

U.S. FISH AND WILDLIFE SERVICE

BIOLOGICAL OPINION

for

**Environmental Protection Agency's Proposed Approval of the Revised
Washington Water Quality Standards for Designated Uses, Temperature,
Dissolved Oxygen, and Other Revisions**

USFWS Reference: 13410-2007-F-0298

Appendix B: STATUS OF THE SPECIES AND CORE AREA SUMMARIES

APPENDIX B

STATUS OF THE SPECIES AND
CORE AREA SUMMARIES

OLYMPIC PENINSULA CORE AREAS

Dungeness River Core Area

The Dungeness River core area includes the Dungeness and Grey Wolf Rivers, associated tributaries, and estuary. The Dungeness River core area is one of two core areas in the Olympic Peninsula Management Unit that are connected to the Strait of Juan de Fuca.

Bull trout occur throughout the Dungeness and Gray Wolf Rivers downstream of impassable barriers, which are present on both rivers. They also occur in the Dungeness River estuary and Gold Creek, a Dungeness River tributary. Char were sampled in the Dungeness River below the falls. One Dolly Varden was identified in the samples; the rest were bull trout (Spruell 2006). In an earlier genetic analysis, 50 char sampled upstream of the barrier falls at river mile 24 were all Dolly Varden (S. Young, WDFW, *in litt.* 2001). It is likely that the Dolly Varden sampled below the falls was a fish that passed over the falls and was not able to return to its home range above the falls.

Fluvial and anadromous life history forms of bull trout occur in the Dungeness River core area. Mainstem rivers within the core area provide spawning, rearing, foraging, migration, and overwintering habitats. The estuary also provides important foraging habitat. During a study in 2006 and 2007 by the Jamestown S'Klallam Tribe that targeted capture of salmon smolts, a number of bull trout were incidentally captured in fyke nets located in estuary feeder channels and during beach seining. These fish ranged in size from 117 to 380 millimeters and were often captured in the midst of juvenile pink and chum salmon and post larval surf smelt.

The status of the bull trout core area population is based on four key elements necessary for long-term viability: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity (USFWS 2004b).

Number and Distribution of Local Populations

Two local populations have been identified: 1) middle Dungeness River up to river mile 24 and tributaries, including Silver, Gold, and Canyon Creeks, and 2) Gray Wolf River to confluence with Cameron, Grand, and Cedar Creeks. With only two local populations, bull trout in this core area are considered to be at increased risk of extirpation and adverse effects from random naturally occurring events.

Adult Abundance

From late August through November 2004, comprehensive redd surveys were conducted for the first time in the Gray Wolf and middle Dungeness Rivers. These surveys combined walking surveys with radio telemetry tracking. Eight redds were observed in the middle Dungeness, above the confluence with the Gray Wolf River and below the impassable barrier, and 32 redds were observed in the Gray Wolf River local population area. This probably represents approximately 90 percent of the redds in the two local populations (L. Ogg, USFS, pers. comm.

2004b). In 2005, a late spawning run of bull trout in the area around the confluence of the Gray Wolf and Dungeness Rivers was observed. Further study and analysis is needed to determine whether this group of spawners comprises a third local population.

Other than the information from the surveys described above, little is known about adult abundance in the Dungeness River core area. This is mainly due to little survey effort (until recently) and the difficult access to the upper watershed. However, the Dungeness River core area probably supports at least 500 but fewer than 1,000 adults. With fewer than 1,000 adults, this population is considered to be at increased risk of genetic drift.

Productivity

Bull trout in the Dungeness core area are considered at risk of extirpation until sufficient information is collected to properly assess the productivity of this core area.

Connectivity

A number of barriers to fish movement and migration in the Dungeness River core area are due to improperly sized or installed culverts throughout the core area. Connectivity between the Dungeness River and its floodplain has been eliminated by diking to prevent flooding. Migration during late summer and early fall can be blocked by reduced flows from water diversions for irrigation in the lower Dungeness watershed. Migration at certain times of the year may be blocked by the WDFW fish hatchery collection rack on the lower Dungeness River. In addition, the hatchery water intake is a complete barrier to upstream fish passage in Canyon Creek. Despite these alterations, migratory bull trout persist in both local populations. Bull trout in this core area have diminished risk of extirpation from habitat isolation and fragmentation.

Changes in Environmental Conditions and Population Status

Since the bull trout listing, Federal actions occurring in the Dungeness River core area have caused harm to, or harassment of, bull trout. However, many of these actions will provide long-term benefits to bull trout habitat. These actions include statewide Federal restoration programs that include riparian restoration, replacement of fish passage barriers, and fish habitat improvement projects; federally funded transportation projects involving repair and protection of roads and bridges; and section 10(a)(1)(B) permits for Habitat Conservation Plans (HCP) addressing forest management practices. Capture and handling during implementation of section 6 and section 10(a)(1)(A) permits have directly affected bull trout in the Dungeness core area.

The number of non-Federal actions occurring in the Dungeness River core area since the bull trout listing is unknown. Activities conducted on a regular basis, such as emergency flood control, development, and infrastructure maintenance, affect riparian and instream habitat and probably negatively affect bull trout.

Threats

Threats to bull trout in the Dungeness River core area include:

- Past logging and logging-related activities, such as roads, have degraded habitat conditions (e.g., fisheries, water quality, and connectivity) in the upper watershed, which has a naturally unstable geology with steep slopes that are susceptible to mass wasting.
- Past and current agricultural practices and the over appropriation of water rights negatively affect instream flow, increase water temperatures, and increase sediment deposition in the streambed. Other impacts include blocked migration, decreased juvenile rearing areas, false attractions of bull trout to other streams, transportation of pollutants in irrigation flows, reduced amounts of large woody debris, and loss of estuarine rearing and foraging habitat.
- Water quality has been degraded by municipal, agricultural, and industrial effluent discharges and development.
- Residential and urban development along the shore that include intertidal filling, bank armoring, and shoreline modifications have caused the loss of extensive eelgrass meadows in the nearshore.
- Bull trout are susceptible to incidental mortality associated with fisheries that target coho and steelhead at the mouth of the Dungeness River for approximately 74 days per year. Although recreational fishing for bull trout has been closed in the Dungeness River core area since 1994, incidental catch does occur, particularly during the early portion of the winter steelhead fisheries (NMFS, *in litt.* 2004).
- Predation by eagles and ospreys has caused the mortality of several fish in the Dungeness River that were tagged during the 2004 telemetry study (L. Ogg, USFS, pers. comm. 2004a).

Elwha Core Area

The Elwha core area includes the Elwha River and its tributaries including Boulder, Cat, Prescott, Stony, Hayes Godkin, Buckinghorse, and Delabarre Creeks; Lake Mills and Lake Aldwell; and the estuary of the Elwha River. There is no upstream passage at either the Elwha Dam or Glines Canyon Dam, which fragment the core area. The Elwha River core area is one of two core areas in the Olympic Peninsula Management Unit that are connected to the Strait of Juan de Fuca.

Anadromous, fluvial, adfluvial, and resident life history forms likely occupy the Elwha core area. Until the recent Olympic National Park bull trout tracking and telemetry project, there was little available information on fish movement and life history expression. Spawning has now been documented in the area directly above Lake Mills. It is likely that additional spawning sites

above Lake Mills occur although they have not yet been documented. There is little habitat suitable for bull trout spawning and incubation downstream from the dams. Elevated stream temperatures in the mainstem Elwha River, due to the two dams and the lack of suitable tributary habitat, likely limit success of reproducing bull trout in both the lower and middle reaches of the Elwha River (S. Brenkman, pers.comm. 2007).

The status of a bull trout core area population is based on four key elements necessary for long-term viability: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity (USFWS 2004b).

Number and Distribution of Local Populations

Only one local population has been identified in the Elwha core area. Although bull trout have been documented throughout the upper Elwha, the recent telemetry project has identified several canyon reaches in the upper Elwha that may be complete or partial barriers to fish movement, and future surveys may identify additional local populations. The Little River has been identified as a potential local population, based on the availability of suitable habitat and the likelihood that this high quality spawning habitat will be available to migratory bull trout once the Elwha and Glines Canyon Dams are removed. With only one local population, bull trout in the Elwha core area are considered at increased risk of extirpation and adverse effects from random naturally occurring events.

Adult Abundance

Bull trout occur in moderately low numbers between the two dams. Both juvenile and adult bull trout have been captured in the upper and middle Elwha River and in Lake Aldwell below Glines Canyon Dam. At the time of listing, bull trout were rare (i.e., one or two fish per year) in the Elwha River below the Elwha Dam. Thirty-one bull trout, ranging in size from 250 to 620 millimeters, were documented in this section of the river during snorkel surveys in 2003 (G. Pess, NMFS, *in litt.* 2003). This number is likely related to increased survey effort rather than to an increase in numbers of bull trout in the lower Elwha River (S. Brenkman, Olympic National Park, pers.comm. 2007).

There is no information on trends in abundance of Elwha River bull trout, and the status of Elwha River bull trout is unknown. Consequently, until sufficient information is available regarding adult abundance, the bull trout population in the Elwha core area is considered at risk of genetic drift.

Productivity

There has been no monitoring of the bull trout in the Elwha River, and bull trout in the Elwha core area are considered at risk of extirpation until sufficient information is collected to properly assess productivity.

Connectivity

The Elwha and Glines Canyon Dams in the Elwha River fragment the populations of bull trout in the Elwha core area. Bull trout are found downstream of both dams, but there is no upstream passage. Restoration of connectivity in the Elwha River will be required to allow full expression of the bull trout's migratory life history forms, including anadromy. The dams are scheduled for removal in the future.

Changes in Environmental Conditions and Population Status

Since the bull trout listing, Federal actions occurring in the Elwha River core area have resulted in harm to, or harassment of, bull trout. These actions include statewide Federal restoration programs that include riparian restoration, replacement of fish passage barriers, and fish habitat improvement projects; federally funded transportation projects involving repair and protection of roads and bridges; and Section 10(a)(1)(B) permits for HCPs addressing forest management practices. Capture and handling during implementation of section 6 and section 10(a)(1)(A) permits have directly affected bull trout in the Elwha core area.

The number of non-Federal actions occurring in the Elwha River core area since the bull trout listing is unknown. However, because most of the core area is in Federal ownership, few non-Federal actions likely have occurred in this core area.

