catch rates were slightly higher in 1995, with three (0.022/hour) native char censused in the sample area by ONP biologists over the same sample period. (Meyer et al. 1996).

ONP biologist have also conducted limited snorkel surveys in the North Fork in September 1994 and 1995. Counts in the most comparable reaches (approximately 9 km) for 1994 and 1995 were 9 and 31 respectively. Snorkel surveys were conducted on the East Fork below Graves Creek in September 1994 and August 1995. Counts in an approximately 10 km section were 14 and 49 for 1994 and 1995 respectively. The difference between the 1994 and 1995 counts for the lower East Fork may be a result of surveying in different months. Surveys conducted in September may have missed the peak of migratory adults.

Several native char have been captured each year during vertical gill net studies conducted on Lake Quinault by the Quinault Indian Nation (USFWS 1998).

There is only very limited information available regarding the status of char in the Quinault "although they are believed to be at low levels of abundance" (Meyer and Averill 1994). WDFW has rated this subpopulation status as unknown (WDFW 1997).

Approximately 13 km of the mainstem and all of the North Fork Quinault lie within ONP and is pristine habitat. The roughly 72 km of mainstem habitat outside of the park boundaries has been degraded by intense logging activities on Olympic National Forest and Quinault Indian Reservation lands (WDFW 1997).

The Lower Quinault River is on the Washington State's proposed 1998 303(d) list for not meeting temperature standards (WDOE 1997).

The Lower Quinault drainage outside of the Quinault Indian Reservation has been closed to fishing for native char since 1994 (WDFW 1997). Since 1994, the native char bag limit for Quinault tribal lands was reduced from 12 to 4 fish (USFWS 1998). The ONP has catch-and-release regulations for native char in all ONP waters. There may be some mortality from incidental hook and release of bull trout in fisheries targeting other species.

### Upper Quinault River

This subpopulation lies completely within the ONP, where the habitat is in pristine condition. Both bull trout and Dolly Varden (*S. malma*) have been identified above the anadromous barrier on the East Fork Quinault. The ONP conducted preliminary char surveys in September 1994 and August 1995 (Meyer and Averill 1994; WDFW 1997). In 1994 ONP biologists noted that it appeared the East Fork contained larger numbers of total fish and fish per mile than the North Fork, although no "adult" char (fish  $\geq$  12 inches) were observed (Meyer and Averill 1994). Thirty-two native char were counted in a 10 km reach above Graves Creek in 1994. Snorkel surveys conducted in 1995 did not include reaches above Graves Creek.

In 1995, the ONP sampled the East Fork below the Enchanted Valley Ranger Station (rkm 102) using electrofishing and hook-and-line (Meyer et al. 1996; WDFW 1997). Twenty-five native char were collected for genetic analysis. Results of the analysis showed 5 of the samples were bull trout,

20 were Dolly Varden and there was no evidence of hybridization (Leary and Allendorf 1997). WDFW has rated this subpopulation status as unknown (WDFW 1997).

The ONP has catch-and-release regulations for native char in all ONP waters. There may be some mortality from incidental hook and release of native char in fisheries targeting other species.

### Raft River

There is essentially no information with regards to native char for the Raft River system (USFWS 1998). It was listed by Mongillo (1993) as part of the present distribution of native char and was given an "unknown" status rating. Fish in this system may be strays from other areas and may have entered the river to forage or overwinter (WDFW, *in litt.* 1997).

### Queets River Basin:

The Queets River drains the western slopes of the Olympic Mountains, flowing southwesterly and entering the Pacific Ocean near the village of Queets. Upstream of river kilometer (rkm) 13, the Queets mainstem is encompassed entirely by a narrow corridor of the Olympic National Park (ONP). The short section between the ONP boundary and the Pacific Ocean flows within the Quinault Indian Reservation. Except for short terminal sections entering the Queets mainstem, the upstream areas of tributary streams below rkm 38.6, are outside of the ONP boundary.

There are several major tributaries to the Queets mainstem, the Clearwater and Salmon rivers, and Matheny Creek. The Clearwater flows primarily through State and private lands. The Salmon River is contained almost entirely on the Quinault Reservation. Matheny Creek flows through Forest Service, State, and a small portion of ONP land.

Native char in this system may consist of anadromous, fluvial and resident life histories. Bull trout and Dolly Varden (*S. malma*) have both been identified in the mainstem Queets based on Haas formula measurements (Meyers et al. 1996). Few efforts have been made to directly monitor the native char in this system, hence only limited information exists on the abundance and status of the subpopulation. The Quinault Indian Nation has recorded incidental catches of native char during seining efforts monitoring salmon smolt emigration for a 16-year period. Incidental catch data are available from 1977 to 1991 at which time seining efforts were terminated.

**Land Ownership:** Within the Queets River Basin, there are approximately 142,600 acres (48 percent) in Federal ownership (Forest Service and National Park Service); 104,300 acres (35 percent) in State ownership; 33,600 acres (11 percent) in private ownership (includes City and County lands); and 18,700 acres (6 percent) in Tribal ownership (USGS 1996).

The majority of the Queets mainstem is in the ONP and remains in near pristine condition (WDFW 1997). However, tributaries outside of the ONP have been degraded by logging. Logging activities on the upper reaches of tributaries outside of the ONP have resulted in degradation of spawning and

rearing habitat for salmon and steelhead (WDF et al. 1993; Phinney and Bucknell 1975). The lower mainstem condition of Matheny Creek was noted as lacking large wood, and lacking the ability to recruit large wood due to tree removal on the flood plain and stream banks (USDA 1995a). This is likely the case with other logged tributaries in the Queets system. The Clearwater River has been logged extensively, the Salmon River to a lesser degree. Areas in these drainages suffer from increased siltation from slides and road building, and decreased large woody debris input and increased temperatures from the reduction of riparian areas (Phinney and Bucknell 1975; Cederholm and Reid 1987; USFWS 1998).

The Queets drainage outside of the Quinault Indian Reservation has been closed to fishing for native char since 1994 (WDFW 1997). Since 1994, the native char bag limit for Quinault Tribal lands was reduced from 12 to 4 fish (USFWS 1998). The ONP has catch-and-release regulations for native char in all ONP waters. There may be some mortality from incidental hook and release of bull trout in fisheries targeting other species.

Interactions between hatchery-origin salmon and char have not been examined (WDFW 1997). Although bull trout evolved with and continue to coexist with anadromous salmonids (Ratliff and Howell 1992), hatchery releases of certain anadromous salmonids may impose predation and competition pressures on bull trout that are above natural levels.

### Queets River

In terms of connectivity, the Queets subpopulation remains intact. Seining data indicates an incidental catch rate fluctuating between 3.3 to 2.0 char a day from 1977 to 1981, followed by a decrease, stabilizing around 1.5 fish a day from 1982 to 1991 (WDFW 1997). Seining sites were variable along the Queets in efforts before 1983 (QIN, *in litt.* 1995). Several anglers interviewed by WDFW believe there are a lot less native char now than 10 years ago, and attribute this to angling (WDW 1992). However, the seining data do not appear to reflect this decline.

In October 1991, WDFW collected and sampled 66 native char in a 9.3 km section of the mainstem Queets (WDFW 1997). Ninety percent of the fish collected were identified as bull trout based on Haas measurements. Fish ranged between 380 and 690 millimeters (mm) in length.

In September of 1995, ONP staff collected 29 native char ranging between 150 to 610 mm in length. Eighteen char collected near Hee Haw Creek for genetic analysis were measured by the ONP biologists. Seven (39 percent) of the 18 were identified as bull trout based on Haas measurements. A total of 20 char were retained for genetic analysis; the 18 near Hee Haw Creek and 2 near Tshletshy Creek (USFWS 1998). Genetic analysis showed all 20 were bull trout (Leary and Allendorf 1997).

Information on native char use of the major tributaries to the Queets is limited. Historical use is not known. Currently, native char probably use these tributaries only intermittently. One adult native char (approximately 300 mm in length) was observed on the upper Clearwater River in July of 1993,

at rkm 30 just below Bull Creek (R. Peters, FWS, unpub. data 1997). Cederholm, WDNR fisheries biologist, has stated he has worked extensively in the Clearwater System and has never observed a native char within the drainage (USFWS 1998). Bull trout use of smaller tributaries is unknown.

WDFW rates this subpopulation's status as healthy (WDFW 1997). However, since past data collected by the Quinault Indian Nation may indicate there has been a decline, and recent monitoring data cannot be rigorously compared, FWS feels the status of this subpopulation could just as likely be depressed. The Service believes the status is unknown at this time.

#### Hoh River Basin:

The Hoh River enters the Olympic National Park (ONP) at river kilometer (rkm) 47.5 approximately where the South Fork Hoh branches from the mainstem. The majority of the South Fork and the mainstem above the confluence are contained within the ONP. There are currently no man-made migratory barriers on this system. Native char within the Hoh River are believed to have anadromous and resident life histories. Goodman Creek is a small system just north of the Hoh River. A small section of the lower drainage lies within the ONP. The native char utilizing this system are believed to be anadromous. The char in the Hoh River and Goodman Creek drainages have not been distinguished as bull trout or Dolly Varden (*S. malma*) at this time.

Land Ownership: Within the Hoh River Basin, there are approximately 118,500 acres (50 percent) in Federal ownership (Forest Service and National Park Service); 65,700 acres (27 percent) in State ownership; 54,600 acres (23 percent) in private ownership (includes City and County lands); and 500 acres (<1 percent) in Tribal ownership (USGS 1996).

Interactions between hatchery-origin salmon and native char have not been examined (WDFW 1997). Although bull trout evolved with and continue to coexist with anadromous salmonids (Ratliff and Howell 1992), hatchery releases of certain anadromous salmonids may impose predation and competition pressures on bull trout that are above natural levels.

Brook trout have been stocked in many of the high lakes in the ONP, and could potentially establish themselves in the systems below these lakes. Currently there is no indication of brook trout in these systems.

#### Hoh River

Abundance data are lacking for this drainage, but it is widely believed the Hoh River may contain the largest subpopulation of native char on the Washington Coast (Mongillo 1993). However, interviews with anglers and WDFW employees by Mongillo in 1992, indicate that this subpopulation "has been greatly reduced" since 1982 (WDFW 1997). Although the reasons for this decline are said to be unknown, some believe over fishing by anglers contributed to the decline (WDFW 1992; WDFW 1997).

Most recently, snorkel surveys were conducted by the ONP along an 17.7 km (11 mile) section of the South Fork Hoh in October of 1994 and August of 1995. A total of 41 "adult" native char (fish  $\geq$  12 inches) were observed in 1994 (11-mile reach was surveyed in 3 sections on 3 different days; peak count of 1 area was 35) and 26 "adults" were observed in 1995 (surveyed in 1 day) (Meyer and Averill 1994; Meyer et al. 1996; USFWS 1998). A total of 23 native char less than 12 inches long were also observed during surveys in 1995. WDFW has rated this subpopulation status as unknown (WDFW 1997).

The upper mainstem and upper South Fork are within the ONP where the habitat is considered in excellent condition (WDFW 1997). The lower South Fork and the mainstem Hoh below the confluence has been degraded by extensive logging activities. Intense logging activity and the steep terrain of the two areas, have resulted in slope instability and high silt loads (WDFW 1997). There has been a loss of riparian vegetation and large woody debris in parts of the mainstem, South Fork, and several tributaries, which has reduced cover for fish and elevated summer low-flow temperatures above those considered optimal for salmonids (WDFW 1997).

Numerous creeks in the lower Hoh River are on Washington State's proposed 1998 303(d) list for exceeding temperature standards (WDOE 1997).

The area outside of the ONP has been closed to fishing for native char since 1994. The ONP has catch-and-release regulations for native char in all park waters. There may be some mortality from incidental hook and release of bull trout in fisheries targeting other species (WDFW 1997). Poaching was listed by Mongillo (1993) as a threat to native char in this drainage.

#### Goodman Creek

Abundance and status information is lacking for this system. Occasionally adults have been caught here (WDW 1992). It was listed by Mongillo (1993) as part of the present distribution of native char and had a status rating of unknown. Fish in this system may be strays from a larger system such as the Hoh River (WDFW, *in litt.* 1997).

This system has been extensively logged (Phinney and Bucknell 1975, WDW 1992). Natural low flows in the summer (WDW 1992) in conjunction with loss of riparian vegetation from past logging may create a thermal barrier for migrating char.

This system has been closed to fishing for native char since 1994. There may be some mortality from incidental hook and release of bull trout in fisheries targeting other species.

Poaching was listed by Mongillo (1993) as a threat to native char in this drainage.

### Quillayute Basin:

The Quillayute system is accessible to migratory fish except for an isolated area above Sol Duc Falls (river kilometer 105.4) on the upper Sol Duc River. The only known subpopulation of native char, within this basin, exists in the area above the falls. According to WDFW records, native char have never been observed by anglers fishing the lower Sol Duc and other parts of the Quillayute system for at least the past 60 years. This has been noted as odd since habitat in other parts of the system appear to perfectly suit their critical life history requirements (Mongillo 1993).

**Land Ownership:** Within the Quillayute River Basin, there are approximately 237,600 acres (46 percent) in Federal ownership (Forest Service and National Park Service); 71,100 acres (14 percent) in State ownership; 187,300 acres (36 percent) in private ownership (includes City and County lands); and 18,100 acres (4 percent) in Tribal ownership (USGS 1996).

The ONP has catch-and-release regulations for native char in all ONP waters. There may be some mortality from incidental hook and release of bull trout in fisheries targeting other species.

One char specimen, collected by the ONP in 1995, appeared to have the characteristics of a brook trout x bull trout hybrid (USFWS 1998). Many of the high lakes in the ONP have been stocked with brook trout. They are documented to be in this part of the Sol Duc system (Mongillo and Hallock 1993).