Threats

Threats to bull trout in the Elwha core area include:

- Two dams in the Elwha River prevent connectivity, increase injury and mortality of bull trout attempting to navigate through the dams, reduce spawning gravel recruitment, prevent recruitment of fluvially transported sediment to the estuary, affect the beach and eelgrass beds in the estuary, and increase water temperatures below the dams.
- Past logging on private lands in the Elwha core area, outside of the Olympic National Park, has affected water quality through the release of fine sediment, which potentially affects bull trout egg incubation success and juvenile rearing.
- Impacts from residential and urban development occur mainly in the lower Elwha River. Dike construction has constricted the channel and severely affected nearshore and estuary habitat and processes.
- Bull trout are susceptible to incidental mortality associated with fisheries that target commercially desirable species such as coho and steelhead.
- Stranding and crushing of bull trout occurs during Port Angeles Water District's routine maintenance and repair operations.

Hoh River Core Area

The Hoh River core area comprises the Hoh and South Fork Hoh Rivers and associated tributaries. Active glaciers at the headwaters of the Hoh River watershed deliver both cold water and “glacial flour” to the mainstem.

Bull trout occur throughout the mainstem Hoh and South Fork Hoh Rivers. However, bull trout were not detected in 17 of 18 tributaries surveyed in the upper Hoh River. A series of cascades at river mile 48.5 in the upper Hoh River may be a barrier to upstream fish passage. There is a potential barrier to upstream fish passage in the South Fork Hoh River at river mile 14.

Resident and migratory life history forms of bull trout, including anadromous forms, likely occur in the Hoh River core area. Genetic analysis has identified only bull trout (no Dolly Varden) in the Hoh core area (Spruell and Maxwell 2002).

The status of the bull trout core area population is based on four key elements necessary for long-term viability: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity (USFWS 2004).

Number and Distribution of Local Populations

Two local populations have been identified: 1) Hoh River above the confluence with the South Fork Hoh River, and 2) South Fork Hoh River. With only two local populations, the bull trout in this core area is considered at increased risk of extirpation and adverse effects from random naturally occurring events (see "Life History").

Adult Abundance

Historically the Hoh core area likely comprised the largest population of bull trout on the Washington coast (Mongillo 1993). Currently there is insufficient information for a precise estimate of adult bull trout abundance, but the Hoh core area probably supports at least 500 but fewer than 1,000 adults. With fewer than 1,000 adults, this population is considered at increased risk of genetic drift.

Productivity

Bull trout in the Hoh core area are considered at risk of extirpation until sufficient information is collected to properly assess productivity.

Connectivity

Barriers to fish movement and migration in the Hoh core area include improperly sized or installed culverts in several locations. The mainstem is disconnected from off-channel habitats and adjacent riparian forest by riprap for bank armoring along the Upper Hoh Road. Impassable barriers of cedar spalt debris have formed in coastal rivers and streams in the core area. Holding and rearing areas for adult bull trout during spawning migration, and for juveniles during rearing

movements among different stream reaches, are reduced due to reduction of instream large woody debris. Despite these habitat alterations, migratory bull trout persist in the Hoh River core area. Recent studies have shown that bull trout in the Hoh River core area move into adjacent independent coastal tributaries (Brenkman and Corbett 2003). Bull trout in this core area have diminished risk of extirpation from habitat isolation and fragmentation.

Changes in Environmental Conditions and Population Status

Since the bull trout listing, Federal actions occurring in the Hoh River core area have resulted in harm to, or harassment of, bull trout. These actions include statewide Federal restoration programs that include riparian restoration, replacement of fish passage barriers, and fish habitat improvement projects; federally funded transportation projects involving repair and protection of roads and bridges; and section 10(a)(1)(B) permits for HCPs addressing forest management practices. Capture and handling during implementation of section 6 and section 10(a)(1)(A) permits have directly affected bull trout in the Hoh core area. The number of non-Federal actions occurring in the Hoh River core area since the bull trout listing is unknown.

State forest practice regulations were significantly revised in 2000, following the Forest and Fish agreement (FFR 1999; WFPB 2001). Revised regulations increased riparian protection, unstable slope protection, and recruitment of large wood; road standards improved significantly over the old regulations. Because there is biological uncertainty associated with some of the prescriptions, the Forest and Fish agreement relies on an adaptive management program for assurance that the new rules will meet the conservation needs of bull trout. The updated regulations will significantly reduce the level of future timber harvest impacts to bull trout streams on private lands. However, most negative effects from past forest practices will likely continue to be a threat for decades.

Reasons for Decline

Threats to bull trout in the Hoh River core area include:

- Past and current timber harvest and harvest-related activities, such as roads, have degraded habitat conditions (e.g., fisheries, water quality, and connectivity) in the lower and middle watershed. Numerous steep slopes are susceptible to mass wasting and channelized landslides. The resulting substantial increase in the number of debris flows has reduced macroinvertebrate populations in the Hoh River. Riparian roads have increased fine sediments and peak flows.
- Other impacts from logging include reduced amounts of large woody debris, altered stream morphologies (especially reduced pool area and quality), and loss of riparian vegetation leading to increased water temperatures. Cedar spalts in several tributaries block fish passage, impede water flows, increase water temperature, leach tannins into the water, inhibit plant growth in the riparian area, and form dams that carve stream banks and increase fine sediments.

- Riprap for bank armoring along the Upper Hoh Road has prevented channel migration and formation of new habitats, created unnatural meander patterns, and disconnected the mainstem from off-channel habitats and adjacent riparian forest.

Tribal and recreational fisheries cause incidental mortality of bull trout and are likely affecting the local populations.

Black spot disease may be a factor in the decline of bull trout in the Hoh River.

Queets River Core Area

The Queets core area comprises the Queets River, all of its tributaries, and the estuary. The Queets mainstem, except for the lower 8 miles, is contained entirely within a narrow corridor of the Olympic National Park. The tributaries flow through the Quinault Indian Reservation, Olympic National Forest, and State and private landholdings.

Fluvial, resident, and anadromous life history forms of bull trout occur in the Queets core area. The status of the bull trout core area population is based on four key elements necessary for long-term viability: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity (USFWS 2004b).

Number and Distribution of Local Populations

The upper Queets watershed is located largely within the Olympic National Park and is difficult to access. The Olympic Peninsula Bull Trout Recovery Team identified one local population: the Queets River and associated tributaries upstream from the confluence with Tshletsy Creek. Bull trout occur in the Queets River up to river mile 46; in the Salmon, Sams, and Clearwater Rivers; and in Matheny Creek. The Queets River mainstem and tributaries are designated as mixed use (i.e., rearing, foraging, migration, overwintering). Spawning has been documented in the mainstem river between river miles 45 and 48. With only one local population, bull trout in this core area are considered at increased risk of extirpation and adverse effects from random naturally occurring events (see "Life History").

Adult Abundance

The Queets core area likely supports at least 500 but fewer than 1,000 adults. With fewer than 1,000 adults, the bull trout population in this core area is considered at increased risk of genetic drift.

Productivity

The bull trout population in the Queets core area is considered to be at risk of extirpation until sufficient information is collected to properly assess productivity.

Connectivity

Bull trout occur in the Queets River from the marine waters of the anadromous zone up to the headwater spawning sites. Although there are barriers to movement (e.g., impassable culverts) in some tributaries, there are no barriers to movement in the mainstem Queets River. This migratory corridor is relatively pristine and intact.

Changes in Environmental Conditions and Population Status

Since the bull trout listing, several Federal actions occurring in the Queets core area have resulted in harm to, or harassment of, bull trout. These actions include forest management activities and culvert replacements outside of the local population. The culvert replacements are designed to provide long-term benefits to the watershed and bull trout. The more recent forest management activities that are consistent with the Quinault Indian Reservation 10-year Forest Management Plan incorporate riparian buffers and conservation measures designed to reduce adverse effects to bull trout. No section 6 or section 10(a)(1)(A) permits have been issued in the Queets River core area to date.

Queets Core Area for Effects to Bull Trout Through Capture and Handling.

The number of non-Federal actions occurring in the Queets core area since the bull trout listing is unknown. Activities currently conducted on an infrequent basis, such as emergency flood control, development, and infrastructure maintenance, affect riparian and instream habitat and probably negatively affect bull trout.

Threats

Threats to bull trout in the Queets core area include:

- Past logging and logging-related activities, such as roads, degraded habitat conditions in the Clearwater, Sams, and Salmon Rivers and Matheny Creek.
- Road densities in the Clearwater River basin are high, and roads throughout the Queets core area are in need of repair.
- Bull trout are susceptible to incidental mortality associated with fisheries that target salmon and steelhead at the mouth of the Queets River and incidental hooking mortality from recreational fishers.

Quinault Core Area

The Quinault core area comprises the mainstem Quinault (East Fork) and North Fork Quinault Rivers, associated tributaries, the estuary of the river, and Lake Quinault. Fifty-one percent of the core area lies within the Olympic National Park, 32 percent is owned by the Quinault Indian Nation, and 13 percent is managed by the Olympic National Forest. The remaining 4 percent are private landholdings; Rayonier Timberlands Company is the largest private landowner.

Fluvial, adfluvial, anadromous and, possibly, resident life history forms of bull trout occur in the Quinault core area. The status of the bull trout core area population is based on four key elements necessary for long-term viability: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity (USFWS 2004b).

Number and Distribution of Local Populations

Two local populations have been identified: 1) North Fork Quinault River and its associated tributaries, and 2) upper mainstem Quinault River, upstream from the confluence with the North Fork Quinault River. These two local populations occur entirely within the Olympic National Park. Although there may be more than two local populations, there is insufficient information at this time to identify additional local populations. Dolly Varden occur with bull trout in the upper mainstem Quinault River. There is no evidence of hybridization or introgression between the two species (Leary and Allendorf 1997).

Bull trout occur from the headwaters to the estuary and in numerous tributaries above the lake. Little is known about bull trout in the lower Quinault River below Lake Quinault, but bull trout have been observed in the Cook Creek watershed, which likely provides foraging and overwintering habitat. Above Lake Quinault bull trout have been observed in numerous tributaries to both the North Fork Quinault River and the upper Quinault River.

Although spawning sites have not been located in the Quinault core area, the presence of multiple age classes of bull trout in both local populations indicates spawning and rearing does occur. With only two local populations, bull trout in this core area are considered at increased risk of extirpation and adverse effects from random naturally occurring events.

Adult Abundance

Currently there is insufficient information for a precise estimate of adult bull trout abundance. However, the Quinault core area probably supports at least 500 but fewer than 1,000 adults. With fewer than 1,000 adults, this population is considered at increased risk of genetic drift.

Productivity

Bull trout in the Quinault core area are considered at risk of extirpation until sufficient information is collected to properly assess productivity.

Connectivity

Migratory bull trout occur in both local populations in the Quinault core area. Adequate connectivity between the two local populations and throughout the core area diminishes the risk of extirpation of bull trout in the core area from habitat isolation and fragmentation.

Changes in Environmental Conditions and Population Status

Since the bull trout listing, several Federal actions occurring in the Quinault core area have resulted in harm to, or harassment of, bull trout. These actions primarily consist of forest management activities and road repair outside of the local populations. Capture and handling during implementation of section 6 and section 10(a)(1)(A) permits have directly affected bull trout in the Quinault core area. The only known Federal action occurring in a local population was a road reconstruction adjacent to the upper mainstem Quinault River. In general, the road repair actions were designed to provide long-term benefits to the watershed and bull trout. The more recent forest management activities that are consistent with the Quinault Indian Reservation 10-year Forest Management Plan incorporate riparian buffers and conservation measures designed to reduce adverse effects to bull trout from timber harvest activities and road construction and maintenance.

The number of non-Federal actions occurring in the Quinault core area since the bull trout listing is unknown. Activities conducted on a regular basis, such as emergency flood control, development, and infrastructure maintenance, affect riparian and instream habitat and likely negatively affect bull trout.

Threats

Threats to bull trout in the Quinault core area include:

- Tributaries and rivers outside of the Olympic National Park have been affected by past logging.
- Current and long-term historical impacts from roads and transportation networks affect fisheries, water quality, and connectivity. The core area below Lake Quinault has been modified by extensive road construction and timber harvest activities.
- Bull trout are susceptible to incidental mortality associated with fisheries that target salmon and steelhead at the mouth of the Quinault River and to incidental hooking mortality from recreational anglers.
- Physical reductions of stream channel depths and cover habitat, along with flow regime changes in the mid-to-lower subbasins, have altered migratory corridors.

Skokomish Core Area

The Skokomish core area comprises the South Fork Skokomish River, North Fork Skokomish River (above and below Cushman Dam), Vance Creek, and their tributaries. Mainstem rivers in the area provide important foraging, migration, and overwintering habitat for sub-adult and adult bull trout. Available spawning and early rearing habitat is limited and fragmented. One reservoir in the core area, Lake Cushman, supports an adfluvial population. The Skokomish River core area is the only identified core area with access to Hood Canal.

Fluvial, adfluvial and, possibly, anadromous and resident life history forms of bull trout occur in the Skokomish core area.

The status of the bull trout core area population is based on four key elements necessary for long-term viability: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity (USFWS 2004b).

Number and Distribution of Local Populations

Bull trout are distributed throughout the Skokomish core area. Two local populations have been identified: 1) North Fork Skokomish River (including Elk and Slate Creeks), and 2) South Fork Skokomish River (including Church Creek). Bull trout in the South Fork Skokomish local population are distributed throughout the river below an anadromous barrier. The North Fork Skokomish local population is comprised of fish that are isolated upstream of Cushman Dam in the North Fork Skokomish River. Bull trout have also been observed in the lower North Fork Skokomish River. Habitat in Brown Creek, a tributary to the South Fork Skokomish River, is suitable for bull trout spawning and rearing, and Brown Creek has been identified as a potential local population. With only two known local populations, bull trout in this core area is at increased risk of local extirpation and adverse effects from random naturally occurring events.

Adult Abundance

The Skokomish core area likely supports approximately 200 adult bull trout. Olympic National Forest estimates 60 adults occupy the South Fork Skokomish (WSCC 2003b).

In the North Fork Skokomish River local population adult counts from 1990 to 1996 averaged 302 adults ranged from 250 to 413. More recent counts from 1998 to 2006 indicate a decline to an average of 100 adults, ranging from 89 to 150 (S. Brenkman, ONP, *in litt.* 2003; ONP, *in litt.* 2007). With fewer than 1,000 adults, the bull trout population in this core area is considered at risk of genetic drift.

Since 2001 the Olympic National Forest has completed annual redd surveys in the South Fork Skokomish local population. The river is difficult to survey in the fall because it is flashy and the flows tend to come quickly, making stream crossing hazardous and visibility impossible. Redd counts on the river from 2001 to 2006 have ranged from 22 to 18. Most bull trout spawning between river kilometer (river mile 18.5) to the impassable falls at river kilometer (river mile 23.75). A small number of redds (1-3) have been found in the lower part of Church Creek.

The bull trout population in this core area is one of the most depressed in the Olympic Peninsula Management Unit. The decline in numbers of adult bull trout in the North Fork Skokomish River and the low number of spawning adults in the South Fork Skokomish River indicate that the bull trout in this core area are at increased risk of extirpation and adverse effects from random naturally occurring events. Determining and addressing the causes of this declines is a high priority in the Draft Olympic Peninsula Bull Trout Recovery Plan.

Productivity

In the North Fork Skokomish River bull trout numbers remained relatively stable from 1990 to 1996. Counts since 1998 indicate a declining population. Based on 5 years of redd surveys in the South Fork, this local population is depressed but stable. Bull trout in the Skokomish core area is considered at risk of extirpation.

Connectivity

Fluvial and, potentially, anadromous bull trout are present in the South Fork Skokomish River local population. Bull trout in the North Fork Skokomish River local population occur in Lake Cushman, above an impassable dam, and in the river upstream from the reservoir to the confluence of Four Streams in Olympic National Park. Adfluvial bull trout occur in Lake Cushman, the North Fork Skokomish River, and Elk and Slate Creeks. Restoration of the migratory corridor (upstream and downstream passage at Cushman Dam) between the two local populations and between the local populations and Hood Canal will be required to allow full expression of the bull trout's migratory life history form.

Changes in Environmental Conditions and Population Status

The U.S. Fish and Wildlife Service, National Marine Fisheries Service, and the Environmental Protection Agency assisted the Simpson Timber Company (now Green Diamond Resources) in completing a HCP in 2000. The principle area of the HCP overlaps bull trout distribution in the South Fork Skokomish River and the accessible reaches of its major tributaries. The HCP includes management prescriptions designed to address wetlands, unstable slopes, road construction, road maintenance and decommissioning, certain harvest limitations to moderate snowmelt runoff, and riparian buffers that vary from 5 to 65 meters. The HCP also includes provisions for research and monitoring and a scientific committee of stakeholders.

Capture and handling during implementation of sections 6 and 10(a)(1)(A) permits under the Endangered Species Act have directly affected bull trout in the Skokomish core area.

The number of non-Federal actions occurring in the Skokomish core area since the bull trout listing is unknown. Activities conducted on a regular basis, such as emergency flood control, development, and infrastructure maintenance, affect riparian and instream habitat and probably negatively affect bull trout.

Threats

Threats to bull trout in the Skokomish core area include:

- Past timber harvest and harvest-related activities, such as roads, have degraded habitat conditions, including water quality, in the upper Skokomish River.

- Road densities in the Skokomish River basin represent some of the highest found west of the Cascade Mountains in Washington, and roads throughout the core area are in need of repair.
- Agricultural and livestock practices affect foraging, migration, and overwintering habitat in the lower watershed. Significant effects to the floodplain bull trout habitat, are caused by blocking fish passage, altering stream morphology, and degrading water quality.
- Diversion of water for hydropower production has eliminated connectivity between bull trout habitat upstream from the dams and habitat in the lower North Fork Skokomish River, the mainstem Skokomish River, the South Fork Skokomish River, and Hood Canal.
- The reduction of flows in the North Fork Skokomish River by diversion of water has reduced sediment transport capabilities and caused additional aggradation of the river.
- Incidental mortality of migrating bull trout caused by tribal gill-net fisheries, and recreational and tribal fisheries, poses a threat in the North Fork Skokomish River because of the low numbers of bull trout documented in recent years.
- Rural development, including the construction of dikes and levees, in the lower watershed has degraded water quality, reduced floodplain connectivity, and increased bedload instability.

PUGET SOUND CORE AREAS

Chilliwack Core Area

The Chilliwack core area comprises those portions of the Chilliwack River and its major tributaries, including Silesia and Tomyhoi Creeks, and the Sumas River in the United States. The Chilliwack River is a transboundary system flowing from the United States northwest into British Columbia. The British Columbia portion of the Chilliwack system is functionally part of the core area.

Adfluvial, fluvial and, potentially, resident and anadromous life history forms of bull trout occur in the Chilliwack core area. The adfluvial bull trout population in the Chilliwack core area occupies Chilliwack Lake in the upper Chilliwack River drainage.

Spawning and rearing in the Chilliwack core area probably occurs in all accessible reaches in the United States. Rearing bull trout occupy the mainstem Chilliwack River from Chilliwack Lake upstream to Easy Creek, where accessible habitat ends. Native char occur in the Little Chilliwack River, where habitat is essentially pristine and likely supports some level of bull trout spawning, although spawning has not been confirmed. The extent of spawning and rearing distribution in Silesia Creek is unknown. Migratory bull trout in this system spend all or part of

their subadult and adult lives in the mainstem of the Chilliwack River, Chilliwack Lake, and Fraser River. Chilliwack Lake apparently is a very important foraging area.

The status of the bull trout core area population is based on four key elements necessary for long-term viability: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity (USFWS 2004).

Number and Distribution of Local Populations

Three local populations have been identified in the United States portion of this core area: 1) Upper Chilliwack River (including Easy, Brush, and Indian Creeks), 2) Little Chilliwack River, and 3) Silesia Creek. An additional seven local populations have been identified in British Columbia. The three local populations identified in the United States are considered at intermediate risk of extirpation and adverse effects from random naturally occurring events (see "Life History"). When the seven local populations from the British Columbia are also considered, the risk of extirpation is diminished.

Adult Abundance

The Chilliwack core area likely supports between 500 and 750 adults in the three United States local populations. However, with inclusion of the local populations in Canada, the Chilliwack system likely supports more than 1,000 adults. The Chilliwack River local population is likely near, or in excess of, 100 adults, which minimizes the deleterious effects of inbreeding. Numbers of adults in the remaining local populations and the risk from inbreeding are unknown. The bull trout population in the Chilliwack core area is considered unlikely to be at risk from genetic drift.

Productivity

Bull trout in the Chilliwack core area are considered at an increased risk of extirpation until sufficient information is collected to properly assess productivity.

Connectivity

Migratory bull trout likely are present in most of the local populations in the Chilliwack core area. Consequently, the bull trout in the Chilliwack core area is at diminished risk of extirpation from isolation and habitat fragmentation.