### Upper Sol Duc River

This subpopulation of char lies completely within the ONP boundaries. Cavender (1978; 1984) analyzed samples from this subpopulation and determined them to be Dolly Varden based on morphological and genetic evidence. Three native char samples collected from this subpopulation during a creel census in 1994 were determined to be Dolly Varden based on Haas measurements (Meyer et al. 1996). Two of the samples were determined to be mature females 102 to 152 millimeters (4 to 6 inches) in length. Between 1994 and 1995 a total of 49 native char (samples not distinguished as bull trout or Dolly Varden) have been collected during preliminary surveys in the upper Sol Duc River by the ONP (S. Brenkman, OSU, pers. comm. 1997). No bull trout have been identified at this time, but with so few samples analyzed, it is premature to consider that they are not present. WDFW has assigned this subpopulation an unknown status (WDFW 1997).

### Elwha River Basin:

Eighty-three percent of the Elwha Basin is located within Olympic National Park (ONP) (USDI 1994). The ONP boundary is located just above Lake Aldwell and completely encompasses the headwaters of the Elwha River.

The abundance of bull trout within the Elwha Basin has not been well documented. Information on historic levels of native anadromous fish before the construction of the dams is largely unavailable and primarily anecdotal (USDI 1994). However, the Elwha River was historically noted as one of

the largest producers of salmon and steelhead on the Olympic Peninsula (USDI 1994). Information on current native char population levels is extremely limited.

Bull trout within the basin probably exhibit fluvial, adfluvial, and resident life history patterns. There may also be an anadromous component to the population. The construction of two dams has divided the Elwha River into three relatively isolated sections. Bull trout have probably been isolated into two subpopulations by dams, one above and one below the dams. It has not been determined if the char observed below the lower-most dam are bull trout or Dolly Varden.

Land Ownership: Within the Elwha River Basin, there are approximately 190,000 acres (92 percent) in Federal ownership (Forest Service and National Park Service); 6,400 acres (3 percent) in State ownership; 9,100 acres (4 percent) in private ownership (includes City and County lands); and 400 acres (<1 percent) in Tribal ownership (USGS 1996).

### Lower Elwha River

Construction of Elwha Dam at river kilometer (rkm) 8 has blocked all upstream fish migration since 1914 (USDI 1994). This dam has created the lower Elwha River subpopulation. This lower river subpopulation is likely anadromous, although a remnant of the fluvial life history form may still be present. In recent years, a few unidentified adult native char have been incidentally captured in the Lower Elwha Tribal test fishery (USFWS 1998). WDFW also reports one or two native char being observed each year in the State chinook rearing channel since 1983. Fish observed in the channel have been about 300 to 380 mm (12 to 15 inches) in length (WDFW 1997). In general, native char are present in the river below Elwha Dam in low numbers (USDI 1994). An angler, who has fished here since 1933 notes native char are presently not common (D. Goin, local angler, *in litt.* 1990; WDW 1992). Mongillo (1993) designated the Lower Elwha as a "remnant population," "that is, the fish are known to be present but in very low numbers (well below historic levels)." WDFW has assigned this subpopulation an unknown status (WDFW 1997). The Service believes the subpopulation has a depressed status.

This section of the Elwha drainage lies outside of the ONP and consequently has been subjected to impacts associated with logging.

Glines and Elwha dams have interrupted the historic migratory corridor of this subpopulation. The greatest impact to the subpopulation has been the loss of access to spawning habitat in the upper river which is extremely limited below the dams. The dams significantly limit gravel recruitment in the lower river, which is necessary for spawning (WDFW 1997).

Storage of heat in Lake Mills and Lake Aldwell has created increased water temperatures in the lower river (USDI 1994). Average daily water temperatures below Elwha Dam can exceed 15° C during several months of the year (D. Morrill, Lower Elwha S'Klallam Tribe, unpublished data 1995).

The lakes prevent nutrients and organic matter transported by the upper river from reaching the lower river section. This has likely limited benthic invertebrate production in the lower river, which in turn limits the growth and survival of fish (USDI 1994).

The lower Elwha River is on Washington State's proposed 1998 303(d) list for exceeding temperature and PCB standards (WDOE 1997).

This section has been closed to fishing for native char since 1994 (WDFW 1997). There may be some mortality from incidental hook and release of bull trout in fisheries targeting other species.

Outbreaks of the parasite *Dermocystidium salmonis* on chinook salmon has occasionally occurred on the lower Elwha. This endemic parasite kills fish by infesting the skin and gills. High water temperatures and large concentrations of hosts lead the parasite to reproduce in large numbers (K. Amos, WDFW, pers. comm. 1997). Both of these conditions usually exist during September and October during adult chinook returns into the system. This also corresponds with the adult return of native char into the system.

*Dermocystidium salmonis* is also known to parasitize coho salmon, brown trout, sockeye and non-salmonid species as well, and can affect native char (K. Amos, WDFW, pers. comm. 1997). During years in which large outbreaks of this parasite occur in the lower Elwha, adult and juvenile native char may be negatively affected.

Hatchery-origin chinook and coho are released annually into the lower river (WDFW 1997). Interactions between hatchery-origin salmon and native char have not been examined. Although bull trout evolved with and continue to coexist with anadromous salmonids (Ratliff and Howell 1992), hatchery releases of certain anadromous salmonids may impose predation and competition pressures on bull trout that are above natural levels.

Brook trout have been stocked in some areas of the Elwha Basin. Although no brook trout were captured in the lower river during a preliminary fish community study conducted in 1994, brook trout populations occur in several tributaries which discharge into the river section between the dams (Morrill 1995). There is the potential for them to become established in the river below Elwha Dam.

#### Upper Elwha River

Elwha Dam isolated bull trout in and above Lake Aldwell in 1914. Glines Canyon Dam at rkm 21 further isolated bull trout in and above Lake Mills in 1927 (USDI 1994). The subpopulation above the Glines Canyon Dam has likely retained its fluvial and resident life history forms in addition to developing an adfluvial form. Adult and juvenile bull trout, identified using Haas measurements, have been documented in and above Lake Mills (Taylor 1992; Hiss 1994; Morrill 1995; Meyer et al. 1996). Three native char samples collected by ONP biologists in 1995 were identified as bull trout through genetic analysis (Leary and Allendorf 1997). Adult native char have been observed

in the past "staging" near the head waters of the Elwha drainage (Chicago Camp rkm 64) in late summer and fall (USFWS 1998).

Juvenile bull trout have also been captured 1.5 km below Glines Canyon dam (Hiss 1994) and occasionally adult native char have been caught by anglers just above Lake Aldwell (USFWS 1998). Although this river section between the dams appears to contain a few juvenile and adult bull trout, there is very limited spawning habitat. A few juvenile bull trout have been found in Griff Creek, Hughes Creek and Little River, which enter the Elwha River in this section (Morrill 1995). These creeks may provide additional spawning habitat, although temperature or substrate in these creeks may not be adequate to support bull trout spawning. No spawning bull trout have been documented in these creeks.

Based on trap catches by Hiss (1994) and the lack of spawning habitat in this section, the bull trout existing between the two dams most likely have been washed over Glines Canyon Dam from Lake Mills. This group of individuals is best categorized as a segment of the upper Elwha subpopulation.

WDFW has assigned this subpopulation an unknown status (WDFW 1997).

More than 8 km (5 miles) of riverine habitat was inundated by the creation of Lake Mills and Lake Aldwell (USDI 1994). The Elwha River basin above Lake Mills lies within the ONP and is considered pristine.

The section of river between Elwha and Glines Canyon dams has suffered many of the same detrimental impacts described in the lower river below Elwha Dam. Trapping of bedload in Lake Mills has greatly reduced the supply to the middle reach (USDI 1994). Mainstem spawning habitat is very limited, since the middle reach is primarily dominated by cobble and boulder substrate (USFWS 1998). It is unknown whether bull trout can utilize tributary habitat in this section for spawning.

Storage of heat in Lake Mills has created increased water temperatures in the middle reach of the river (USDI 1994). Average daily water temperatures between the dams has occasionally exceeded 15° C during several weeks of the year (D. Morrill, Lower Elwha S'Klallam Tribe, unpublished data 1995).

Lake Mills prevents nutrients and organic matter transported by the upper river from reaching the middle river section. This has likely limited benthic invertebrate production in the middle reach, which in turn limits the growth and survival of fish (USDI 1994).

The blocking of anadromous fish passage to more than 112 km (70 miles) of mainstem and tributary habitat has likely resulted in a significant loss of forage species for bull trout. Ratliff and Howell (1992) suggest that due to its highly piscivorous nature, bull trout may have been adversely affected by declines in prey species. They present the example of depressed bull trout populations above Hells Canyon Dam, where there is no longer any salmon and steelhead production.

The section of river from Elwha Dam to the ONP boundary has been closed to fishing for native char since 1994 (WDFW 1997). The ONP has catch-and-release regulations for native char in all park waters. There may be some mortality from incidental hook and release of bull trout in fisheries targeting other species.

Brook trout are present in many of the high lakes in the headwaters region of the Elwha River and above the barrier on Boulder Creek which drains into Lake Mills (J. Meyer, ONP, pers. comm. 1995). Recent studies and creel census records from the 1950's indicate brook trout populations are probably not well established in the mainstem and most of the tributaries (Quilcene hatchery document 1959; Hiss 1994; Morrill 1995). There is the potential for them to become established in the river above Glines Canyon Dam.

Brook trout are present in potential bull trout spawning tributaries between the dams (Morrill 1995). Their presence may pose a serious hybridization threat to this portion of the subpopulation, since spawning areas are extremely limited.

### Angeles Basin:

The Angeles Basin is made up of several small independent drainages. However, Morse Creek is the only drainage known to have native char. The headwaters drain from ONP and then flow through suburban areas of Port Angeles before entering the Strait of Juan de Fuca. Native char in this system are believed to be anadromous.

Land Ownership: Within the Angeles Basin, there are approximately 38,900 acres (39 percent) in Federal ownership (Forest Service and National Park Service); 15,400 acres (16 percent) in State ownership; and 44,600 acres (45 percent) in private ownership (includes City and County lands) (USGS 1996).

### Morse Creek

Abundance and status information is lacking for this system. Occasionally adults have been caught here (WDW 1992). It was listed by Mongillo (1993) as part of the present distribution of native char and had a status rating of unknown. Fish in this system may be strays from a larger system such as the Elwha and Dungeness rivers that have entered the system to forage and overwinter (WDFW, *in litt.* 1997).

Habitat within the ONP boundary is in excellent condition. Habitat outside of the ONP has been subject to suburban development.

Water is diverted from Morse Creek for the Port Angeles municipal water supply (Williams et al. 1975). This may exacerbate natural low summer flows.

This system has been closed to fishing for native char since 1994. There may be some mortality from incidental hook and release of bull trout in fisheries targeting other species.

Poaching was listed by Mongillo (1993) as a threat to native char in this drainage.

### Dungeness River Basin:

The Dungeness Watershed drains 513 square kilometers (198 square miles) of the northeastern part of the Olympic Peninsula (USDA 1995b). The mainstem headwaters originate in the Olympic Mountain Range and flow 51.3 kilometers to Dungeness Bay before entering the Strait of Juan de Fuca. The primary tributary to the Dungeness mainstem is the Gray Wolf River. The Gray Wolf River is primarily located within the ONP and flows a total of 28 km before entering the Dungeness mainstem at approximately 25.7 rkm (Williams et al. 1975). Only a small portion of the headwaters of the upper Dungeness mainstem are located within the park. The majority of the mainstem and its tributaries flows through Olympic National Forest, State and private lands. The majority of the Dungeness Watershed lies in a rain shadow created by the Olympic Mountains and as a result, much of this area has limited rainfall (USDA 1995b).

The abundance of bull trout in the Dungeness Basin has not been well documented. Information on historic levels is anecdotal at best and information on current levels is extremely limited. The Dungeness Basin has been divided into two subpopulations based on the existence of a falls, which is considered a migratory barrier. It is located on the upper Dungeness River at rkm 30.4 near Gold Creek (USDA 1995b).

**Land Ownership:** Within the Dungeness River Basin, there are approximately 122,000 acres (55 percent) in Federal ownership (Forest Service and National Park Service); 24,700 acres (11 percent) in State ownership; and 76,500 acres (34 percent) in private ownership (includes City and County lands (USGS 1996).

The ONP has catch-and-release regulations for native char in all ONP waters. There may be some mortality from incidental hook and release of bull trout in fisheries targeting other species.

### Lower Dungeness River/Gray Wolf River

This subpopulation encompasses the mainstem Dungeness below the falls at Gold Creek and the entire Gray Wolf System. Anadromous, fluvial and resident life history forms may be present. According to anglers interviewed by Mongillo in 1992, historically native char were "very common and widespread from the lower to the upper watershed. They report that they are still widespread, but greatly reduced in numbers" (D. Goin, local angler, *in litt.* 1990; WDFW 1997).

No abundance surveys have been conducted for bull trout. However, native char have been incidentally captured or observed during survey work for other species (WDFW 1997; R. Peters, FWS, unpub. data 1997). In June, 1994 two char (one bull trout and one undetermined based on

Haas measurements) were collected from the mainstem Dungeness and four char (three bull trout and one Dolly Varden based on Haas measurements) were collected from the Gray Wolf during electrofishing surveys for steelhead (*Oncorhynchus mykiss*). In the fall of 1995, a peak count of nine native char (large juveniles or adults) were observed incidentally during day time surveys for pink salmon (*O. gorbuscha*) (R. Peters, FWS, unpublished data 1997; USFWS 1998). Approximately 3.2 km of the lower river was encompassed by this pink salmon survey, but only a portion of the total habitat was examined. WDFW has assigned this subpopulation a status of unknown (WDFW 1997). The Service believes this subpopulation has a depressed status.

The majority of the Gray Wolf drainage lies within the ONP and is in excellent condition. The lower Dungeness River is negatively impacted due to agriculture, urban development and timber harvest practices. As a result of these activities, erosion has caused extensive gravel aggradation and channel braiding, which has led to reduced water depth, increased water temperature and velocity, and destabilized river bedload (USDA 1995b; WDFW 1997). Land slides into Gold Creek have also contributed large amounts of fine sediment to the system (USDA 1995b). Construction of extensive flood control dikes and channelization of the river have worsened bedload instability and have subjected "rearing fish to extreme conditions" (WDFW 1997).

Irrigation withdrawals from the Dungeness River have occurred for more than 100 years (Dungeness-Quilcene Water Resources Management Plan 1994 cited in USDA 1995b). Impacts from irrigation withdrawals occur below rkm 17.7 at the critical low flow period between August and October (WDFW 1997). These impacts could hinder migration and movements of adult bull trout. The rainshadow location exacerbates late summer low flow situations (USDA 1995b). The lower Dungeness River is on Washington State's proposed 1998 303(d) list for not meeting instream flows (WDOE 1997).

Water quality of the Lower Dungeness River and the estuary has been negatively affected by pollution from urban and agricultural run-off (WDFW 1997).

The area outside of the ONP boundary has been closed to fishing for native char since 1994. The ONP has catch-and-release regulations for native char in all ONP waters. There may be some mortality from incidental hook and release of bull trout in fisheries targeting other species. There may be some potential poaching. There has been evidence of poaching for pink salmon in this system (USFWS 1998), and it is likely not limited to this species.

### Upper Dungeness River

The subpopulation of char above the falls is believed to exhibit fluvial and resident life histories (WDFW 1997). However, fish captured during a WDFW survey suggests that only a resident life history is present. WDFW conducted a preliminary native char survey of the upper mainstem Dungeness in August 1996 (WDFW 1997). Four sections were sampled between rkm 41.8 and 46.7 using electrofishing gear. Fish ranged from 30 mm to 205 mm in length with the total density of 0.108 fish/m<sup>2</sup> for the area sampled. Densities calculated for the four sample sites ranged from 0.08

to 0.16 fish/m<sup>2</sup>. Seven native char were sacrificed and preserved for Haas measurements and maturity determination. All seven fish were determined to be Dolly Varden based on Haas measurements. Five of the seven were determined to be mature. WDFW has assigned this subpopulation a status of "tentatively healthy" (WDFW 1997).

Brook trout are documented as being present in this section of the Dungeness River (Mongillo and Hallock 1993).

The depressed or critical status of anadromous salmonid species within the Dungeness Basin may substantially limit the amount of forage for native char. Winter and summer steelhead, upper river pink salmon and coho are listed by WDFW as depressed and lower river pink salmon and chinook salmon are listed as critical (WDF et al. 1993).

Most of the Upper Dungeness is located on Olympic National Forest (Buckhorn Wilderness area) and ONP lands. The majority of fresh water habitat is basically pristine (WDFW 1997). Portions of some of the tributary subwatersheds were timber harvested between 1960-1993. Approximately 7 percent of the total acreage within each of the Mueller Creek (1,320 acres), Silver Creek (2,775 acres), and Sleepy Hollow Creek (2,754 acres) subwatersheds has been harvested (USDA 1995b). These three subwatersheds represent approximately 17 percent of the area of the Upper Dungeness above Gold Creek. They are currently designated as Late Successional Reserve.

#### Skokomish River Basin:

The Skokomish River Basin drains the east slopes of the Olympics into Hood Canal fjord of Puget Sound. The upper North Fork Skokomish River flows through ONP to the park boundary at river kilometer (rkm) 45 just above the point of entry into Cushman Reservoir. This portion of the river historically supported anadromous fish, but construction of upper Cushman Dam (rkm 31.5) by Tacoma Public Utilities (TPU) has blocked their access into the park since 1926 (HCCC 1995). The lower Cushman Dam (rkm 27.8) completed in 1930, further shortened the anadromous reach. Except for a small area of its upper headwaters, the South Fork Skokomish lies outside of the park boundary. There is an anadromous barrier (falls) at rkm 40.2 near Rule Creek (WDFW 1997). The South Fork meets the North Fork at rkm 14.5 below Cushman Reservoir.

Bull trout have been isolated into at least two subpopulations within the Skokomish River system by the construction of the dam. A third subpopulation may be isolated above Staircase Rapids (rkm 48) in the upper North Fork, but recent evidence suggests the rapids may not be a migratory barrier during parts of the year (USFWS 1998). There are no historical abundance data for this system, and current abundance data are limited to the Cushman Reservoir subpopulation.

Land Ownership: Within the Skokomish River Basin, there are approximately 104,400 acres (68 percent) in Federal ownership (Forest Service and National Park Service); 5,300 acres (3 percent) in State ownership; 41,700 acres (27 percent) in private ownership (includes City and County lands); and 2,500 acres (2 percent) in Tribal ownership (USGS 1996).

### South Fork/Lower North Fork Skokomish River

This subpopulation of char may have anadromous, fluvial and resident life history forms. Several char over 356 millimeters (14 inches) have been observed (USFWS 1998). Distribution surveys by the U.S. Forest Service have been ongoing since 1994 (WDFW 1997). Surveys have located native char in a number of creeks (Church, Pine, Cedar, LeBar, Brown, Rock, Flat, and Vance creeks) in addition to the mainstem, but in very low numbers (1-2 fish). Spawning distribution is unknown. Twenty five char (65 to 362 mm fork length) were collected for genetic analysis in 1995 and were all determined to be bull trout (Leary and Allendorf 1997). Very limited abundance data are available for this subpopulation. 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). Highest counts for this section have been around 60 individuals, with most fish under 150 mm (6 inches). No redds have been observed. It is unknown whether bull trout are currently present in the Lower North Fork Skokomish. Habitat conditions that were able to support bull trout likely no longer exist. River flow in this section is strongly if not completely dependent on the operation of the lower Cushman Dam. WDFW has rated the status of this subpopulation as unknown (WDFW 1997). Based on the extremely low numbers of char recorded in recent surveys, the Service believes the subpopulation has a depressed status.

The South Fork watershed has been heavily logged and loss of stream-side cover from forest practices was noted as a limiting factor to salmon production in this section of the Skokomish River by Williams et al. (1975). Alterations in natural flows, as a result of the intensity of past logging and road building in the upper reaches of the South Fork, have led to increased flooding problems (HCCC 1995). This area is subject to extreme summer low flows and extreme winter high flows. Extensive erosion, aggradation of sediments, and bedload movement are now common in the South Fork and mainstem of the Skokomish River (HCCC 1995). Lack of large wood recruitment is also noted as a major problem for this habitat.

Lower North Fork stream habitat for all salmonids has been heavily impacted by the operation of the lower Cushman Dam. From 1930 to 1988, there was total diversion of river flow out of the channel below the lower dam through a tunnel to a power plant at Potlatch on Hood Canal (HCCC 1995). The current operation of the dam facility diverts the majority of the North Fork (96 percent of the annual flow) out of the watershed, and releases 33 cubic feet per second downstream through an interim flow agreement. During winter flooding conditions or power shut down periods, the facility will spill excess water over the dam, above the current interim flow. The Lower North Fork is subject to near drought conditions during most of the year, and flood conditions for the remainder. This reach is now dominated by gravel rather than cobbles, and measurements of silt accumulation in pools indicate as much as 0.91 meters (3 feet) of silt and organic matter have been deposited in portions of the reach (FERC 1996). The majority of gravel accumulation is below McTaggart Creek (rkm 21.4).

The N.F. Skokomish River is on Washington State's proposed 1998 303(d) list for not meeting instream flows, and the Skokomish River mainstem is on the list for exceeding fecal coliform standards (WDOE 1997).

This area has been closed to fishing for native char since 1994 (WDFW 1997). There may be some mortality from incidental hook and release of bull trout in fisheries targeting other species.

Brook trout are present in many of the high lakes in the headwater regions of the ONP (J. Meyer, ONP, pers. comm. 1995). Brook trout could potentially establish themselves in the systems below these lakes. Brook trout currently have not been found in this part of the Skokomish system. However, they may pose a threat to bull trout in the future if they become established lower in the system.

Brook trout are known to inhabit Rock Creek, Lake Haven, Spider Lake and Cedar Creek (Mongillo and Hallock 1993). The apparent low abundance of bull trout in Cedar and Rock creeks may cause bull trout to be particularly susceptible to brook trout hybridization in these tributaries. There is the potential for brook trout to expand their distribution within the South Fork and Lower North Fork Skokomish in the future.

#### Cushman Reservoir

This subpopulation has been isolated from the rest of the Skokomish system by the construction of Cushman Dam. This subpopulation is now restricted to an adfluvial life history. Only a limited amount of habitat appears to be available for spawning as a result of the reservoir and Staircase Rapids. Adult char from this subpopulation have been identified as bull trout based on Haas formula measurements and genetic analysis (Brenkman 1996 cited in WDFW 1997).

Adult (spawner) counts have been conducted on this subpopulation for a number of years (1972-1979 and 1985-1996) (WDFW 1997). Foot surveys and visual estimates were utilized during the 1970's and snorkel surveys have been used since 1985. Foot survey estimates are likely conservative because of the difficulty in observing char due to their cryptic coloration. Fish in deep pools may go uncounted. Counts showed that the abundance of adult bull trout declined through the 1970s. When snorkel counts began in 1985, four adults were counted. Adult counts steadily increased to a high of 412 in 1993, but in recent years have shown a decline and perhaps a leveling off (1994 = 281, 1995 = 250, and 1996 = 289) (WDFW 1997). The increase in spawners, from 1986 to 1993, corresponds with the harvest closure established in 1986 on Cushman Reservoir and the upper North Fork Skokomish River. WDFW has rated the status of this subpopulation as healthy. However, since the last 3 years of adult counts have been below the 7-year average count (302), and since there is no record of the historic escapement to gauge the recent adult returns, the U.S. Fish and Wildlife Service believes that a "healthy" rating may be premature at this time.

It is believed that virtually all of the critical spawning and early rearing habitat is currently in the section of the North Fork Skokomish River within the ONP boundary (WDFW 1997). Since

spawning habitat for this subpopulation appears to be limited to the short section of river, between Staircase Rapids and the reservoir, protection of this habitat is vital to this subpopulations persistence. The construction of upper Cushman Dam created a large reservoir out of the much smaller natural lake (Lake Cushman) (FERC 1996). The reservoir apparently provides adequate habitat and food base for this subpopulation (WDFW 1997). The reservoir supports a population of landlocked chinook salmon (HCCC 1995; WDFW 1997) which may act as an important forage base for bull trout.

Large fluctuations in water level occur in the reservoir which is managed for power generation and flood control (WDFW 1997). The lower 0.5 miles of the river above the reservoir has been inundated by these fluctuations. This inundated area does support bull trout spawning, however, this section is less desirable for spawning due to higher percentages of fine sediment (WDFW 1997). Current operation of the reservoir (spring fill and fall drawdown) does not appear to impede entry of spawning adults into the river (USFWS 1998).

An impending land exchange between ONP and TPU would move the ONP boundary 0.5 mile upstream. This would transfer 30 acres (encompasses the area of inundation) of ONP land at the head of Cushman reservoir into TPU ownership (FERC 1996). This area would no longer be under the protection of the ONP, but TPU has agreed to manage former ONP lands in their present state (i.e., as wildlife habitat) (NPS 1992).

Harvest of native char has been closed in the reservoir since 1986 and in the North Fork Skokomish River since 1982 (WDFW 1997). There may be some mortality from incidental hook and release of bull trout in fisheries targeting other species. Some bull trout are caught and released incidentally in a land-locked chinook fishery which is open in the reservoir year-round (WDFW 1997).

Although not known to be a factor at this time, one school of juvenile largemouth bass (*Micropterus salmoides*) has been observed recently in the North Fork Skokomish just above Lake Cushman (USFWS 1998). Largemouth bass have been documented consuming salmonids in some systems (Fayram 1996; Shrader 1997). Largemouth bass may only have a minor impact, since thermal preferences of these two species will likely separate them both spatially and temporally within the reservoir and riverine habitat during most of the year. Fry and juvenile bull trout that migrate to the reservoir after April, may be more vulnerable to bass predation due to increasing water temperatures. Largemouth bass may contribute to a decrease in certain forage species formerly exploited only by bull trout.

#### Upper North Fork Skokomish River

This subpopulation is assumed to be isolated by Staircase Rapids. There is some debate over whether this is a complete isolating barrier. Large adult char of the Cushman Reservoir subpopulation up to approximately 45.7- 63.5 cm (18- 25 inches) in length have been observed above the rapids during spawning times (USFWS 1998). They also appear to be greater in size than most mature resident and fluvial life history forms. Smaller adults and native char less than 200 mm

strategies for the east-side planning units, the Service has determined that the lack of riparian and wetland conservation strategies will adversely affect bull trout. Current Washington State Forest Practices Rules and any "emergency rules" passed by the State Forest Practices Board would continue to be applied in managing riparian areas in these three planning units. On November 18, 1998, the Forest Practices Board (WSDNR 1998) adopted a "Salmon Emergency Rule." This rule is to remain in effect until March 17, 1999 and includes the Columbia River DPS of bull trout.

Implementation of the HCP is projected to reduce late-successional forest on WSDNR-managed lands in the short-term (74 percent)(USDI et al. 1996). This reduction would likely adversely affect bull trout populations in an estimated 6 to 11 miles of fish bearing streams in the east-side planning units. The most significant harvest impacts are likely to occur to some Type 4 and Type 5 Waters which now receive incidental protection due to spotted owls, but would receive no protection or minimal protection under State regulations. These impacts would likely affect water quality and quantity in certain watersheds that contain a high percentage of WSDNR lands. Increases in sedimentation and stream temperatures are likely 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 sensitivity of bull trout to fine sediments and elevated stream temperatures, these habitat changes are likely to have a negative impact on bull trout. The effects of these localized impacts would not be restricted to Type 5 Waters, but would be translated downstream to larger water types. Similar impacts would also occur directly on Type 1 through Type 4 Waters.