Changes in Environmental Conditions and Population Status

Since the bull trout listing, Federal actions occurring in the Chilliwack core area have caused harm to, or harassment of, bull trout. These actions include statewide Federal restoration programs that include riparian restoration, replacement of fish passage barriers and fish habitat improvement projects; and section 10(a)(1)(B) permits for HCPs addressing forest management practices. No section 10(a)(1)(A) permits have been issued in the Chilliwack core area for effects to bull trout from capture and handling.

The number of non-Federal actions occurring in the Chilliwack core area since the bull trout listing is unknown. The majority of the core area is in Federal ownership and in pristine condition. Consequently, it is unlikely many non-Federal actions have occurred in this core area.

Reasons for Decline

Habitat in the United States portion of the population is in excellent to pristine condition, except habitat affected by agricultural practices along the Sumas River. Threats to the bull trout in the Chilliwack core area occur primarily in Canada. In British Columbia, the status of the Chilliwack River stock of bull trout is categorized as at “presumed conservation risk” (i.e., current threats are believed to be significantly affecting the population or population is considered at risk) (BCMWLAP 2002).

Threats to bull trout in the Chilliwack core area include:

- Significant timber harvest has occurred, and is ongoing, throughout the drainage.
- Agricultural and livestock practices along the mainstem Chilliwack River and the Sumas River have significantly affected these river systems.
- Residential development and urbanization have affected foraging, migration, and overwintering habitat.
- Current fisheries management in British Columbia retains bull trout in Canada, reducing the number of spawners returning to the United States.

Lower Skagit Core Area

The Lower Skagit core area comprises the Skagit basin downstream of Seattle City Light’s Diablo Dam, including the mainstem Skagit River and the Cascade, Sauk, Suiattle, White Chuck, and Baker River including the lake systems (Baker Lake and Lake Shannon) upstream of upper and lower Baker Dams.

Bull trout, which occur throughout the Lower Skagit core area, include fluvial, adfluvial, resident, and anadromous life history forms. Resident life history forms, found in several locations in the core area, often occur with migratory life history forms. Adfluvial bull trout occur in Baker, Shannon, and Gorge Lakes. Fluvial bull trout forage and overwinter in the larger pools of the upper portion of the mainstem Skagit River and, to a lesser degree, in the Sauk River (WDFW et al. 1997; Kraemer, *in litt.* January 2003).

Many bull trout extensively use the lower estuary and nearshore marine areas for extended rearing and subadult and adult foraging. Key spawning and early rearing habitat, found in the upper portion of much of the basin, is generally on federally protected lands, including North Cascades National Park, North Cascades Recreation Area, Glacier Peak Wilderness, and Henry M. Jackson Wilderness Area.

The status of the bull trout core area population is based on four key elements necessary for long-term viability: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity (USFWS 2004).

Number and Distribution of Local Populations

Nineteen local populations were identified in the draft recovery plan (USFWS 2004): 1) Bacon Creek, 2) Baker Lake, 3) Buck Creek, 4) Cascade River, 5) Downey Creek, 6) Forks of Sauk River, 7) Goodell Creek, 8) Illabot Creek, 9) Lime Creek, 10) Lower White Chuck River, 11) Milk Creek, 12) Newhalem Creek, 13) South Fork Cascade River, 14) Straight Creek, 15) Sulphur Creek, 16) Tenas Creek, 17) Upper South Fork Sauk River, 18) Upper Suiattle River, and 19) Upper White Chuck River. Although initially identified as potential local populations in the draft recovery plan (USFWS 2004), Stetattle Creek and Sulphur Creek (Lake Shannon), each now meets the definition of local population based on subsequent observations of juvenile bull trout and prespawn migratory adult bull trout (R2 Resource Consultants and Puget Sound Energy 2005; J. Shannon, *in litt.* 2004). With 21 local populations, the bull trout in the Lower Skagit core area is at diminished risk of extirpation and adverse effects from random naturally-occurring events (see "Life History").

Adult Abundance

The Lower Skagit core area, with a spawning population of migratory bull trout that numbers in the thousands, is probably the largest population in Washington (C. Kraemer, *in litt.* 2001). Consequently, the bull trout population in this core area is not considered at risk from genetic drift.

The majority of local populations in the core area include 100 adults or more; therefore, they are at a diminished risk of extirpation. However, some local populations probably have fewer than 100 adults and may be at risk from inbreeding depression. There is some risk of extirpation of the following local populations due to their lower numbers of adults; however, other factors, such as stable or increasing population trends may reduce this risk. Fewer than 100 migratory adults and a limited number of resident fish use the Forks of the Sauk River; however, the migratory component appears abundant and is increasing (C. Kraemer, *in litt.* January 2003). Fewer than 100 adults probably occur in Tenas Creek, but this local population is presumed to be increasing. The Straight Creek local population includes fewer than 100 migratory adults and an unknown number of resident fish (C. Kraemer, *in litt.* July 2001), but the migratory component appears stable. The Lime Creek local population probably has fewer than 100 migratory adults, but resident and migratory components are considered abundant. The South Fork Cascade River local population probably has fewer than 100 migratory adults (C. Kraemer, *in litt.* July 2001); however, resident and migratory components are considered stable. Based on recent observations, the Sulphur Creek local population in the Lake Shannon system also has fewer than 100 adults (R2 Resource Consultants and Puget Sound Energy 2006). Prior to 2004, Goodell Creek supported more than 100 adult spawners. In October 2003, a large landslide in Goodell Creek blocked access to the majority of spawning habitat for migratory bull trout in the Goodell Creek local population. Adult counts of migratory bull trout in 2004 and 2005 have been fewer than 100 individuals (M. Downen, *in litt.* 2006) in this local population. In the Baker

Lake local population, annual peak counts of 85 adults have been recorded between 2001 and 2005 (R2 Resource Consultants and Puget Sound Energy 2006). Since the most upstream accessible habitat was not surveyed in these efforts, and bull trout typically spawn as far upstream as they can within a stream system, this would suggest that on average there may be at least 100 adults in this local population. Total adult abundances in Newhalem and Stettattle Creek local populations are unknown.

Productivity

Long-term redd counts in the index areas of the Lower Skagit core area generally indicate stable to increasing population trends (USFWS 2004). Therefore, this core area is not considered at risk of extirpation at this time. Recent declines in redd counts may indicate a potential change to this long-term trend (M. Downen, *in litt.* 2006).

Connectivity

The presence of migratory bull trout in most of the local populations indicates the bull trout in the Lower Skagit core area has a diminished risk of extirpation from habitat isolation and fragmentation. However, the lack of connectivity of the Baker Lake and Sulphur Creek local populations in the Baker River system and Stettattle Creek local population in the Gorge Lake system with other local populations in the core area is a concern with respect to long-term persistence, life history expression, and refounding. In addition, there is currently only partial connectivity within the Baker Lake system, with no upstream passage for adults within Lake Shannon at upper Baker Dam.

Changes in Environmental Conditions and Population Status

Since the bull trout listing, Federal actions occurring in the Lower Skagit core area have caused harm to, or harassment of, bull trout. These actions include statewide Federal restoration programs that include riparian restoration, replacement of fish passage barriers, and fish habitat improvement projects; federally funded transportation projects involving repair and protection of roads and bridges; and section 10(a)(1)(B) permits for HCPs addressing forest management practices. Capture and handling, and indirect mortality, during implementation of section 6 and section 10(a)(1)(A) permits have negatively directly affected bull trout in the Lower Skagit core area.

The number of non-Federal actions occurring in the Lower Skagit core area since the bull trout listing is unknown. Activities conducted on a regular basis, such as emergency flood control, development, and infrastructure maintenance, affect riparian and instream habitat and probably have negatively affected bull trout and parts of their forage base.

Threats

Threats to bull trout in the Lower Skagit core area include:

- Gorge and Baker Dams restrict connectivity of the Stetattle Creek, Baker Lake, and Sulphur Creek (Lake Shannon) local populations with the majority of other local populations in the core area due to impaired fish passage.
- Operations of the Lower Baker Dam occasionally have significantly affected water quantity in the lower Baker and Skagit Rivers.
- Agricultural practices, residential development, and the transportation network, with related stream channel and bank modifications, have caused the loss and degradation of foraging, migration, and overwintering habitats in mainstem reaches of the major forks and in a number of the tributaries.
- Estuarine nearshore foraging habitats have been, and continue to be, negatively affected by agricultural practices and development activities.

Nooksack Core Area

The Nooksack core area comprises the Nooksack River and its tributaries, including the North, Middle, and South Fork Nooksack Rivers. Fluvial, anadromous and, possibly, resident life history forms of bull trout occur in the Nooksack core area. Bull trout spawning occurs in the North, Middle, and South Fork Nooksack Rivers and their tributaries. Post dispersal rearing and subadult and adult foraging probably occur throughout accessible reaches below barriers to anadromous fish. Overwintering likely occurs primarily in the lower mainstem reaches of the three forks and in the mainstem Nooksack River.

Bull trout and Dolly Varden co-occur in the Nooksack core area, but the level of interaction between the two species and degree of overlap in their distributions is unknown. However, limited genetic analysis and observational data suggest Dolly Varden in this core area inhabit stream reaches above barriers to anadromous fish, while bull trout primarily occupy the accessible stream reaches below the barriers.

The status of the bull trout core area population is based on four key elements necessary for long-term viability: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity (USFWS 2004).

Number and Distribution of Local Populations

Ten local populations have been identified: 1) Lower Canyon Creek, 2) Glacier Creek, 3) Lower Middle Fork Nooksack River, 4) Upper Middle Fork Nooksack River, 5) Lower North Fork Nooksack River, 6) Middle North Fork Nooksack River, 7) Upper North Fork Nooksack River, 8) Lower South Fork Nooksack River, 9) Upper South Fork Nooksack River, and 10) Wanlick Creek. Spawning areas in the local populations apparently are small and dispersed. With 10

local populations, the bull trout in this core area is considered at intermediate risk of local extirpation and adverse effects from random naturally occurring events (see "Life History").

Adult Abundance

The Nooksack core area probably supports fewer than 1,000 adults. Eight of the local populations likely have fewer than 100 adults each, based on the relatively low number of migratory adults observed returning to the core area. The Glacier Creek local population has approximately 100 adults, based on incidental redd counts and available spawning habitats. The Upper North Fork Nooksack River local population may support 100 adults, based on the number of persistent, small numbers of spawning adults observed in tributaries and available side channel habitat. The Nooksack core area bull trout population is considered at risk of genetic drift. Although the deleterious effects of inbreeding are minimized in these two local populations, the other eight local populations with few adults are considered at risk of inbreeding depression.