Riparian Management Zone widths, as specified by the Washington State Forest Practices Rules, did not always ensure protection of the riparian components because the minimum widths were insufficient to fully protect riparian ecosystems (USDI et al. 1996). In most cases, past practices were not sufficient to address salmonid habitat needs (detrital inputs, water temperature, stream bank stability, large woody debris recruitment). These Forest Practices Rules allowed harvest activities throughout the whole Riparian Management Zone up to the edge of a stream. This allowance posed a substantial risk to bull trout because it greatly hindered proper riparian function. Impacts of near stream harvest, which negatively affected bull trout, included increased stream bank erosion, increased stream sedimentation, decreased canopy cover causing increased stream temperatures, and decreased large woody debris recruitment (elements in pool formation and instream cover). More recently, the Washington State Forest Practices Board has adopted temporary "emergency rules," in areas of listed salmonids to increase protection for listed species. Under the current emergency rules, forest-management activities within 200 feet of shorelines of the state and within 100 feet of other Type 1, 2, and 3 waters are prohibited without State Environmental Policy Act (SEPA) review. These rules are subject to change by future Forest Practices Board rulings. Populations most at risk in the east-side planning units are the Klickitat River and White Salmon River populations in the Klickitat unit, due to the large WSDNR-managed land base and remnant level status of these populations.

A comprehensive road network management plan will not be applied to the east-side planning units. The increase in road construction and activity associated with additional timber harvest will likely adversely affect bull trout populations. The lack of a road network management plan that would

strongly minimize active road densities through landscape planning and increased closure and abandonment for inactive roads, would allow continued expansion of the road network. Additional roads developed without landscape planning would exacerbate the current problems of increased sediment and erosion associated with forest road networks, which adversely affect aquatic habitats and their inhabitants. Given bull trout's sensitivity to fine sediments at certain life stages, and the strong association with pool habitat, any new road construction and activity which causes sediment loading of nearby streams will adversely affect bull trout residing in these particular locations.

Past land-management activities, including those of WSDNR, have degraded habitat conditions throughout the range of many late-successional and aquatic habitat-dependent species. 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 northern spotted owl are managed in accordance with the Record of Decision (ROD) for the Northwest Forest Plan. Under the ROD, riparian areas will be managed in accordance with the Aquatic Conservation Strategy, which 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 50-100 years.

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

When the Northwest Forest Plan is implemented as originally designed and intended, and as it may be modified through section 7 consultation, Federal lands are expected to carry the major burden of conservation and recovery of late-successional habitats and associated species such as the bull trout, however it is also anticipated that nonfederal lands will provide necessary migration corridors. The Northwest Forest Plan only covers a portion of the species' range. However, other Federal efforts such as the Interior Columbia Basin Ecosystem Management Project being undertaken in the

have also been observed above the rapids only as far as Four Stream (USFWS 1998). There is very limited abundance data for this subpopulation. Two mainstem surveys of a 1.9 km reach in October 1988 and October 1995 located 10 and 5 char respectively (5.2 and 2.6 fish per km) (WDFW 1997). WDFW has assigned this subpopulation a status of unknown (WDFW 1997).

The majority of critical spawning and early rearing habitat is within the ONP boundary and is considered to be in excellent condition (WDFW 1997). The remainder lies in the ONP.

The ONP has catch-and-release regulations for native char in all ONP waters. There may be some mortality from incidental hook and release of bull trout in fisheries targeting other species (WDFW 1997).

Brook trout are present in many of the high lakes in the headwater regions of the ONP (J. Meyer, ONP, pers. comm. 1997). A few brook trout have been found in Donahue Creek, and are likely pioneers from Flapjack Lakes (S. Brenkman, OSU, pers. comm. 1997). Brook trout are most likely not a major threat to bull trout at this time due to their current distribution in the Skokomish system. However, brook trout may pose a greater threat in the future, if they continue to extend their range and become established lower in the system.

#### Nisqually River Basin:

Native char in the Nisqually River are identified as a subpopulation based on their geographic distribution. Although habitat is available for all life history forms, it is not known which forms inhabit this river system. Historical accounts describe bull trout entering the mouth of the Nisqually and other Puget Sound rivers in "vast numbers" in the fall, and continuing until Christmas (Suckley and Cooper 1860). Historic records apparently document the presence of resident bull trout above the barriers at rkm 68 and rkm 71, but it is unknown whether they still occur there (WDW 1992). One juvenile native char was sampled by the Nisqually Tribe in the lower reaches while stream sampling for juvenile salmon in the mid-1980s, and was identified as a Dolly Varden. One fish reported as a Dolly Varden was caught in a beach seining effort at the West Delta area of the Nisqually River reach in 1978 (Fresh et al. 1979). No native char have been reported in the Nisqually tribal commercial fisheries (WDFW 1997). Spawning locations are unknown for this subpopulation. Alder Dam at rkm 71 limits upstream passage of anadromous fish on the Nisqually River. Native char have not been documented in Alder Lake, formed by the dam, or in upstream waters (WDFW 1997). Electroshocking surveys by Mt. Rainier National Park (MRNP) staff in October and November 1993 indicated a possible bull trout specimen from Tahoma Creek, a tributary on the upper Nisqually (Samora and Girdner 1993), however the identity of this specimen was not confirmed and its identity is considered to be bull trout. A second upper tributary to the Nisqually, Kautz Creek, was also surveyed with no bull trout found (Samora and Girdner 1993).

The WDFW rates this subpopulation as "unknown" status, due to a lack of long-term monitoring data (WDFW 1997). The Fish and Wildlife Service believes the status of the Nisqually River

subpopulation is depressed, based on available information that indicates native char occur in very low numbers in comparison to historic levels.

Land Ownership: Within the Nisqually River Basin, there are approximately 126,900 acres (28 percent) of land in Federal ownership (Forest Service, National Park Service, and other Federal ownership); 64,500 acres (14 percent) in State ownership; 259,000 acres (57 percent) in private ownership (includes City and County lands); and 825 acres (< 1 percent) in Tribal ownership (USGS 1996).

Logging and land development have negatively impacted the habitat along the mid to lower reaches of the Nisqually River. Logging near unstable slopes has created major landslides which have increased sedimentation and temperature and degraded spawning and rearing habitat. A major landslide occurred in 1991 and temporarily blocked the river. Heavy sedimentation into the river resulted (WDFW 1997).

The Nisqually River has been closed to fishing for bull trout and Dolly Varden since 1994. There may be some mortality from incidental hook and release of native char (WDFW 1997).

Brook trout were widely stocked in Mount Rainier National Park, beginning about 1918, along with hatchery strains of native species (rainbow and cutthroat trout); the practice ended in 1973 (Samora and Girdner 1993). Brook trout are still very common in the park and hybridization with bull trout is considered a significant threat to bull trout. Any native char that may spawn within the upper segment of the Nisqually would be negatively affected by the presence of brook trout.

#### Puyallup River Basin:

The lower reaches of the Puyallup, White and Carbon rivers pass through extensive urban, residential, or agricultural zones. All three rivers have their headwaters within Mount Rainier National Park (MRNP). Upper reaches are often blocked by dams and water diversions, with spawning and rearing areas degraded by land management activities. Surveys conducted in the Park have documented presence of native char in all three rivers (Samora and Girdner 1993). One specimen from Ranger Creek, a tributary to the Carbon River, was examined at Oregon State University and positively identified as a bull trout through the Haas methodology (Samora and Girdner 1993).

The current distribution of native char in these subbasins generally approximates historic, but population sizes are not as large as in drainages to the north. Status information for populations in this portion of Puget Sound is largely limited to intermittent electrofishing and creel counts, which do not depict long-term population trends. However, historical accounts indicate anadromous char entered these drainages in "vast numbers" in the mid-1800s (Suckley and Cooper 1860). Key habitats throughout these river systems have likely been eliminated or seriously degraded due to human activities.

Land Ownership: Within the Puyallup River Basin, there are approximately 261,000 acres (41 percent) in Federal ownership (Forest Service and National Park Service); 2,900 acres (< 1 percent) in State ownership; 366,900 acres (57 percent) in private ownership; and 13,200 acres (2 percent) in Tribal ownership (USGS 1996).

The Puyallup River, White River, and Carbon River have been closed to fishing by the State for bull trout and Dolly Varden since 1994. Fishing for bull trout is also prohibited in Mount Rainier National Park. There may be some mortality from incidental hook and release of native char in fisheries targeting other species (WDFW 1997).

### Puyallup River

The WDFW delineates native char in the Puyallup River as a distinct stock because of the probable geographic isolation of their spawning populations, although spawning locations are unknown (WDFW 1997). Life history types are unknown for this subpopulation, although habitat is available for anadromous, fluvial and resident forms (WDFW 1997). In 1994, two native char were sampled incidental to steelhead parr electrofishing surveys at rkm 66 and in Mowich Creek (WDFW 1997). Adult char are occasionally caught incidentally in the Puyallup River by steelhead anglers (WDW 1992), and by Puyallup Tribal members using drift nets in the lower Puyallup. No native char have been observed at the Puyallup Tribe's fish hatchery at Clark Creek, a tributary to the Puyallup River near rkm 8.0, in the last 8 years. Native char were found on the South Puyallup River during electroshocking surveys in 1993 (Samora and Girdner 1993). The Electron Dam, near rkm 66 and just downstream of the confluence with Mowich Creek, does not allow for fish passage, and thus isolates the char in Mowich Creek from migratory movement down the mainstem Puyallup.

The WDFW rates this subpopulation as "unknown" status, due to a lack of quantitative population trend data (WDFW 1997). The Service believes the status of the Puyallup River subpopulation is depressed, based on available information that indicates native char occur in very low numbers in comparison to historic levels.

Urban development, agriculture and logging activities have reduced summer flows, decreased riparian canopy, increased winter peak flows and increased stream sedimentation on the Puyallup River. These activities have severely affected major tributaries used by steelhead, and it is likely that they have adversely affected those areas used by native char. Diking in the lower Puyallup has reduced river capacity and led to a need for additional bank protection and constant gravel removal in attempts to prevent erosion. These activities usually further reduce channel stability and the quality of fish habitat (WDFW 1997).

### White River

Native char occur in the mainstem White River and the following tributaries: Clearwater River, West Fork White River, Huckleberry Creek, Greenwater River (Noble and Spalding 1995), Frying Pan Creek (Samora and Girdner 1993) and Pinocle Creek (WDW 1992). Presence is unknown in other

tributaries (Noble and Spalding 1995). Spawning locations are unknown. Historically, bull trout in the White River drainage were fluvial or anadromous; today they are mostly fluvial (Noble and Spalding 1995). Very little historical or current information on population estimates or distribution is available. In 1993, nine native char were sampled incidental to steelhead char parr electrofishing surveys on the White River between rkm 69.2 and rkm 85.8. The fish ranged in length from 99 mm (4 inches) to 300 mm (12 in). In the West Fork White River, four native char were sampled and ranged in length from 127 mm (5 inches) to 203 mm (8 inches) (WDFW 1997). Other data are available from the adult fish trap at the Puget Sound Energy diversion dam at Buckley. Counts made from 1987 to 1996 show native char in the counts and ranged from a low of 8 in 1988 to a high of 46 in 1994. The average for this 10-year period is 24 fish per year. A trend cannot be determined from this data since count effort varied between years (WDFW 1997). Four char ranging in size from 152 mm (6 inches) to 457 mm (18 inches) were caught on hook and line in the late 1970s and early 1980s in the White River in MRNP (WDFW 1997).

Urban development, agriculture and logging activities have reduced summer flows, decreased riparian canopy, increased winter peak flows and increased stream sedimentation on the White River. These activities have severely affected major tributaries used by steelhead, and it is likely that they have adversely affected those areas used by native char (WDFW 1997). During a flood in 1977 and subsequent cleanup operations, the Greenwater River (a White River tributary containing native char) experienced total loss of large woody debris. The White, Clearwater and Greenwater Rivers are all on Washington State's proposed 303(d) list for 1998, due to temperature exceedences (WDOE 1997). Both tributaries as well as the mainstem White contain native char.

On the White River, downstream movement by native char is limited by the Buckley Diversion Dam (rkm 40.2) which is a barrier to migratory fish (Williams et al. 1975). Large numbers of migrating steelhead are lost during years when the timing of the smolt migration coincides with the diversion of the White River into Lake Tapps. It is likely that migrating bull trout and Dolly Varden also suffer mortality during these periods (WDFW 1997). The Buckley Diversion Dam results in significantly reduced flows in the 33.8 km (21 mile) bypass reach of the White River, which can strand fish and impede migration (WDFW 1997). Mud Mountain Dam, on the White River at rkm 47.6, also blocks fish passage, although chinook, coho and steelhead are transported around the dam allowing access to the White River, West Fork of the White River, and the Huckleberry Creek basins (Samora and Girdner 1993).

### Carbon River

Native char are known to occur in the Carbon River and the tributaries Chenuis Creek, Ranger Creek, and Ipsut Creek. Steelhead parr electrofishing surveys in 1994 found 16 native char in the Carbon River, between rkm 29.9 and 35.4. The fish ranged in length from 112 mm (4 inches) to 310 mm (12 inches) (WDFW 1997). An additional two char were collected during the steelhead surveys, and both measured 210 mm (8 inches) in length (WDFW 1997). The National Park Service conducted limited electroshocking surveys in the fall of 1993, and documented presence of native char at 5 of 17 sites surveyed. At Ranger Creek, a tributary to the Carbon River, one specimen was

identified by Doug Markel at Oregon State University as bull trout using the Haas methodology (USFWS 1997). No other specimens within the Park were examined for identification as either bull trout or Dolly Varden. More intensive snorkeling surveys to determine presence/absence were conducted in August and September 1995, and found native char present at five of eight sites in tributaries to the Carbon River, including Ranger Creek, Chenuis Creek, and Ipsut Creek. The MRNP biologists assumed all native char encountered were bull trout based on the Ranger Creek specimen identified as bull trout.

The WDFW rates this subpopulation as "unknown" status. The Service concurs, primarily because of the lack of historical information regarding the abundance of native char in this river system.

#### Green River Basin:

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. An 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 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. The Fish and Wildlife Service believes 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 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 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) believes 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.

Land Ownership: 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).

#### Snohomish River/Skykomish River Basin:

The Snohomish River and its tributaries represents the second largest drainage system in the Puget Sound region. The Snohomish River basin consists of two main rivers, the Skykomish, which drains approximately 844 square miles, and the Snoqualmie, draining approximately 693 square miles. Both the Skykomish and the Snoqualmie have their headwaters in the Cascade Mountains (Williams et al. 1975).