Productivity

The bull trout in the Nooksack core area is considered at increased risk of extinction until sufficient information is collected to properly assess productivity.

Connectivity

There is connectivity among most of the local populations, except for the Middle Fork Nooksack River, which has poor fish passage. There are road culvert barriers in several local populations. Consequently, the bull trout in the Nooksack core area is considered at intermediate risk of extirpation from habitat isolation and fragmentation.

Changes in Environmental Conditions and Population Status

Since the bull trout listing, Federal actions occurring in the Nooksack core area have resulted in harm to, or harassment of, bull trout. These actions include statewide Federal restoration programs that include riparian restoration, replacement of fish passage barriers, and fish habitat improvement projects; federally funded transportation projects involving repair and protection of roads and bridges; and section 10(a)(1)(B) permits for HCPs addressing forest management practices. Capture and handling and indirect mortality during implementation of section 6 and section 10(a)(1)(A) permits have directly affected bull trout in the Nooksack core area.

The number of non-Federal actions occurring in the Nooksack core area since the bull trout listing is unknown. Activities conducted on a regular basis, such as emergency flood control, development, and infrastructure maintenance, affect riparian and instream habitat and probably negatively affect bull trout.

Threats

Threats to bull trout in the Nooksack core area include:

- Past timber harvest and harvest-related activities, such as roads, have caused the loss or degradation of a number of spawning and rearing areas within local populations, as well as foraging, migration, and overwintering habitats.
- Bellingham Diversion has significantly reduced, if not precluded, connectivity of the Upper Middle Fork Nooksack River local population with the rest of the core area.
- Agricultural practices, residential development, the transportation network and related stream channel and bank modifications have caused the loss and degradation of foraging, migration, and overwintering habitat in mainstem reaches of the major forks and in a number of tributaries.
- Marine foraging habitats have been, and continue to be, greatly affected by urbanization along nearshore habitats in Bellingham Bay and the Strait of Georgia.
- The potential for brook trout and brook trout/Dolly Varden hybrids, detected in many parts of the Nooksack core area, to increase their distributions is a significant concern.

Puyallup Core Area

The Puyallup core area comprises the Puyallup, Mowich, and Carbon Rivers; the White River system, which includes the Clearwater, Greenwater, and the West Fork White Rivers; and Huckleberry Creek. Glacial sources in several watersheds drain the north and west sides of Mount Rainier and significantly influence water, substrate, and channel conditions in the mainstem reaches. The location of many of the basin's headwater reaches within Mount Rainier National Park and designated wilderness areas (Clearwater Wilderness, Norse Peak Wilderness) provides relatively pristine habitat conditions in these portions of the watershed.

Anadromous, fluvial, and potentially resident bull trout occur within local populations in the Puyallup River system. Bull trout occur throughout most of the system although spawning occurs primarily in the headwater reaches. Anadromous and fluvial bull trout use the mainstem reaches of the Puyallup, Carbon, and White Rivers to forage and overwinter, while the anadromous form also uses Commencement Bay and likely other nearshore areas within Puget Sound. Habitat conditions within the lower mainstem Puyallup and White Rivers have been highly degraded, retaining minimal instream habitat complexity. In addition, habitat conditions within Commencement Bay and adjoining nearshore areas have been severely degraded as well, with very little intact intertidal habitat remaining.

The Puyallup core area has the southernmost, anadromous bull trout population in the Puget Sound Management Unit (USFWS 2004). Consequently, maintaining the bull trout population

in this core area is critical to maintaining the overall distribution of migratory bull trout in the management unit.

The status of the bull trout core area population is based on four key elements necessary for long-term viability: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity (USFWS 2004).

Number and Distribution of Local Populations

Five local populations occur in the Puyallup core area: 1) Upper Puyallup and Mowich Rivers, 2) Carbon River, 3) Upper White River, 4) West Fork White River, and 5) Greenwater River. The Clearwater River is identified as a potential local population, as bull trout are known to use this river and it appears to provide suitable spawning habitat, but the occurrence of reproduction there is unknown (USFWS 2004).

Information about the distribution and abundance of bull trout in this core area is limited because observations have generally been incidental to other fish species survey work. Spawning occurs in the upper reaches of this basin where higher elevations produce the cold water temperatures required by bull trout egg and juvenile survival. Based on current survey data, bull trout spawning in this core area occurs earlier in the year (i.e., September) than typically observed in other Puget Sound core areas (Marks et al. 2002). The known spawning areas in local populations are few in number and not widespread. The majority of spawning sites are located in streams within Mount Rainier National Park, with two exceptions, Silver Creek and Silver Springs (Marks et al. 2002; R. Ladley, Puyallup Tribe, Tacoma, Washington, *in litt.* 2006).

Rearing likely occurs throughout the Upper Puyallup, Mowich, Carbon, Upper White, West Fork White, and Greenwater Rivers. However, sampling indicates most rearing is confined to the upper reaches of the basin. The mainstem reaches of the White, Carbon, and Puyallup Rivers probably provide the primary freshwater foraging, migration, and overwintering habitat for migratory bull trout within this core area.

With fewer than 10 local populations, the Puyallup core area is considered to be at intermediate risk of extirpation and adverse effects from random naturally occurring events.

Adult Abundance

Rigorous abundance estimates are generally not available for local populations in the Puyallup core area. Currently, fewer than 100 adults probably occur in each of the local populations in the White River system, based on adult counts at Mud Mountain Dam's Buckley Diversion fish trap. Although these counts may not adequately account for fluvial migrants that do not migrate downstream of the facility, these counts do indicate few anadromous bull trout and few mainstem fluvial bull trout return to local populations in the White River system. Therefore, the bull trout population in the Puyallup core area is considered at increased risk of extirpation until sufficient information is collected to properly assess adult abundance in each local population.

Productivity

Due to the current lack of long-term, comprehensive trend data, the bull trout population in the Puyallup core area is considered at increased risk of extirpation until sufficient information is collected to properly assess productivity.

Connectivity

Migratory bull trout are likely present in most local populations in the Puyallup core area. However, the number of adult bull trout expressing migratory behavior within each local population appears to be very low compared to other core areas. Although connectivity between the Upper Puyallup and Mowich Rivers local population and other Puyallup core area local populations was reestablished with the creation of an upstream fish ladder at Electron Dam in 2000, this occurred after approximately 100 years of isolation. Very low numbers of migratory bull trout continue to be passed upstream at the Mud Mountain Dam's Buckley Diversion fish trap. The overall low abundance of migratory life history forms limits the possibility for genetic exchange and local population refounding, as well as limits more diverse foraging opportunities to increase size of spawners and therefore, overall fecundity within the population. Consequently, the bull trout population in the Puyallup core area is at intermediate risk of extirpation from habitat isolation and fragmentation.

Changes in Environmental Conditions and Population Status

Since the bull trout listing, the Service has issued Biological Opinions that exempted incidental take in the Puyallup core area. These incidental take exemptions were in the form of harm and harassment, primarily from hydrologic impacts associated with increased impervious surface, temporary sediment increases during in-water work, habitat loss or alteration, and handling of fish. None of these projects were determined to result in jeopardy to bull trout. The combined effects of actions evaluated under these Biological Opinions have resulted in short-term and long-term adverse effects to bull trout and degradation of bull trout habitat within the core area.

Of particular note, in 2003 the Service issued a Biological Opinion (FWS Ref. No. 1-3-01-F-0476) on the State Route 167 North Sumner Interchange Project. This project was located in Pierce County in the White River portion of the Puyallup watershed and was proposed by Washington State Department of Transportation. The project's direct and indirect impacts and cumulative impacts within the action area included urbanization of approximately 600 acres of land. We anticipated that conversion of this land to impervious surface would result in the permanent loss and/or degradation of aquatic habitat for bull trout and their prey species through reduced base flows, increased peak flows, increased temperatures, loss of thermal refugia, degradation of water quality, and the degradation of the aquatic invertebrate community and those species dependent upon it (bull trout prey species). These impacts will result in thermal stress and disrupt normal behavioral patterns. Incidental take of fluvial, adfluvial, and anadromous bull trout in the form of harassment due to thermal stress and the disruption of migrating and foraging behaviors was exempted for this project. These adverse effects were expected to continue in perpetuity.

Section 10(a)(1)(B) permits have also been issued for HCPs that address bull trout in this core area. Although these HCPs may result in both short and/or long-term negative effects to bull trout and their habitat, the anticipated long-term beneficial effects are expected to maintain or improve the overall baseline status of the species. Additionally, capture and handling, and indirect mortality, during implementation of section 6 and section 10(a)(1)(A) permits have directly affected some individual bull trout in this core area.

The number of non-Federal actions occurring within the Puyallup core area since the bull trout were listed is unknown. However, activities conducted on a regular basis, such as emergency flood control, development, and infrastructure maintenance affect riparian and instream habitat which typically results in negative affects to bull trout and their habitat.

Threats

Threats to bull trout in the Puyallup core area include:

- Extensive past and ongoing timber harvest and harvest-related activities, such as road maintenance and construction, continue to affect bull trout spawning and rearing areas in the upper watershed.
- Agricultural practices, such as bank armoring, riparian clearing, and non-point discharges of chemical applications continue to affect foraging, migration, and overwintering habitats for bull trout in the lower watershed.
- Dams and diversions have significantly affected migratory bull trout in the core area. Until upstream passage was recently restored, the Electron Diversion Dam isolated bull trout in the Upper Puyallup and Mowich Rivers local population for nearly 100 years and has drastically reduced the abundance of migratory bull trout in the Puyallup River. Buckley Diversion and Mud Mountain Dam have significantly affected the White River system in the past by impeding or precluding adult and juvenile migration and degrading foraging, migration, and overwintering habitats in the mainstem. Despite improvements to these facilities, passage related impacts continue today but to a lesser degree.
- Urbanization, road construction, residential development, and marine port development associated with the city of Tacoma, have significantly reduced habitat complexity and quality in the lower mainstem rivers and associated tributaries, and have largely eliminated intact nearshore foraging habitats for anadromous bull trout in Commencement Bay.
- The presence of brook trout in many parts of the Puyallup core area and their potential to increase in distribution, including into Mount Rainer National Park waters, are considered significant threats to bull trout. Because of their early maturation and competitive advantage over bull trout in degraded habitats, brook trout in the upper Puyallup and Mowich River's local population is of highest concern because of past isolation of bull trout and the level of habitat degradation in this area.

- Until the early 1990s, bull trout fisheries probably significantly reduced the overall bull trout population within this and other core areas in Puget Sound. Current legal and illegal fisheries in the Puyallup core area may continue to significantly limit recovery of the population because of the low numbers of migratory adults.
- Water quality has been degraded due to municipal and industrial effluent discharges resulting from development, particularly in the lower mainstem Puyallup River and Commencement Bay.
- Water quality has also been degraded by stormwater discharge associated with runoff from impervious surface. Impervious surface in the Puyallup watershed increased by 12 percent between 1990 and 2001 (PSAT 2007).
- Major flood events in November 2006 significantly impacted instream habitats within the Puyallup River system. These events are assumed to have drastically impacted bull trout brood success for the year, due to significant scour and channel changes that occurred after peak spawning. Significant impacts to rearing juvenile bull trout were also likely, further impacting the future recruitment of adult bull trout.
- In November 2006, an 18,000 gallon diesel spill in the head waters of Spring Creek (C. Hebert, FWS, *in litt.* 2006), a bull trout spawning area of the Upper White River local population, likely impacted the available instream spawning habitat. The duration of ongoing contamination of instream habitats by residual diesel is unknown.

Snohomish-Skykomish Core Area

The Snohomish-Skykomish core area comprises the Snohomish, Skykomish, and Snoqualmie Rivers and their tributaries. Bull trout occur throughout the Snohomish River system downstream of barriers to anadromous fish. Bull trout are not known to occur upstream of Snoqualmie Falls, upstream of Spada Lake on the Sultan River, in the upper forks of the Tolt River, above Deer Falls on the North Fork Skykomish River, or above Alpine Falls on the Tye River.

Fluvial, resident, and anadromous life history forms of bull trout occur in the Snohomish River/Skykomish core area. A large portion of the migratory segment of this population is anadromous. There are no lake systems within the basin that support an adfluvial population. However, anadromous and fluvial forms occasionally forage in a number of lowland lakes connected to the mainstem rivers.

The mainstems of the Snohomish, Skykomish, North Skykomish, and South Fork Skykomish Rivers provide important foraging, migrating, and overwintering habitat for subadult and adult bull trout. The amount of key spawning and early rearing habitat is more limited, in comparison with many other core areas, because of the topography of the basin. Rearing bull trout occur throughout most of the accessible reaches of the basin and extensively use the lower estuary, nearshore marine areas, and Puget Sound for extended rearing.

The status of the bull trout core area population is based on four key elements necessary for long-term viability: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity (USFWS 2004).

Number and Distribution of Local Populations

Four local populations have been identified: 1) North Fork Skykomish River (including Goblin and West Cady Creeks), 2) Troublesome Creek (resident form only), 3) Salmon Creek, and 4) South Fork Skykomish River. With only four local populations, bull trout in this core area are considered at increased risk of extirpation and adverse effects from random naturally occurring events (see "Life History").

Adult Abundance

The Snohomish-Skykomish core area probably supports between 500 and 1,000 adults. However, this core area remains at risk of genetic drift. Most of the spawners in the core area occur in the North Fork Skykomish local population. Redd counts within the North Fork Skykomish local population peaked at over 530 in 2002 (USFWS 2004), but have recently declined to just over 240 in 2005 and 2006 (WDFW 2007). This is one of two local populations in the core area (the other is South Fork Skykomish River) that support more than 100 adults, which minimizes the deleterious effects of inbreeding. The Troublesome Creek population is mainly a resident population with few migratory fish. Although adult abundance is unknown in this local population, it is probably stable due to intact habitat conditions. The Salmon Creek local population likely has fewer than 100 adults. Although spawning and early rearing habitat in the Salmon Creek area is in good to excellent condition, this local population is at risk of inbreeding depression because of the low number of adults. Monitoring of the South Fork Skykomish local population indicates increasing numbers of adult migrants. This local population recently exceeded 100 adults and is not considered at risk of inbreeding depression (C. Jackson, WDFW, pers. comm. 2004). Fishing is allowed in this system.

Productivity

Long-term redd counts for the North Fork Skykomish local population indicate increasing population trends. Productivity of the Troublesome Creek and Salmon Creek local populations is unknown but presumed stable, as the available spawning and early rearing habitats are considered to be in good to excellent condition. In the South Fork Skykomish local population, new spawning and rearing areas are being colonized, resulting in increasing numbers of spawners. Sampling of the North Fork and South Fork Skykomish local population areas indicates the overall productivity of bull trout in the Snohomish-Skykomish core area is increasing.

Connectivity

Migratory bull trout occur in three of the four local populations in the Snohomish-Skykomish core area (North Fork Skykomish, Salmon Creek, and South Fork Skykomish). The lack of connectivity with the Troublesome Creek local population is a natural condition. The

connectivity between the other three local populations diminishes the risk of extirpation of the bull trout in the core area from habitat isolation and fragmentation.

Changes in Environmental Conditions and Population Status

Since the bull trout listing, Federal actions occurring in the Snohomish-Skykomish core area have caused harm to, or harassment of, bull trout. These actions include statewide Federal restoration programs that include riparian restoration, replacement of fish passage barriers, and fish habitat improvement projects; federally funded transportation projects involving repair and protection of roads and bridges; and section 10(a)(1)(B) permits for HCPs addressing forest management practices. Capture and handling during implementation of section 6 and section 10(a)(1)(A) permits have directly affected bull trout in the Snohomish-Skykomish core area.

The number of non-Federal actions occurring in the Snohomish-Skykomish core area since the bull trout listing is unknown. However, activities conducted on a regular basis, such as emergency flood control, development, and infrastructure maintenance, affect riparian and instream habitat and probably negatively affect bull trout.

Threats

Threats to bull trout in the Snohomish-Skykomish core area include:

- Past timber harvest and harvest-related activities, such as roads, have degraded habitat conditions in the upper watershed.
- Agricultural and livestock practices, including blocking fish passage, altering stream morphology, and degrading water quality in the lower watershed (FMO habitat), have significantly affected the floodplain and bull trout habitat.
- Illegal harvest or incidental hooking mortality may occur at several campgrounds where recreational fishing is allowed by the Washington Department of Fish and Wildlife.
- Water quality has been degraded by municipal and industrial effluent discharges and development.
- Nearshore foraging habitat has been, and continues to be, affected by development activities.

Stillaguamish Core Area

The Stillaguamish core area comprises the Stillaguamish River basin, including the North Fork and South Fork Stillaguamish Rivers and their tributaries. Major tributaries to the North Fork Stillaguamish River include the Boulder River and Deer, Little Deer, and Higgins Creeks. Canyon Creek, the only major tributary to the South Fork Stillaguamish River, has minor tributaries including Millardy, Deer, Coal, Palmer, Perry, and Beaver Creeks.

Bull trout occur throughout the Stillaguamish River basin and, in the Stillaguamish core area, primarily include anadromous and fluvial life-history forms (USFWS 2004b). There are no known populations in the North Fork Stillaguamish River above the barrier to migration at river mile 37.5 (C. Kraemer, WDFW, *in litt.* 1999). No resident populations have been found above any of the natural migratory barriers on Deer or Higgins Creeks. No exclusively resident populations have been identified in this core area, but the South Fork Stillaguamish River population has a strong resident component coexisting with migratory forms.

The South Fork Stillaguamish River upstream of Granite Falls has supported anadromous bull trout since the construction of a fishway in the 1950s. Previously the falls were impassable to anadromous fish. Anecdotal information from fish surveys in the 1920s and 1930s, however, suggest that native char likely were present above Granite Falls prior to construction of the fishway (WDFW 1998).

Spawning habitat is generally limited in the Stillaguamish core area, and apparently, only the upper reaches provide adequate spawning conditions. Bull trout spawn in the upper reaches of the accessible portions of the upper North Fork Stillaguamish River and its tributaries, including Deer and Higgins Creeks. There has been no extensive juvenile sampling or evaluation of spawning success in the North Fork Stillaguamish River. Bull trout in the Upper Deer Creek local population spawn in Higgins Creek, and spawning also may occur in upper Little Deer Creek. Bull trout spawn in the Boulder River below the impassible falls at river mile 3. Although unconfirmed, spawning and rearing probably occur in the Squire Creek system, which is similar in size to Boulder River and also influenced by snowmelt. Boulder River may be identified as an additional local population when more distribution information is available.

Spawning areas in the South Fork Stillaguamish River and its tributaries include Canyon Creek and upper South Fork Stillaguamish. Bull trout are known to spawn and rear in Palmer, Perry, and Buck Creeks and the upper South Fork mainstem above Palmer Creek. Recent spawning surveys identified a major spawning area above the Palmer Creek confluence. Between 50 and 100 bull trout spawn in this reach. Electrofishing surveys also documented high densities of juveniles (D. Downen, *in litt.* 2003). Spawning and early rearing habitat in the South Fork Stillaguamish River is considered to be in fair condition. Although bull trout spawn in the upper South Fork Stillaguamish River and other tributaries, available habitat is partially limited by gradient and competition with coho salmon. Upstream movement of bull trout from the lower river depends on proper functioning of the fish ladder at Granite Falls. Migratory and resident fish coexist on the spawning grounds.

Bull trout in the Canyon Creek local population use the upper South Fork Stillaguamish River for spawning and rearing. Although there have been isolated and incidental observations of spawning by migratory-size bull trout, electrofishing surveys have been unable to locate any juvenile or resident bull trout from this population. Despite repeated survey efforts, very few bull trout have been located in this population because of the difficulty in locating individuals.

The status of the bull trout core area population is based on four key elements necessary for long-term viability: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity (USFWS 2004b).

Number and Distribution of Local Populations

Four local populations have been identified in the Stillaguamish core area: 1) Upper Deer Creek, 2) North Fork Stillaguamish River, 3) South Fork Stillaguamish, and 4) Canyon Creek. The scarcity and spatial isolation of available spawning habitat limits the number of local populations in the Stillaguamish core area. With only four local populations, bull trout in this core area are considered to be at increased risk of extirpation and adverse effects from random naturally occurring events.