Native char in this river basin occur in the Snohomish, Pilchuck, North Fork Skykomish and its tributaries between Bear Creek Falls and Deer Creek Falls, South Fork Skykomish, and possibly the Snoqualmie. Anadromous, fluvial, and resident life history forms of native char are all found in the Skykomish River Basin. An earlier assessment by WDFW (Mongillo 1993) delineated three populations in this river basin, and considered them either stable (South Fork Skykomish below Sunset Falls); unknown (South Fork Skykomish above Sunset Falls); and secure (Troublesome Creek). No habitat or population data were or are available to support this "secure" status, although fish in this creek may be considered at low *risk*, due to limited access. The WDFW rates the status of this subpopulation as unknown (WDFW 1997). The Fish and Wildlife Service concurs with this rating.

In the South Fork Skykomish, native char did not formerly occur above Sunset Falls (river kilometer (rkm) 83.0), but a trap and haul operation begun in the 1950s to provide access for other salmonids provides access for native char as well. A 1993 radio tagging study of native char collected at Sunset Falls fishway showed that nearly all the fish spawned in the lower East Fork Foss River (WDFW 1997), a tributary to the South Fork. Only resident fish are found in upper tributary reaches that lie above fish-barrier falls (e.g. Troublesome Creek) (WDFW 1997). Native char were reported from the upper North Fork Tolt River in the 1960s. No native char were found there in a 1992 survey. Native char may have existed historically in the Upper Sultan River prior to the construction of a water diversion dam at rkm 15.6 in about 1916 (Noble and Spalding 1995). No records are available of past sport catches, or incidental catches in commercial fisheries near or in the Snohomish River's mouth (Noble and Spalding 1995). No native char are reported from any of the forks of the Snoqualmie above Snoqualmie Falls, but brook trout are established in some reaches of the north and south forks. Since the Snoqualmie is contiguous to the Skykomish, where native char are abundant, it is reasonable to assume they may be present in the Snoqualmie as well (USFWS 1997). The status of these fish, if present, is unknown.

Native char are common throughout the Skykomish basin, but the only significant spawning area, other than the South Fork, is limited to about four miles of the upper North Fork. The upper North Fork Skykomish is one of two WDFW index areas in the Puget Sound area and surveys have been

conducted since 1988. Redd counts between 1988 and 1996 ranged 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 during that year), 75 redds in 1995, and 60 redds in 1996. The average number of redds for this index area over the 9-year period is 78 redds. Peak counts (the highest daily count of live fish in an index area) conducted between 1988 and 1996 ranged from a low of 18 in 1990 to a high of 105 in 1994 (WDFW 1997). The next year, 1995, the peak count dropped to 23. In 1996 the peak count was 48. Trap counts are available for only 3 years: in 1994, 18 fish were counted; in 1995, 40 were counted; and, in 1996, 45 were counted (WDFW 1997).

Land ownership: Within the Snohomish/Skykomish River Basin, there are approximately 463,500 acres (40 percent) in Federal ownership (Forest Service, National Park Service, and other Federal ownership); 150,500 acres (13 percent) in State ownership; 546,100 acres (47 percent) in private ownership (includes City and County lands); and 6,000 acres (< 1 percent) in Tribal ownership (USGS 1996).

Habitat conditions in the portions of the North Fork Skykomish and its tributaries used by native char are generally good to excellent, though there has been some loss of side-channel habitat due to diking and bank protection for flood plain roads. Water quality in the North Fork Skykomish is generally excellent (WDFW 1997). Habitat in the South Fork Skykomish has been degraded by logging and road construction, especially in the Beckler and Tye watersheds, in the North Fork Tolt River subbasin (WDFW 1997; WDW 1992). Heavy logging that occurred downstream from the National Forest boundary resulted in increased runoff and increased sedimentation in the mainstem Skykomish between the town of Startup and the forks (Williams 1975). Anecdotal information suggests native char were found in the North Fork Tolt River in the 1960s. Poor water quality conditions and high temperatures may preclude bull trout from occupying this river today (WDFW 1997). The East Fork Foss River drainage, a known spawning area in the Skykomish River Basin, lies almost entirely within the Alpine Lakes Wilderness area so presumably habitat conditions are good.

The Everett Diversion Dam at rkm 15.6 is a barrier to upstream migration on the Sultan River. There is a Diversion Dam on the Pilchuck River (rkm 42.5) run by the City of Snohomish with fish passage facilities.

Although the status of this subpopulation is unknown, the State of Washington allows the fishing of bull trout and Dolly Varden in this river system. Since 1990, there has been a 20-inch minimum size limit and a two-fish daily bag limit for bull trout and Dolly Varden in the Snohomish mainstem and the Skykomish River below the forks. This regulation is intended to permit females to spawn at least once. All other areas in the basin are closed to fishing for native char (WDFW 1997).

Poaching of adult native char has been identified as an ongoing problem in the upper North Fork Skykomish. This area is open to angling yearly from June 1 through October (WDFW 1997). This

is of particular concern since this river is one of only two known spawning areas in the river basin. In addition to poaching, inadvertent capture of bull trout can occur due to angler misidentification.

Brook trout have been introduced into many lakes in the Skykomish subbasin, and are known to occur in the South Fork Skykomish above Sunset Falls (WDW 1992). They are also established in some reaches of the North and South forks of the Snoqualmie River. It is unknown whether bull trout inhabit these areas in the Snoqualmie, however, anglers apparently occasionally catch native char in the lower Snoqualmie River (S. Fransen, FWS, pers. comm. 1997). Hybridization between bull trout and brook trout is considered a threat to the persistence of bull trout.

#### Stillaguamish River Basin:

All native char habitat within the Stillaguamish River Basin is contiguous, and no evidence of reproductive isolation within the basin exists. The Washington Department of Fish and Wildlife (WDFW) identifies native char in this basin as a distinct stock based on their geographic distribution. Anadromous, fluvial and resident bull trout are all believed to occur in the watershed (WDFW 1997). Native char are found throughout the basin, with spawning areas in the North Fork and its tributaries including Deer Creek, Little Deer Creek (probable spawning), Higgins Creek, Boulder River and Squire Creek, and in the South Fork and its tributaries including Canyon, Millardy, Deer, Coal, Beaver (probable spawning) and Palmer Creeks. The overall status of bull trout within the Stillaguamish River Basin is generally unknown, but populations have likely declined. The WDFW (1997), while identifying the status as "unknown," considers that the population appears to be stable or expanding, with the exception of Deer Creek. However, there are no population abundance estimates or other data for bull trout in the Stillaguamish to support this assumption. In an earlier report, Deer Creek and Canyon Creek were identified as containing declining populations of bull trout (Mongillo 1993). The Fish and Wildlife Service considers the current status of the Stillaguamish subpopulation unknown.

Since the construction of a fishway at Granite Falls in the 1950s, the South Fork Stillaguamish River upstream of the falls has supported native char believed to be anadromous. Prior to this, the falls were impassable to anadromous fish. Spawning adults have been observed in Palmer Creek and the extreme upper South Fork (USFWS 1997).

In the North Fork Stillaguamish and its tributaries, native char are observed each fall during routine snorkel surveys to count adult chinook salmon (WDFW 1997).

**Land Ownership:** Within the Stillaguamish River Basin, there are approximately 176,000 acres (40 percent) within Federal ownership (primarily Forest Service land); 72,000 acres (16 percent) in State ownership; and 195,000 acres (44 percent) in private ownership (USGS 1996).

Habitat conditions in the North Fork and lower South Fork have been seriously degraded by channel widening and filling and a significant reduction in primary pool abundance. The North Fork spawning tributaries of Deer Creek and Canyon Creek have been extremely degraded. Loss of

riparian cover, slope failures, stream sedimentation, and increased stream temperatures due to logging practices have adversely affected bull trout and all other fish species in Deer Creek (Noble and Spalding 1995; WDFW 1997). Other limiting factors in the North Fork include loss of deep holding pools for adults and low summer flows (WDFW 1997). No adult or juvenile bull trout were observed in Deer Creek during 5 years of monitoring within the past 5 years, despite monitoring efforts. Habitat conditions in the South Fork Stillaguamish have also been degraded by logging practices, resulting in higher stream temperatures, flooding, sedimentation, and loss of large woody debris (WDFW 1997; Noble and Spalding). Excessive siltation caused by mud and clay slides on the North Fork near Hazel and on the South Fork above Robe contribute to poor water quality (Williams et al. 1975). Although a fishway was constructed in the 1950s to allow fish passage above Granite Falls on the South Fork, access to the fishway is limited by poor entrance conditions/attraction at the fishway, sedimentation and flow problems, and by a rock fall in Robe Canyon which may be a migration barrier (WDFW 1997).

Agriculture and residential development have contributed to poor water quality in the lower Stillaguamish. Water pollution from agricultural chemicals and manure is common and sometimes severe. Anadromous migration holding habitat in the mainstem Stillaguamish suffers from low flows and high temperatures during the summer, especially in the lower river sloughs which have slow moving water without significant riparian cover (WDFW 1997).

#### Skagit River Basin:

The Skagit River is the largest drainage in Puget Sound, contributing approximately one-third of its freshwater inflow. The mainstem Skagit is 261 km (162 miles (mi)) in length, including 56 km (35 mi) in Canada. The Skagit River Basin supports the largest natural population of native char in Puget Sound. All four life history forms are present. The Service recognizes four subpopulations within this watershed. Three impassable dams on the upper Skagit reproductively isolate native char, fragmenting a once contiguous anadromous population. These are the Gorge Dam, Diablo Dam and Ross Dam. Except for infrequent spillage over the dams allowing some movement of fish downstream, each reservoir harbors an isolated population of native char that utilizes adjoining tributaries for spawning and are thus treated as separate subpopulations by the Service. Native char inhabiting the lower Skagit and its tributaries have been identified as a fourth subpopulation by the Service. Native char in the Baker Reservoir, identified as a separate stock by the WDFW, are being included as part of the lower Skagit subpopulation, due to the fact that some bull trout and Dolly Varden are transported from below the lower Baker Dam to above the upper dam to Baker Reservoir through an adult trap-and-haul facility. Since there is likely genetic exchange between native char in the lower Skagit and the Baker River drainage, the Service is considering this one subpopulation.

#### Lower Skagit River (below Gorge Dam)

This subpopulation includes the Skagit River below Gorge Dam at rkm 156, and contains several major tributaries: the Sauk, Cascade, Suiattle, and Whitechuck Rivers. The subpopulation is apparently composed of anadromous, fluvial, and resident life history forms. The Sauk, Cascade,

Suiattle, and Whitechuck Rivers all provide spawning and rearing habitat for native char in this subpopulation. There are 28 documented or probable native char spawning tributaries within the Sauk River Basin (the Sauk River Basin includes the Suiattle and Whitechuck Rivers as well as the Sauk River) (WDFW et al. 1997; Kraemer 1994). In addition, at least 10 tributaries to the mainstem Skagit are suspected of containing spawning native char (WDFW et al. 1997). Genetic analysis of samples of 25 juvenile fish collected from the South Fork Sauk River in 1995 indicated the sample contained only bull trout (Leary and Allendorf 1997).

The Washington Department of Fish and Wildlife (WDFW) rates the status of the lower Skagit exclusive of the Baker River as "healthy" (WDFW 1997). The Service believes the subpopulation fits the Service's "strong" classification category. A classification of "strong" indicates that 1) spawning and rearing occur within the subwatershed; 2) all major life history forms that once occurred are still present in the subwatershed; 3) abundance is stable or increasing; and 4) the population, or metapopulation of which this subwatershed is a part, supports an average of 5,000 individuals or 500 adults. As mentioned above, known or probable spawning occurs in 28 tributaries within the Sauk River subbasin alone.

Native char populations in the Skagit River Basin have been fragmented by a number of hydroelectric dams, which have created several isolated subpopulations. The Gorge, Diablo and Ross Dams on the mainstem Skagit prevent upstream fish passage, and allow only limited, infrequent downstream movement. Two dams on the Baker River, a major tributary to the Skagit, have seriously reduced fish passage in this drainage. The dams have essentially eliminated the anadromous component in those areas. Lake Shannon, formed by lower Baker Dam, has inundated 9 miles of previously free-flowing river and the lower portions of tributaries in the flooded reach, destroying some potential spawning habitat. The upper dam greatly enlarged the original Baker Lake and flooded the lower portions of its tributaries, also destroying some potential spawning habitat (WDFW 1997). The adfluvial life history form has been favored by the operation of the dams, while any anadromous component has likely been lost.

Many of the spawning and rearing areas in the Skagit River Basin are within Forest Service wilderness designation or the North Cascades National Park and the habitat is considered intact. Other areas within this subpopulation, some of which are known spawning tributaries, are negatively affected by forest-management activities. The WDFW/USFS survey forms for four areas within this subpopulation (Sauk River and tributaries; Skagit River below Gorge Dam; Baker Lake and tributaries above the dams; and the Cascade River) all rated forest-management activities as being a negative influence on bull trout (WDW 1992). Some portions of the Sauk River basin are designated as Matrix under the President's Northwest Forest Plan, for example the middle segment of the mainstem Sauk, and the Whitechuck River upstream to the boundary of the Glacier Peak Wilderness. National Forest land designated as Matrix is intended for timber harvest under the Forest Plan.

### Gorge Reservoir

Native char in Gorge Reservoir are isolated by Seattle City Light's Gorge Dam downstream and the Diablo Dam upstream. The primary spawning area for this subpopulation is the lower 2.7 km (1.7 mi) of Steattle Creek and that portion of the Skagit from the reservoir up to Diablo Dam (less than 1 mile). The subpopulation is assumed to be adfluvial (WDFW 1997). There are no population abundance estimates available for this subpopulation; the status is considered unknown by both the WDFW and the Service (WDFW 1997).

The Gorge Reservoir and its tributaries are located within the Ross Lake National Recreational Area and the North Cascades National Park. This subpopulation has been isolated since the completion of the Gorge dam in 1919.