Adult Abundance

The bull trout population in the Stillaguamish River basin is estimated at fewer than 1,000 adults. In the North Fork Stillaguamish River, as many as 100 adult bull trout have been observed holding near the mouth of the Boulder River. Surveys documented nearly 300 adult char between river miles 21 and 25 during fall 2001; fewer than 100 adults were counted in the remaining sample years between 1996 and 2003 (G. Pess, NMFS, *in litt.* 2003). Other limited snorkel surveys had similar results (M. Downen, pers. comm. 2003). These staging adult bull trout are assumed to spawn somewhere in the North Fork Stillaguamish River. Adult abundance in the Upper Deer Creek and Canyon Creek local populations is considered low. The Boulder River population probably has fewer than 100 adults. Approximately 50 to 100 adults are present in the South Fork Stillaguamish River, based on conservative estimates from spawning and electrofishing surveys (D. Downen, *in litt.* 2003). Although accurate counts are unavailable, current estimates of adult abundance suggest that Upper Deer Creek and Canyon Creek local populations have fewer than 100 adults and are considered at risk of inbreeding depression.

Connectivity

Primary foraging, migration, and overwintering areas in the Stillaguamish River basin include the mainstems of the North Fork and South Fork Stillaguamish Rivers and the Stillaguamish River to the estuary. Foraging sub-adults and adults may be found in nearly all reaches of the basin below migratory barriers to the basin. Rearing individuals may use nearly all accessible reaches in higher elevation and coldwater portions of the basin. Anadromous forms in the Stillaguamish core area are presumed to use nearshore marine areas in Skagit Bay, Port Susan, and Possession Sound, but may also use areas even farther from their natal basin.

All native char habitat within the Stillaguamish River Basin generally has good connectivity. However, because the local populations are somewhat isolated from one another, maintaining connectivity among them will be critical to support life-history diversity, refounding, and genetic exchange.

Changes in Environmental Conditions and Population Status

Since the bull trout listing, Federal actions occurring in the Stillaguamish core area have caused harm to or harassment of bull trout. These actions include statewide Federal restoration programs that include riparian restoration, restoration of fish passage at barriers, and habitat-improvement projects. In addition, federally funded transportation projects involving repair and

protection of roads and bridges have been completed. Finally, section 10(a)(1)(B) permits have been issued for HCPs that address bull trout in this core area.

The number of non-Federal actions occurring in the Stillaguamish core area since the bull trout listing is unknown. However, activities conducted on a regular basis, such as emergency flood control, development, and infrastructure maintenance, affect riparian and instream habitat and probably negatively affect bull trout.

Threats

Threats to bull trout in the Stillaguamish core area include:

- Channel widening and a significant reduction in primary pool abundance have seriously degraded habitat conditions in the North Fork and lower South Fork Stillaguamish Rivers.
- Spawning habitats in Deer and Canyon Creeks have been extremely degraded.
- Past logging and logging-related activities, such as roads, have degraded habitat in the Stillaguamish River basin. The loss of riparian cover, slope failures, stream sedimentation, increased stream temperatures, flooding, and loss of large woody debris have adversely affected bull trout in Deer Creek and in the South Fork Stillaguamish River (WDFW 1997b; USFWS 2004b). Deer and Higgins Creeks currently violate State water-quality standards for temperature.
- Agricultural and residential development has contributed to poor water quality in the lower Stillaguamish River basin. Excessive siltation caused by mud and clay slides on the North Fork Stillaguamish River near Hazel, Washington, and on the South Fork above Robe, contribute to poor water quality (Williams et al. 1975).
- Other limiting factors in the North Fork Stillaguamish River include loss of deep holding pools for adults and low summer flows (USFWS 2004b).
- Low flows and high temperatures during the summer affect holding habitat for anadromous migrants in the mainstem Stillaguamish River, especially in the lower river sloughs that have slow-moving water without significant riparian cover (WDFW 1997b).

Upper Skagit Core Area

The Upper Skagit core area includes the Skagit basin upstream of Diablo Dam, as well as Diablo Lake and the majority of Ross Lake. The upper Skagit River is a transboundary system that flows south from British Columbia to the United States. A significant portion of the upper Skagit drainage lies within Canada (USFWS 2004). Much of the habitat in the core area is undisturbed as large portions of the watershed are located in largely undeveloped North Cascades National Park and Pasayten Wilderness Area, Washington, and Skagit Valley Provincial Park, British Columbia, Canada.

The Upper Skagit core area supports both bull trout and Dolly Varden. Generally, populations of Dolly Varden in the upper Skagit River drainage have been found to be spatially segregated from bull trout, with Dolly Varden typically residing upstream of those areas possessing resident and migratory bull trout (McPhail and Taylor 1995). Although hybridization between the two species does occur, size-dependent differences in spawning behavior and habitat choice appear to play an important role in isolating the two species and therefore, maintaining their distinct genomes in these areas of sympatry (Taylor et al. 2001). Adfluvial, fluvial, and potentially resident life history forms of bull trout are present in the Upper Skagit core area. Bull trout occur throughout most of the system, utilizing the majority of accessible tributaries to spawn and rear. Adfluvial bull trout in the core area primarily use either Ross Lake or Diablo Lake to forage and overwinter but occasionally enter Ross Lake tributaries to forage. Fluvial bull trout within British Columbia likely use the upper mainstem reaches of the Skagit River to forage and overwinter. It is unknown whether fluvial migrants are present in the United States' tributaries to Ross Lake, in particular Ruby and Lightning Creeks.

The status of a bull trout core population can be described by four key elements: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity (USFWS 2004).

Number and Distribution of Local Populations

At least 13 local populations are known to occur in the Upper Skagit River core area (USFWS 2004). Given there are greater than 10 local populations, the Upper Skagit core area is considered to be at diminished risk of local extirpation. Seven of the local populations occur largely within the United States (i.e., Big Beaver Creek, Little Beaver Creek, Panther Creek, Pierce Creek, Ruby Creek, Silver Creek, and Thunder Creek) and one is transboundary with Canada (i.e., Lightning Creek). All others are wholly within British Columbia.

Adult Abundance

In the Upper Skagit core area, including those portions of the drainage in British Columbia, the adult abundance likely exceeds 1,000 spawners (USFWS 2004). However, no comprehensive redd or adult surveys have been conducted for this core area. This core area is currently not considered to be at risk from genetic drift. There are likely at least 100 adult spawners in the Ruby Creek and Lightning Creek local populations based on the available habitat and number of adults observed staging at their mouths. Therefore, the risk of inbreeding depression is considered low for these two local populations. Adult abundance in the remaining local populations within the core area is currently unknown, so the risk of inbreeding depression for these local populations is considered unknown.

Productivity

Due to the current lack of long-term, comprehensive trend data, the bull trout population in the Upper Skagit core area is considered at increased risk of extirpation until sufficient information is collected to properly assess productivity.

Connectivity

Migratory bull trout persist in most of the local populations in the Upper Skagit core area and therefore, are considered to be at a diminished risk of extirpation. However, there is no connectivity between the Thunder Creek local population in the Diablo Lake system and the other local populations within the Ross Lake system due to the upstream migration barrier created by Ross Dam. If connectivity between the Thunder Creek local population and the remaining areas of the Upper Skagit core area cannot be adequately addressed at Ross Dam, the establishment of additional local populations may be needed to ensure the persistence of the Thunder Creek local population.

Changes in Environmental Conditions and Population Status

Since the listing of bull trout, Federal actions have occurred in the Upper Skagit core area and may have resulted in harm to or harassment of bull trout. These actions include a fire management plan on national park land, statewide Federal restoration programs, which include riparian restoration, replacement of fish passage barriers, and fish habitat improvement projects and federally-funded transportation projects involving repair and protection of roads and bridges. Available information indicates few section 10(a)(1)(A) permits and no 10(a)(1)(B) permits have been issued in the Upper Skagit core area.

It is unknown how many non-Federal actions may have occurred in the Upper Skagit core area since the listing of the bull trout. The majority of the core area occurs within Federal ownership; therefore it is unlikely there have been many non-Federal actions within this core area.

Threats

Threats to bull trout in the Upper Skagit core area include:

- Ross Dam currently restricts connectivity between the Thunder Creek local population and the majority of the core area.
- Past forest practices have some lingering impacts to bull trout local populations within the United States. Past and ongoing forest practices in Canada remain a significant threat to some local populations in this country.
- Past commercial and present recreational mining activities continue to impact instream habitats within the Ruby Creek system.
- Brook trout are established in a number of tributaries to Ross Lake that are also used by bull trout. Because of their early maturation and competitive advantage over bull trout in degraded habitats, their presence is of greatest concern in bull trout spawning and rearing streams. In some tributaries (e.g., Hozomeen Creek), brook trout appear to have completely replaced or displace bull trout.

- Legal and illegal fishing continues to impact bull trout within Ross Lake and its tributaries. Large adults are easily targeted, and their direct or incidental mortality has the most significant impact to the population.

LOWER COLUMBIA RIVER GEOGRAPHICAL AREA

Klickitat Core Area

Based on recent surveys bull trout are known to occur in the West Fork Klickitat River. Tributaries of the West Fork Klickitat River which currently support bull trout include: Trappers Creek, Clearwater Creek, Two Lakes Stream, Little Muddy Creek, and an unnamed tributary of Fish Lake Stream. The West Fork Klickitat population is currently the only population identified in the Klickitat core area likely supports only a resident life history form based on recent trapping efforts (USFWS 2002). Although a migratory size bull trout was observed in the Klickitat River in the early 1990's, surveys conducted in 2001 did not find bull trout in the mainstem Klickitat River upstream of the confluence with the West Fork (Byrne et al. 2001; Thiesfeld et al. 2001; J. Byrne, Washington Department of Fish and Wildlife, pers. comm. 2005).

The status of a bull trout core population can be described based on four key elements: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity.

Number and Distribution of Local Populations

Only one local population is known to occur in the Klickitat core area. In addition to the West Fork Klickitat River, bull trout are also found in Trappers Creek, Clearwater Creek, Two Lakes Stream, Little Muddy Creek, and an unnamed tributary of Fish Lake Stream.

Adult Abundance

Bull trout in the West Fork Klickitat local population are thought to be primary resident and low numbers indicate that this local population is at risk from the deleterious effects of inbreeding depression. If fluvial bull trout persist in the core area, their abundance is most likely below 100 spawning adults and, therefore, should be considered at risk from inbreeding depression. Abundance of both resident and migratory bull trout in the Klickitat core area is likely below 1,000 spawning individuals and the core area is considered at risk from genetic drift.

Productivity

For a population to contribute to recovery, its growth rate must indicate that the population is stable or increasing for a period of time. Given the overall lack of long-term population census information in the Klickitat core area, this core area is considered at increased risk of extinction.