### Diablo Reservoir

Native char in Diablo Reservoir are isolated by the Diablo Dam downstream, and the Ross Dam upstream. Most spawning occurs in Thunder Creek and its tributary, Fisher Creek (WDFW 1997) which is contained entirely within the North Cascades National Park. However, no char adults or juveniles were located upstream during snorkel and electro-shocking surveys (Glesne 1997 in WDFW et al. 1997). Bull trout in this subpopulation are assumed to be adfluvial. The status of this subpopulation is considered unknown by both the WDFW and the Service (WDFW 1997).

This subpopulation is located completely within the Ross Lake National Recreational Area and the North Cascades National Park. This subpopulation has been isolated since the completion of the Diablo Dam in 1930.

### Ross Reservoir

Native char in Ross Reservoir are isolated from other char in the lower Skagit by the Ross Dam. Spawning occurs within many of the lower tributary areas, such as Big Beaver, Little Beaver, Silver, Hozomeen, Lightning and Ruby Creeks, as well as the portion of the upper mainstem Skagit River in Canada (WDFW 1997). This subpopulation is assumed to be mostly adfluvial, with resident and possibly fluvial forms present in the portion of the Skagit that occurs in Canada (WDFW 1997). The status is considered unknown by both the WDFW and the Service (WDFW 1997).

The Ross Reservoir is located in the Ross Lake National Recreational Area, and its tributaries are located within the North Cascades National Park or the Pasayten Wilderness of the Mt. Baker National Forest, with the exception of Ruby Creek and its tributaries, Canyon Creek and Granite Creek, which are located in non-wilderness areas of the Mt. Baker National Forest. The Land Ownership: The Skagit River Basin contains approximately 1,390,900 acres (78 percent) in Federal Ownership (primarily Forest Service and National Park Service); 86,600 acres (5 percent) in State Ownership; and 296,200 acres (17 percent) in private ownership (includes City and County) (USGS 1996).

Non-native brook trout have been planted in high elevation lakes at the headwaters of Ross, Diablo and Gorge Reservoirs. In addition, brook trout have been reported or collected from tributaries to the mainstem Skagit (Bacon Creek), Baker River (Lake Creek), and Ross Lake (Big Beaver Creek, Lightening Creek, Crater Creek and Canyon Creek) (Glesne 1993). In several locations, brook trout and native char were collected together, such as in Lake Creek (tributary to the Baker River), and Crater and Lightening Creeks (tributaries to Ross Reservoir) (Glesne 1993). Hybridization between brook trout and bull trout is considered a threat to the persistence of bull trout.

### Nooksack River Basin:

The mainstem Nooksack and its north fork are 129 km (80 miles (mi.)) in length, and the watershed area is 826 square mi. (Williams et al. 1975). The mainstem has a very slight gradient and crosses a broad, flat valley. Most of this land has been converted from its natural condition. The principal land uses are agriculture, with many dairy farms; rural residential development; small towns; and limited forestry. Levees and riprapped sections for flood protection are common features along the mainstem. The North Fork Nooksack River and its major tributaries have their origins in glaciers and permanent snowfields. The North Fork drains the north side of Mount Shuksan, while Wells and Glacier Creeks drain the north slopes of Mount Baker. The South Fork drains generally lower elevations around Twin Sisters Mountain. The upper North and South Fork watersheds are entirely in forested areas.

Three subpopulations of native char are delineated in the Nooksack River Basin: Canyon Creek; upper Middle Fork Nooksack (above an impassable fish barrier); and the Lower Nooksack (which includes the North Fork, lower Middle Fork (below an impassable barrier), and South Fork). Canyon Creek is tentatively designated as a separate subpopulation because of genetic analysis done in 1995 which showed that the sample of 25 juvenile fish collected were all Dolly Varden (WDFW 1997; Leary and Allendorf 1997).

Land Ownership: Within the Nooksack River Basin, there are approximately 165,500 acres (40 percent) in Federal ownership (Forest Service and National Park Service); 8,200 acres (2 percent) in State ownership; 232,400 acres (56 percent) in private ownership (includes City and County lands); and 5,400 acres (1 percent) in Tribal ownership (USGS 1996).

### Lower Nooksack River

The Lower Nooksack subpopulation includes the North Fork Nooksack, the Middle Fork Nooksack below an impassable fish barrier (City of Bellingham diversion dam), and the South Fork Nooksack. The subpopulation may be composed of anadromous, fluvial and resident life history forms. The status is considered unknown by both WDFW and the Service (WDFW 1997). The remnant status is also unknown (Mongillo 1993).

Native char are known to spawn in areas of the North Fork below Nooksack Falls at about river kilometer (rkm) 105 and in tributary and mainstem areas down to Maple Falls Creek at rkm 80; in

the lower Middle Fork in the canyon area below the City of Bellingham diversion dam; and in the South Fork both above and below the falls at approximately rkm 50 down to Edfro Creek (WDFW 1997). In the South Fork, spawning has been confirmed in Bells Creek, Wanlick Creek, Howard Creek and in mainstem areas. In the North Fork, spawning has been observed in Wells Creek, Deadhorse Creek and in all tributaries and mainstem areas down to Maple Falls Creek (WDFW 1997).

### Canyon Creek

Canyon Creek, a major tributary to the North Fork Nooksack River, harbors a significant population of native char that may include anadromous, resident and fluvial life history forms (WDFW 1997). A natural barrier between river kilometers 7.2 and 8.0 prevents upstream passage of spring chinook salmon and steelhead trout, although native char may be present both above and below the barrier (Frederick, FWS, *in litt.*, 1995). The lower few miles of the Creek are accessible for anadromous fish, and a resident population apparently exists above the Forest Service Bridge near rkm 11 (WDFW 1997). Electrophoretic analysis of samples from 25 juvenile fish collected from Canyon Creek in 1995 indicated that they were all Dolly Varden and none were bull trout (Leary and Allendorf 1997). This supports earlier work that suggested Dolly Varden occur in Canyon Creek. It is unknown whether bull trout also occur in Canyon Creek. The status of this subpopulation is considered unknown by both the WDFW and the Service (WDFW 1997). The remnant status is also unknown (Mongillo 1993).

### Upper Middle Fork Nooksack River

The bull trout population in the Middle Fork Nooksack has been fragmented since the construction in of the City of Bellingham water diversion dam. Bull trout above the dam are reproductively isolated from those fish occurring below the dam. Bull trout above the dam are found in the mainstem and its tributaries: Ridley, Green and Clearwater creeks, as well as several unnamed tributaries (WDFW 1997). Prior to dam construction, the population may have been anadromous, utilizing the upper Middle Fork Nooksack for spawning. In 1993, 1 native char specimen was identified as bull trout by Gordon Haas, using the Haas morphometric method (USFWS 1997). This fish had been collected during electroshock surveys in the mainstem Middle Fork above the diversion dam, near the confluence of Warm Creek and Wallace Creek with the Middle Fork Nooksack (Michael Barclay, Cascade Environmental Services, and *in litt.* 1997). There are no population abundance estimates available for this subpopulation; the status is considered unknown by both the WDFW and the Service (WDFW 1997). The remnant status is also unknown (Mongillo 1993).

## Lewis River Basin:

### Lewis River

The Service identified two subpopulations of bull trout in the Lewis River watershed, both within the North Fork: 1) Yale Reservoir and 2) Swift Reservoir. As of 1997, only migratory (adfluvial) bull trout have been identified (WDFW 1997). The North Fork Lewis River is segregated by three dams (Merwin, Yale, and Swift), which do not allow upstream passage. Limited downstream passage over these dams is assumed to contribute adult bull trout observed in the most downstream reservoir (Merwin). Because no known spawning sites are accessible to bull trout in Merwin Reservoir, the fish are not considered a subpopulation. Bull trout currently occupy 22.1 km (11.9 mi) of the mainstem North Fork Lewis River including identified spawning tributaries (Gifford Pinchot National Forest (GPNF) 1995a). Although Platts et al. (1995) concluded that insufficient information existed to determine the status and trends of bull trout in Swift and Yale reservoirs, WDFW (1997) considers bull trout to be depressed due to "chronically low abundance." Spawning ground surveys conducted since 1988 for the Yale Reservoir subpopulation indicate an annual escapement in Cougar Creek of 22 fish (range 7 to 37).

### Swift Reservoir

The Swift Reservoir subpopulation spawns in Pine and Rush Creeks (WDFW 1997). Radiotelemetry studies conducted on bull trout in Swift Reservoir indicate that migrating adults use both Rush and Pine Creeks with no evidence of reproductive isolation. Bull trout distribution is limited to the lower 1.6 km (1.0 mi) of Rush Creek due to impassable falls, and the expansion of bull trout range within other tributaries in the upper watershed is thought to be limited by unsuitable temperature regimes (Faler and Bair 1996). From 1994 through 1996, 101, 246, and 282 adult bull trout were estimated to migrate annually into Rush and Pine creeks (M. Faler, Service, *in litt.* 1997; GPNF 1995a; WDFW 1997). Unlike the Yale Reservoir subpopulation, bull trout in Swift Reservoir have a larger spawning area and connectivity between spawning grounds (Pine and Rush creeks), which would buffer this subpopulation against stochastic events. For example, after the 1980 eruption of Mt. St. Helens when habitat throughout the Pine Creek drainage was severely altered (Faler and Bair 1996), migratory (adfluvial) bull trout from Swift Reservoir subsequently recolonized Pine Creek.

## Effects of the Action

### Bull Trout

Bull trout populations have been negatively impacted by past and current forest-management practices, and most populations continue to experience the negative effects from these land-use practices and related activities. The WSDNR HCP riparian and wetland conservation strategies that are proposed for the west-side and OESF planning units provide greater assurance of meeting bull trout habitat requirements in the future than current Washington State Forest Practices Rules (WSDNR 1995). However, the Service has determined that the riparian and wetland conservation strategies and other HCP prescriptions may still adversely affect bull trout.

## West-side Planning Units (timber-related activities)

The HCP riparian and wetland conservation strategies for the west-side planning units provides riparian buffers for Washington State Type 1 through Type 4 Waters (perennial streams > 2' wide) which should provide increased bank stability, inputs of large woody debris and detritus, beneficial water temperatures, and sediment filtering on these water types. As long as management activities are minimized and mature forest characteristics are maintained within these riparian management zones, negative impacts to bull trout from management activities inside and outside of the riparian buffers should be reduced. Proposed buffers on Type 5 Waters with unstable areas should provide sufficient protection against mass-wasting and associated sediment inputs, which can adversely affect bull trout and their habitat downstream in larger water types. The HCP states that Type 5 Waters would receive protection in areas of stable slopes where necessary for maintaining important elements of the aquatic ecosystem, in accordance to WSDNR's Forest Resource Plan policies, until research develops better scientific knowledge of the requirements necessary to protect the function of Type 5 Waters. This interim protection for stable Type 5 Waters is discretionary and uncertain and may pose threats to bull trout in downstream water types through potential adverse alteration of habitat and sediment loading.

In addition to the base riparian buffers, the HCP wind buffers added to the windward side of Type 1, Type 2, and larger Type 3 Waters in areas of high blowdown potential would further benefit bull trout habitat. These wind buffers would enhance protection and stability to base riparian stream buffers. The lack of wind buffers on smaller Type 3 and Type 4 Waters may make their riparian buffers more susceptible to windthrow damage, and as a result impact bull trout habitat. Mobbs and Jones' (1995) survey of riparian management zones in coastal western Washington showed windthrow was significantly higher on Type 4 Waters than for all other water types.

The proposed comprehensive road network management plan should reduce negative impacts to bull trout and their habitat, by reducing accelerated erosion and sediment loading of streams. However, because there will actually be a net increase in the number of roads in management areas, the net benefit of the reduction of active roads is difficult to measure. 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 they are stabilized and abandoned (Cederholm and Reid 1987). Only rarely can roads be built that have no negative impacts on streams (Furniss et al. 1991). Given bull trout's sensitivity to increased sediments at certain life stages, areas of new road construction and activity are likely to adversely affect bull trout in these particular locations. Depending on the site of road construction, riparian buffers may act to sufficiently reduce these negative effects. An indirect effect of the net increase in roads within management areas is the elevated accessibility to rivers and streams containing bull trout. The potential for increased harvest pressure and poaching on bull trout populations in these areas is of concern. 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 all west-side planning units with the exception of the South Coast unit where they are not known to occur.

The west-side riparian and wetland conservation strategies are generally expected to result in long-term benefits to bull trout; however, protection for bull trout is not always guaranteed with the west-side riparian and wetland conservation strategies, negative impacts to bull trout are less than with current Washington State Forest Practices Rules. Given the HCP efforts to reduce adverse effects to bull trout from timber harvest and related activities, the Service believes that the application of the WSDNR HCP to the west-side planning units is not likely to compromise the continued existence of bull trout.

#### OESF Planning Unit (timber-related activities)

The HCP riparian and wetland conservation strategies for the OESF provide riparian buffers (interior-core and exterior) on Type 1 through 5 Waters which should be adequate to provide increased bank stability, input of large woody debris and detritus, beneficial water temperatures, and sediment filtering for bull trout habitat. The riparian conservation strategy proposed for the OESF is distinct from that for other HCP planning units because of the unique physical and ecological features of the western Olympic Peninsula (WSDNR 1997). The timber harvest proposed in interior-core buffers should cause minimal impact to bull trout and their habitat, since DNR has committed to harvest in these buffers only when management activities are consistent with the conservation objectives stated in the HCP. These objectives reflect the requirements for maintaining habitat that is capable of supporting viable populations of salmonid species (WSDNR 1996).

Harvest restrictions in riparian buffers would range from moderate (partial-cut) to maximum (no-harvest). In addition, WSDNR is required to utilize maximum harvest restrictions in the first 25 feet of all fishbearing waters (Type 1 through 4 streams), similar to the conservation approach applied to the west-side planning units. This no-harvest buffer would act as added insurance against unforeseen deleterious events and miscalculated experimental management actions which could negatively impact bull trout. The primary concern would be events or actions that might increase sediment loads and erosion, or promote unstable channel morphology. Bull trout would be highly susceptible to these types of events or actions, due to the close association bull trout have to stream substrate and their sensitivity to fine sediment. The use of estimated rooting diameter in establishing this zone should help protect bank stability. The proposed research and monitoring of interior-core buffers should promote proper riparian function in the long-term from the resulting modification of management strategies over time. The experimental design and monitoring of exterior-core wind buffers utilized in the OESF Planning Unit are expected to enhance and protect interior-core buffers through refinements in the future.

Roads can be a major source of management-related sedimentation in streams, especially on the OESF which is prone to mass-wasting. The proposed comprehensive road maintenance plan designed to minimize road construction and activity impacts, and the proposed use of landscape-planning tools to minimize road densities within watersheds, should reduce negative impacts to bull trout and their habitat by decreasing accelerated erosion and sediment loading of streams. Road stabilization and abandonment should be placed as high priorities for all problem roads, since negative impacts to stream habitat continue to occur with their presence. Only rarely can roads be built that have no

negative impacts on streams (Furniss et al. 1991). Given bull trout's sensitivity to increased sediments at certain life stages, and the susceptibility of the OESF to mass wasting, areas of new road construction and activity are likely to adversely affect bull trout in some locations. Depending on the site of road construction, riparian buffers may act to sufficiently reduce the negative effects of sediment and erosion that are associated with these roads.

As noted for the other planning units, an indirect effect of the net increase in roads within management areas is the elevated accessibility to rivers and streams containing bull trout. The potential for increased harvest pressure and poaching on bull trout populations in these areas is of concern. Poaching is known to occur in the OESF on both the Hoh River and Goodman Creek (Mongillo 1993).

Although protection for bull trout is not always guaranteed with the OESF riparian and wetland conservation strategies, negative impacts to bull trout are certainly far less than with current Washington State Forest Practices Rules. Given the HCP commitment to minimize adverse effects to bull trout from timber harvest and related activities, and the commitment to enhance and protect riparian areas/function through research and monitoring, the Service believes that the application of the DNR HCP to the OESF Planning Unit is not likely to compromise the continued existence of bull trout. The OESF riparian and wetland conservation strategies are generally expected to result in long-term benefits to bull trout.

#### Nontimber Resource Activities

Forest-land-management activities unrelated to timber harvest can adversely affect bull trout. These nontimber resource activities include; construction of roads, powerlines, and pipelines as a result of rights-of-way, special forest products collection, valuable materials extraction, oil and gas exploration, grazing, electronic site construction, the lease of ORV areas, and the construction and use of recreational site. Within each of the HCP Planning Units, some of these nontimber resource activities are known to occur. Additional riparian and aquatic degradation resulting from the construction and use associated with these nontimber resource activities, present the greatest potential to adversely affect bull trout.

Timber removal may occur during some of these nontimber resource activities. However, this removal would be subject to the same policies, laws, and regulations associated with timber harvest activities within the HCP Planning Units. The riparian and wetland conservation strategies proposed for the west-side and OESF Planning Units would also apply to these nontimber resource activities.

The act of collecting special forest products is not anticipated to adversely impact bull trout based on the current level of activity and modes of collection that are utilized (little to no mechanized equipment). In addition, many collections are considered by WSDNR as timber-harvest activities (Christmas greens and trees, certain medicinals, firewood), and would therefore be subject to the riparian and wetland conservation provisions of the HCP in the west-side and OESF Planning Units.

Valuable material extraction (sand and gravel extraction and mineral mining) occurring adjacent to streams can have profound impacts to stream habitat. Depending on the site of extraction, this activity can create unstable channel morphology, decreases in gravel recruitment for spawning fish, toxic water conditions, and increases in sedimentation. In 1996, less than 1,000 acres of DNR-managed land was affected by sand and gravel extraction, much of which was covered under commercial contracts. Currently, all commercial contracts are subject to review under SEPA. Water quality in the vicinity of pits must meet the surface and groundwater standards described in WAC 173-201A and WAC 173-200, respectively, in order to receive a National Pollution Discharge Elimination System permit from the department of Ecology. Although the current level of activity is considered to have minimal effects to bull trout, extractions are likely to increase over time. Gravel and sand extraction sites located near bull trout streams or associated riparian areas, could have negative impacts on bull trout in these particular drainages. In most cases, riparian buffers proposed by the HCP in conjunction with the objective to maintain or restore salmonid values, should be adequate to minimize the impacts to bull trout. Where operations occur in areas of steep gradient with unstable slopes or near stream areas with little to no riparian vegetation, these restrictions may not be adequate to buffer impacts to bull trout.

Some level of sand and gravel extraction may currently occur within riparian, wetland, and flood plain areas. Those activities may be covered so long as they do not occur within the aquatic lands (between the ordinary high-water marks) which are not included in the HCP area. Only the "forest lands" are included as HCP lands. Future contracts, leases, and sales are not authorized for take, and would be reviewed in an annual meeting with the WSDNR and the Service. The plan of operations for sand and gravel extraction would be reviewed to ensure compliance with the commitments of the HCP. The HCP commitment regarding activities in the Riparian Management Zone (including the 100-year flood plain) states that forest-management activities that maintain or restore the quality of salmonid habitat shall be allowed. The primary objectives with respect to wetlands are "no overall net loss of naturally occurring wetland acreage and function" and "maintain hydrologic function." Future extraction facilities could not be established in wetland areas and be consistent with these objectives. Future activities planned for the riparian zone and riparian buffers could not include sand and gravel extraction because of the inconsistency with the primary objective to maintain and restore salmonid habitat. Limiting this activity within the riparian and wetland areas will provide benefits to bull trout. Even though take resulting from future actions above the 1996 level of activity is not covered by the permit, the Service remains concerned about existing activities because some level of extraction could currently be occurring in riparian areas. Only the 1996 level of impact, less than 1,000 acres, is analyzed in the BO and CO and authorized for take upon listing of bull trout.

The Service reviewed information concerning sand and gravel extraction contracts on DNR-managed lands in order to determine that these activities within riparian areas and the 100-year flood plain are sufficiently minimized and mitigated to allow a 70 to 100-year ITP. DNR currently has up to 40 such contracts for the sale of sand or gravel, with 15 to 20 contracts in forested areas, affecting up to 1,000 total acres. Sales under these contracts are subject to the State Environmental Policy Act (SEPA) and to WSDNR's SEPA policy for the elimination of conditions that are hazardous to fish. Sand and gravel extraction are subject Federal section 404 permits administered by the U.S. Army Corps of

Engineers and to water quality permits administered by the Washington Department of Ecology. Standards for these permits may not be adequate for bull trout.

WSDNR has provided additional information concerning the location of such activities, and the extent of their impacts to anadromous fish and other aquatic and riparian wildlife. This information was necessary for the Service to conclude that extraction in the amount stated above, would be adequately minimized and mitigated for in the HCP, and would not appreciably reduce the likelihood of the survival and recovery of anadromous salmonid species in the wild.

Recreational placer mining for gold (panning and dredging) is growing in popularity and may pose a future threat to bull trout. In 1996, only 1 or 2 permits were active, and at this level it is not likely to adversely affect bull trout. All miners are required to possess the 'Gold and Fish' pamphlet (WDF and WDW 1987), which lists recreational mining restrictions to protect fish and stream habitat. This document is currently being updated, but the basic restrictions still remain. Restrictions include no streambank excavation, no damming of flowing streams, no prospecting in fish spawning areas, and no pit abandonment which may trap fish. This type of mining, when using suction dredges, has the potential to greatly alter instream habitat and resuspend fine sediments in a localized area even with these restrictions. Changes in the location and level of activity under each permit, as well as the cumulative effect of dredging a length of stream over time should be monitored closely to track their effects on bull trout. If any individual intends to engage in more than just panning, they are required to obtain a hydraulic project approval (HPA) permit from the WDFW. There are currently no commercial placer mines, nor commercial placer prospecting leases, or mining contracts on WSDNR-managed lands.

Water quality in the vicinity of mines must meet the surface and groundwater standards described in WAC 173-201A and WAC 173-200, respectively, in order to receive a National Pollutant Discharge Elimination System permit from the Department of Ecology. There are currently no active open-pit metallic or open-pit industrial mineral mines or underground mines on DNR-managed land.

The FEIS stated that the only activity occurring in 1996 under mining contracts was exploration. Because of this provision, all new mining activities would be subject to site-specific Service review and would require a permit amendment and accompanying Biological Opinion if additional take were expected to result. Therefore; no take for mining is analyzed in this BO/CO.

There is currently no oil or gas production in the area. There is one well that is being drilled at this time, but most lease activity involves exploration. This well is located in an area that does not likely contain a bull trout population (Cowlitz River drainage). Current exploration is not likely to affect bull trout, since it involves primarily "thumping" and rarely explosives. Exploration is also restricted from within 200 feet of any Type 1 through Type 4 Waters, making negative impacts to bull trout or bull trout habitat unlikely.

The current level (number and use) of recreational sites is considered to have minimal impact on bull trout populations as a whole; currently there are 1,482 acres of leased recreation sites, Natural Resource Conservation Areas, and Natural Area Preserves on WSDNR-managed lands west of the

Cascades. However, on a case-by-case basis some populations may be extremely vulnerable to harvest pressures as a consequence of the location of certain recreational sites. Not only are a portion of recreational sites associated with riparian areas, but some may be located near bull trout staging and spawning sites where bull trout seasonally congregate. Clark and Gibbons (1991) believe recreation will usually have minor negative effects on fish habitats. They state the biggest recreational effect is likely to be harvesting of fish populations. Bull trout are aggressive predators and readily take lures and bait, increasing their susceptibility to angling (Ratliff and Howell 1992). However, harvesting of bull trout at these recreation sites is likely minimal because of the small acreage affected, not all of which is in riparian areas.

Off-road-vehicle use associated with recreational sites, can also adversely affect bull trout by increasing erosion and sedimentation in streams. Currently this activity affects a relatively small area of WSDNR-managed lands and should have minimal impact to bull trout populations as a whole. Expansion of off-road-vehicle trail networks in the riparian areas of bull trout streams, would likely increase the overall negative impact to bull trout. The Service notes that the future placement of any new recreational sites would be outside of riparian zones and in locations that avoid access to bull trout spawning and staging areas. In addition, the Service notes WSDNR's efforts to close or move existing recreational sites that are having notable effects to bull trout or bull trout habitat. These actions would further protect bull trout from recreational site impacts.

New roads and elevated road use associated with many nontimber resource activities, may negatively impact some bull trout habitat. Road construction and road use impacts to bull trout would be the same as those described under timber-resource activities. Some nontimber-resource activities (pipelines, powerlines, electronic sites) would create severe road impacts primarily during the project's development and construction phase, while other activities (special forest products collection, valuable material extraction, oil and gas exploration, use of recreational sites) would likely create low to severe impacts which may occur seasonally to year-round. The comprehensive road management plans and landscape planning should minimize impacts from these nontimber resource activities on the west-side and OESF Planning Units. Depending on the site of road construction, proposed riparian buffers may act to sufficiently absorb any additional sedimentation and erosion.

At this time, nontimber-resource activities on WSDNR-managed lands are not likely to compromise the continued existence of bull trout, based on the current levels of activity. WSDNR has committed to manage these activities in accordance with the provisions of the HCP, and has committed to address levels of impact to species that go above 1996 levels. Nontimber-resource activities will be reviewed jointly by the Service and WSDNR on an annual basis to determine whether the associated level of take is expected to increase and require an amendment.

#### Cumulative Effects

Cumulative effects include the effects of future State, local, or private actions that are reasonably certain to occur in the action area considered in this BO and CO. Impacts from future Federal actions

that are unrelated to the HCP are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

For the purpose of assessing cumulative effects, the action area includes the portion of Washington west of the Cascade. The HCP includes lands managed by WSDNR within the action area. Activities considered in this cumulative effects include those which may occur on lands not managed by WSDNR or Federal agencies, or which are not permitted by a Federal agency.

In general, WSDNR-managed lands include large parcels as well as smaller parcels of land. The WSDNR-managed lands covered by the HCP are widely distributed within the identified action area. Due to this wide distribution of WSDNR-managed lands within the landscape of western Washington, actions on other lands within this larger area may have cumulative effects on bull trout. This cumulative effects analysis will address broad categories of nonfederal actions on lands not managed by WSDNR, which are reasonably certain to occur and general trends.

Cumulative effects analysis from the January 27, 1997, BO are hereby incorporated by reference. Although identification of individual future nonfederal actions is not discussed, the types and amounts of potential actions which may occur are identified and impacts in relation to the HCP are discussed. Three broad categories of impacts, based upon the types of impacts posed to species discussed in this opinion, are described including: (1) growth and development; (2) forest management; and, (3) other management actions. Growth and development refer to permanent loss of suitable habitats. Growth and development actions include suitable habitat conversion for urban, other residential, commercial, or agricultural uses, and for structures or networks providing infrastructure support such as hydropower and irrigation diversions, roads, and power-lines. Forest management refers to temporal and spatial changes from other State or private actions in suitable habitats across the landscape in the action area. Examples include age or structural changes resulting from harvest and other forest-management actions such as planting, pruning, fertilizing, forest growth, and wildland fires. Other management actions refer to actions within suitable habitats which impact habitat structures or composition such as recreation, grazing, fishing, and mining. Each of these categories of impacts may result in the loss of secure habitat for species using suitable habitats within the action area. Examples of this include physical displacement, exposure to contaminants, and declining air and water quality.

### Summary of Cumulative Effects

Actions on private lands and other non-WSDNR-managed lands, such as urban development especially the increase of impermeable surfaces, logging, road building, and recreation will continue to contribute to habitat degradation and loss which will affect the species. The development of private lands and associated loss of habitats is anticipated to continue. Habitat fragmentation, habitat loss, and habitat degradation are expected to continue as development creates a demand for new public services and facilities. Disturbances caused by human development have, and will continue to have, a cumulative impact on bull trout through loss and degradation of habitat.

## CONCLUSION

After reviewing the current status of the listed Columbia Basin DPS of bull trout in Washington State, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects; it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of bull trout. No critical habitat has been designated for this species at this time; therefore, none will be affected.

After reviewing the current status of the proposed Coastal/Puget Sound DPS, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects; it is the Service's conference opinion that the proposed action is not likely to jeopardize the continued existence of bull trout.

## INCIDENTAL TAKE STATEMENT

Section 9 of the Act, as amended, 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. 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.

This incidental take statement applies only to the listed Columbia River and the proposed Coastal/Puget Sound distinct population segments of the bull trout located west of the Cascade Crest. Other listed species were previously addressed in the January 1997, Biological Opinion. Should Washington State Department of Natural Resources request that any of the currently unlisted species be added to the permit, formal consultation under section 7 of the Act will be reinitiated, at which time a definitive incidental take statement would be issued for the species, provided the proposed action is in compliance with section 7(a)(2) of the Act. The Incidental Take Statement for the Coastal/Puget Sound DPS does not become effective unless the listing is final and the Service adopts this Conference Opinion as a Biological Opinion.

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. The Service has a continuing duty to regulate the

activity covered by this Incidental Take Statement. If the Service: (1) Fails to require the permittee 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

The Service expects that this action is likely to result in incidental take of bull trout in the form of harm or harassment due to effects from timber harvest and related activities, including road building, stream crossings, canopy removal, and potential increases in sediments and temperature which may adversely impact bull trout at a number of life-history stages. The proposed Service 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.

The Service anticipates 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 WSDNR; (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) There is 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 quality of habitats provided/impacted for the Columbia River Basin and Coastal/Puget Sound distinct population segments.

Therefore, even though the Service expects incidental take to occur from the effects of the action, the best scientific and commercial data available are not sufficient to enable the Service 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. Consequently, take is estimated based on the quantity of habitat likely to be impacted in the 70 to 100-year period. In some cases, this impact may adversely affect bull trout sufficiently to result in harm or harassment.

Selective harvest in riparian buffers is expected to occur at any given location only a maximum of once per rotation. While this could vary between 60 and 140 years depending on the management zone, the Service assumed this would average 100 years. Harvest in many older riparian stands will be limited by provisions of the HCP with respect to functional habitat for salmonids. However, it is

difficult to predict how every stream would be addressed at this point in time, so the Service has relied on its best assessment of a worst-case scenario. The Service expects only about 1 percent of riparian stands to be entered per year at a maximum.

On the OESF, some entry into the 88,141 acres of riparian buffers is expected. Interior buffers are to be managed in a more-conservative manner and little take is expected to result from those actions. Of the 56,716 acres of interior buffer, about 20,000 acres are over 30 years old and would be subject to some selective harvest. This could result in 286 acres per year subject to single tree removal or other conservative treatments. Of the 31,425 acres of exterior buffer, only about 11,850 are over 30 years old. This could result in selective harvest of about 169 acres of exterior buffer per year on average. The Service estimates that up to 2,000 acres of thinning per year may occur in riparian buffers on the OESF. The OESF is estimated to have 121 miles of stream that contain bull trout (WSDNR 1997).

In the west-side planning units, 133,500 acres are in riparian buffers bordering roughly 380 miles of fish bearing streams that have been estimated to contain bull trout. Approximately one-quarter to one-third of those acres are located within the range of the listed Columbia River DPS. This equates to approximately 91 miles of fish-bearing streams estimated to contain bull trout in the Columbia River DPS. The remaining 289 miles of fish-bearing streams estimated to contain bull trout is within the Coastal/Puget Sound DPS (WSDNR 1997). About 60 percent, or 80,000 acres of the 133,500, are estimated to be over 25 years of age and might be subject to selective harvest during the HCP period (1,145 acres per year). About 53,000 acres may be subject to thinnings during the HCP period (760 acres per year).

In both the OESF and the other west-side planning units, about 10-20 percent of riparian buffers are in deciduous forest. While some of this is naturally deciduous and should not be altered, some of these stands could be converted to conifer stands for the long-term benefit of salmonids. Short-term impacts and associated take are expected to result from restoration activities on about 5 percent of riparian areas, or 4,407 acres of the OESF and 6,675 acres of other west-side planning units. Together, this should average no more than about 11,080 acres or 158 acres per year.

The Service estimates that of the riparian areas entered each per year, about 75 percent will be in yarding corridors. Fifteen percent of the riparian area associated with those entries would be removed to create the corridors each year. Of the 221,641 acres of west-side riparian buffers, 6,650 acres might be subject to some level of harvest or thinnings within the buffer or in adjacent stands during a given year. This assumes two mid-rotation treatments during a 100-year rotation. If only about 5,000 acres of this required use of yarding corridors and only 15 percent of that was in corridor itself, then no more than 750 acres would be placed in yarding corridors in any given year. This would actually be somewhat less where previous yarding corridors are used during subsequent entries.

Construction and maintenance of roads are anticipated to adversely impact bull trout sufficiently to result in harm or harassment, particularly during the early life-history stages. The Service anticipates incidental take in the form of harm of bull trout associated with the construction and maintenance of

29 miles of roads per year, as a result of implementing the HCP. This estimate is based on the addition of one road for every section of west-side land during the 70-year period. We also anticipate some incidental take in the form of harm associated with upgrading or removing 30 to 60 miles of road per year.

The rationale for the above estimates is based on the assumption that bull trout occur throughout lands managed by Washington Department of Natural Resources. Because bull trout distribution is not continuous, only a fraction of the acres and activities described above have the potential to impact bull trout. Take is generally expected to be avoided; but, if it occurs, only a minimal number of individuals would likely be affected. Bull trout occur in limited areas, especially during early life stages; and, should impacts sufficient to result in take occur, it would be rare and localized. Therefore, the number of individuals likely to be subject to disturbance at any particular time, or the numbers of individuals which may be taken, is low, yet unquantifiable. Estimates of take are in terms of the amount of habitat impacted to the extent that take could possibly occur.

### EFFECT OF THE TAKE

In the accompanying Biological Opinion/Conference Opinion, the Service determined (for the following reasons) that this level of anticipated take is not likely to result in jeopardy to these species or the destruction or adverse modification of critical habitat.

Take in the form of harm and harassment may occur. Unknown or known redds may be subject to timber-harvest impacts during the incubation period, or young may be subject to impacts during the subsequent rearing period. Individuals may be subject to impacts which may inhibit their ability to survive and reproduce. However, sufficient amounts and quality of habitat are expected to be present to provide bull trout with an opportunity to maintain and increase their numbers within the Action Area.

It is the Service's opinion that minor impacts to a small amount of habitat across the landscape, in association with the potential increase in habitat quality and, subsequently, numbers of individuals within the Action Area, is within acceptable levels. This corresponds to a small percentage of the bull trout found within the range of the species and within the distinct population segments. Further, any take of individuals that may occur as a result of the proposed action would only affect a small portion of the subpopulations in the distinct population segments. The effects will be minimal, because of the conservation measures. However, these minimal effects cannot be precisely defined. The proposed action will only affect a small percent of the population as a worst-case scenario.

Several factors indicate that the HCP is not likely to jeopardize the continuing existence of the listed Columbia River DPS of bull trout for that portion west of the Cascade Crest. First, these lands contain only limited segments of bull trout stocks and the species range extends well beyond the HCP Planning Area. Second, the Service maintains the ability to require additional mitigation in the event of a substantial and material decline in the status of the species caused by

the HCP. The Service may also terminate the permit as provided in regulations and the Implementation Agreement. Lastly, the Service believes that 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 which play an important role in the long-term protection of bull trout on WSDNR-managed lands.

Several factors indicate that the HCP is also not likely to jeopardize the continuing existence of the proposed Coastal/Puget Sound DPS of bull trout. Similarly, these lands contain only a limited segments of bull trout stocks and the species range extend well beyond the HCP lands. Within the range of the Coastal/Puget Sound DPS only 10.4 percent of the acreage is owned by the State, while 15.2 percent lies within the boundaries of several national parks, 22 percent are on national forests, 45 percent are in private ownership, and the remaining acreage is owned by Tribal, city/county, and others (USGS 1996). In addition, the Service maintains the ability to require subsequent mitigation in the event of a substantial and material decline in the status of the species is caused by implementation of the HCP. The Service also has the option to terminate the permit as provided for in regulations and the Implementing Agreement. The Service believes this unlikely, since 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 which will play an important role in the long-term protection of bull trout on WSDNR-managed lands.

For the reasons stated in this opinion, implementation of the HCP should adequately address bull trout by providing for the restoration and protection of bull trout habitat, and thus, would contribute to the conservation of the species/distinct population segments.

#### REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measure necessary and appropriate to minimize incidental take:

Any incidental take of listed bull trout west of the Cascade Crest must comply with all the terms and conditions of an Incidental Take Permit issued to WSDNR under section 10(a) of the Act, including the provisions of the HCP and Implementation Agreement submitted with the WSDNR's application (PRT 812521).

If this Conference Opinion is adopted as a Biological Opinion following a listing or designation, these measures, with their implementing terms and conditions, will continue to be nondiscretionary. Compliance with the HCP is ensured even in the absence of the listing of the Coastal/Puget Sound DPS.

## TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the WSDNR must comply with the following term and condition, which implements the reasonable and prudent measure described above. This term and condition is nondiscretionary.

1. The Incidental Take Permit (PRT 812521) issued to WSDNR in accordance with section 10(a) of the Act as evaluated in this Biological Opinion, must continue to require compliance with all terms and conditions of the HCP and IA.

## CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans or to develop information. The Service offered the following conservation recommendations in the January 27, 1997, Biological Opinion, of which the following recommendations apply to bull trout:

The Service recommends, for both the Columbia River DPS of bull trout west of the Cascade Crest and Coastal/Puget Sound DPS of bull trout, that the following conservation measures contained in the original BO continue to be implemented:

1. The Service should provide technical assistance to WSDNR through the term of the permit and provide technical advice on monitoring and other biological issues associated with implementation of the HCP, as well as assist in the development of conservation strategies such as the comprehensive Road-management Plan.
2. The Service should conduct regular and frequent compliance monitoring, including review of the periodic reports.
3. The Service should assist with coordination among other State and Federal agencies. This should include, but not be limited to, providing WSDNR with habitat data to be used in assessing WAU targets and their relative priorities, as well as location data for owl nest sites.
4. The Service should present WSDNR with guidelines to avoid destruction of habitats and/or disturbance to species which could result in incidental take of species beyond 1996 levels, in order to ensure that incidental take of species from nontimber resource activities remain at 1996 levels.

5. The Service should work cooperatively with WSDNR to develop and implement a public education program on the positive effects of road closures for fish and wildlife, water quality, and other forest resources.
6. The Service should work cooperatively with WSDNR in development of the comprehensive road management plan to: (1) prioritize and implement seasonal restrictions on open roads which would minimize mortality risk, habituation, and displacement of wildlife; (2) incorporate road construction and reconstruction with minimum design specifications to facilitate eventual reclamation; and, (3) identify potential single purpose road construction and reconstruction for timber sales.

With respect to bull trout, the Service offers the following additional conservation recommendations:

7. The Service should encourage the development of Habitat Conservation Plans and other similar conservation efforts on State, Tribal, and private lands within the range of the bull trout, which will allow for increased conservation benefits that tie directly to efforts on Federal lands in providing a comprehensive management strategy to conserve bull trout populations. Conservation activities will be necessary to improve the connectivity between populations, and to restore habitat within population areas.
8. The Service should encourage the implementation of adequate riparian buffers on State, Tribal, and private lands for any type of stream that has the potential to impact bull trout, but particularly the ephemeral or intermittent streams that may deliver water, sediment, and wood to bull trout streams, for which protection under Washington State Forest Practice Rules in their current state are particularly inadequate for the protection and restoration of bull trout.
9. The Service should encourage development and implementation of a comprehensive road-network management plan on State, Tribal, and private lands. Generally, bull trout thrive in landscapes where impacts from roads are minor. Roads within riparian areas, roads with chronic sediment problems, and roads that are likely to fail should be upgraded, relocated, or removed.
10. The Service should encourage and seek opportunities to implement habitat-restoration efforts on State, Tribal, and private lands that have already been negatively impacted from timber-harvest activities or other habitat-degrading actions. Restoration activities such as decommissioning roads, removing impassible culverts, stabilizing areas prone to erosion, and replanting of riparian areas, will help restore degraded bull trout habitat. Although preventing habitat degradation is easier and less-costly than restoring habitat after it has been impacted, the Service should still seek future opportunities on State, Tribal, and private lands that may have been degraded in the past and offer opportunities for improvement, in conjunction with State, Tribal, and private partners and cooperators.

11. The Service should ensure that the status and trend of the small, isolated stocks of bull trout within the action area are monitored.
12. The Service should incorporate channel-migration zones and channelized debris-flow zones into its consideration during Habitat Conservation Plan negotiation and development, and whenever adjustments are made to riparian strategies as part of adaptive management or as suggested amendments by the permittee.

#### REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the action outlined in the request for the listed Columbia River DPS of 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.

This concludes the conference for the action outlined in the request for the proposed Coastal/Puget Sound DPS of bull trout. You may ask the Service to confirm the Conference Opinion as a Biological Opinion issued through formal consultation if the distinct population segment is listed. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the Conference Opinion on the project and no further section 7 consultation will be necessary.

After listing of the species as threatened and any subsequent adoption of this Conference Opinion, the Federal agency shall request reinitiation if: (1) the amount of or extent of incidental take is exceeded; (2) new information reveals effects of the agency action may affect the species or critical habitat in a manner or to an extent not considered in this Conference Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the species or critical habitat that was not considered in this Conference Opinion; (4) a new species is listed or critical habitat designated that may be affected by the action.

The Incidental Take Statement provided in this Conference Opinion does not become effective until the species is listed and the Conference Opinion is adopted as the Biological Opinion issued through formal consultation. At that time, the project will be reviewed to determine any take of the species has occurred. Modifications of the opinion and incidental take statement may be appropriate to reflect that take. No take of the species may occur between the listing of a species and the adoption

of the Conference Opinion through formal consultation, or the completion of a subsequent formal consultation.

If you have any questions regarding this Biological Opinion/Conference Opinion, please contact Timothy Romanski at (360) 753-5823 of this office.

TR/jko

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