Connectivity

Currently, bull trout in the Klickitat core area are most likely represented by resident forms, and consequently are at an increased risk of extinction.

Changes in Environmental Conditions and Population Status

All of the bull trout spawning and juvenile rearing areas in this core area are on the Yakima Indian Reservation. Since the bull trout listing, Federal actions occurring in the Klickitat core area have resulted in harm to, or harassment of, bull trout. These actions include timber harvest activities by the Yakama Nation, statewide Federal restoration programs that include riparian restoration, replacement of fish passage barriers, and fish habitat improvement projects; federally funded transportation projects involving repair and protection of roads and bridges, and activities along the BPA power line corridor; and section 10(a)(1)(B) permits for HCPs addressing forest management practices. Capture and handling during implementation of section 6 and section 10(a)(1)(A) permits have directly affected bull trout in the Klickitat core area.

State forest practice regulations were significantly revised in 2000, following the Forest and Fish agreement (FFR 1999; WFPB 2001). Revised regulations increased riparian protection, unstable slope protection, and recruitment of large wood; road standards improved significantly over the old regulations. Because there is biological uncertainty associated with some of the prescriptions, the Forest and Fish agreement relies on an adaptive management program for assurance that the new rules will meet the conservation needs of bull trout. The updated regulations will significantly reduce the level of future timber harvest impacts to bull trout streams on private lands. However, most negative effects from past forest practices will likely continue to be a threat for decades.

Threats and Recovery Objectives

Threats to bull trout in the Klickitat core area include:

- Increased sediment loads associated with logging roads near tributary streams has been identified as problem in several basins within the Klickitat core area.
- Some cattle grazing has occurred in the Klickitat River basin which has lead to eroded stream banks, increased sedimentation and incised channels.
- Warm temperatures due to natural low flows within in the Klickitat drainage may be a concern for adult bull trout that spawn in the mainstem or lower reaches of tributary streams as well as for juveniles that may rear in those locations. Any agricultural diversions would only exacerbate an already tenuous flow condition.
- Introduction of non-native species has impacted bull trout populations through a combination of hybridization, competition, and predation.

- Although angling impacts and harvest are unknown in the Klickitat River and tributaries, they may have been significant prior to the implementation of restrictive fish regulations in the early 1980's.

Recovery objectives are focused on maintaining current bull trout distributions and restoring distribution in previously occupied areas, maintaining stable or increasing trends in abundance of bull trout, restoring and maintaining suitable habitat for all life history stages, and conserving genetic diversity and providing opportunity for genetic exchange. This can be achieved by correcting prevailing threats especially reducing the abundance of nonnative fishes, addressing low flow conditions, and improving stream channel and riparian conditions. In addition, the establishment of fisheries management goals and objectives, research and monitoring programs, adaptive management approaches, and use of available conservation programs and regulations are recommended to achieve recovery objectives, and monitor progress in reaching recovery goals.

Lewis River Core Area

Currently, reproducing populations of bull trout within the Lewis River core area are found in Lake Merwin, Yale, and Swift Creek reservoirs. Bull trout in the Lewis River are considered to be predominately adfluvial. The number of bull trout inhabiting the Lewis River core area is believed to be low. Spawning and juvenile rearing occur in Cougar Creek, Rush Creek, and Pine Creek.

The status of a bull trout core population can be described based on four key elements: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity.

Number and Distribution of Local Populations

Two local populations are known to occur in the Lewis River core area. Spawning adfluvial bull trout in Yale Lake migrate into Cougar Creek from the middle of August through early September and spawn from late September through early October. The other population occurs in Swift Creek Reservoir and spawns in Rush and Pine Creeks.

Adult Abundance

The estimated Cougar Creek spawner population ranges from 0 to 40 individuals based on annual estimates taken between 1979 and 2001. Due to low spawner numbers this population is considered at risk of inbreeding depression. The annual spawner population estimates from Rush and Pine Creeks (Swift Creek Reservoir) between 1994 and 2001, range from 101 to 542 fish. The majority of spawning occurs in Rush Creek and the 8-year average for both creeks is 309 fish. Bull trout in this population are not at risk of inbreeding depression. Additional escapement estimates, based on "mark and recapture" counts are also available for Swift Creek Reservoir (Pine and Rush Creeks) since the time of listing. Estimated escapement was variable during the 1990's (ranging between 101 and 437 adults), but has increased since 1999, with a

2004 population estimate of 1287 adults (USFWS 2002; WDFW 2005). Overall the population is probably below 1,000 spawning adults and, therefore, is considered at risk.

Productivity

Recent genetic analyses suggest that only one genetically distinct group (Pine and Rush Creek local populations) exists within the Lewis River system (Neraas and Spruell 2004). Previous analyses indicated that two genetically distinct groups (Pine and Rush Creeks, and Cougar Creek) were present in the core area (Spruell et al. 1998). Increased sample size and samples collected from known spawning sites indicate that the third local population (Cougar Creek), which represents the only spawning tributary in Yale Reservoir, likely represents a mixture of spawners from the two upstream local populations in Swift Creek Reservoir.

For a population to contribute to recovery, its growth rate must indicate that the population is stable or increasing for a period of time. Given the overall lack of long-term population census information in the Lewis River core area and the variability in the Cougar Creek population, this core area is considered at increased risk of extinction.

Connectivity

Lack of passage at hydroelectric facilities within the Lewis River core area has fragmented populations and prevented bull trout from using foraging and overwintering habitats in the mainstem Columbia River. Migratory bull trout persist at low levels by virtue of adopting an adfluvial life history in Swift Creek and Yale Lake reservoirs. Lack of passage and the low abundance of the migratory life history strategy limit the possibility for genetic exchange and local population refounding placing the Lewis River core area at increased risk of extinction.

Changes in Environmental Conditions and Population Status

A settlement agreement for the relicensing of the Yale, Merwin, Swift No. 1 and Swift No. 2 hydroelectric projects was signed in 2004 (PacifiCorp et al. 2004). Conservation measures are incorporated in the project description to minimize or compensate for the effects of the projects on listed species, including bull trout. Conservation measures for bull trout include perpetual conservation easements on PacifiCorp's lands in the Cougar/Panamaker Creek area and PacifiCorp's and Cowlitz PUD's lands along the Swift Creek arm of Swift Creek Reservoir, upstream and downstream fish passage improvements at all reservoirs, limiting factors analysis for bull trout to determine additional enhancement measures, public information program to protect bull trout, and monitoring and evaluation efforts for bull trout conservation measures. This agreement will also restore anadromous salmon to the upper Lewis River system, restoring a significant part of the historic forage base for bull trout.

Threats and Recovery Objectives

Threats to bull trout in the Lewis River core area include:

- Construction of three hydropower dams on the Lewis River have fragmented habitat, isolated local populations and prevented access to foraging and overwintering habitat.
- Forest practices in the Lewis River basin have combined to alter flow regimes, riparian conditions, and instream habitat.
- Introduction of non-native species including brook trout, lake trout, rainbow trout, kokanee, largemouth bass, and tiger musky have impacted bull trout populations through a combination of hybridization, competition, and predation.
- Harvest has played a role in the decline of local populations, but fishing for bull trout in the Lewis River core area closed only as recently as 1992. Misidentification of bull trout by anglers may remain a threat.

Recovery objectives are focused on maintaining current bull trout distributions and restoring distribution in previously occupied areas, maintaining stable or increasing trends in abundance of bull trout, restoring and maintaining suitable habitat for all life history stages, and conserving genetic diversity and providing opportunity for genetic exchange. This can be achieved by correcting prevailing threats especially through providing passage at all dams, operating dams to minimize negative effects, reducing the abundance of nonnative fishes, and improving stream channel and riparian conditions. In addition, the establishment of fisheries management goals and objectives, research and monitoring programs, adaptive management approaches, and use of available conservation programs and regulations are recommended to achieve recovery objectives, and monitor progress in reaching recovery goals.

NORTHEAST WASHINGTON GEOGRAPHICAL AREA

Pend Oreille River Core Area

Migratory and resident life history forms of bull trout are found within the Pend Oreille core area, which includes Pend Oreille River and tributaries from the Canadian border upstream to the Albeni Falls Dam. The adfluvial life history form which historically returned to Lake Pend Oreille, was eliminated with the construction and operation of the Albeni Falls Dam and other dams on the river and within tributary streams. However, in recent years, approximately 1 dozen large migratory bull trout have been captured within the Pend Oreille River, and on a single occasion documented within a tributary stream on a redd. Recent sightings in the core area include Le Clerc Creek, Mill Creek, Cedar Creek, Indian Creek Sullivan Creek, Sweet Creek, and the Box Canyon and Boundary reservoirs, and at the mouths of Marshall Creek and Slate Creek.

At the time of listing, it was assumed that adfluvial bull trout from Lake Pend Oreille utilized this portion of the Pend Oreille River and associated tributaries. Several recent studies have confirmed that a downstream adfluvial migration strategy still exists in the Pend Oreille River (above Albeni Falls Dam) and was likely the more prominent life history form found in this core area (DuPont and Horner 2002; Geist et al. 2004). Geist (et al. 2004) tracked six radio-tagged

bull trout from below Albeni Falls Dam making repeated movements to the base of the dam in 2003. In 2004, several additional bull trout were tagged and placed above the dam (Geist *in litt.* 2004). Subsequent tracking documented that they migrated to Pend Oreille Lake and that one individual migrated to a known spawning stream, presumably to spawn. These studies confirm that Albeni Falls Dam presents a significant threat to the continued existence of bull trout in this core area as long as there is no fish passage.

The status of a bull trout core population can be described based on four key elements: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity.

Number and Distribution of Local Populations

While sighting of individual bull trout have occurred in several tributaries to the Pend Oreille River core area, only one extant local population has been identified: Le Clerc Creek complex. With only one local population, this core population is considered to be at an increased risk of extirpation.

Adult Abundance

Population estimates in the Pend Oreille core area are not currently available. However, due to relatively few numbers of bull trout documented recently, abundance of bull trout in Le Clerc is probably below 100 adult spawning individuals per year and should be considered at risk from inbreeding. Similarly, bull trout in the entire core area most likely number fewer than 1,000 per year, and should be considered at risk from genetic drift.

Productivity

For a population to contribute to recovery, its growth rate must indicate that the population is stable or increasing for a period of time. In the Pend Oreille core area, bull trout are considered to be at an increased risk of extirpation, due to the lack of long-term census information.

Connectivity

The downstream migration of bull trout was believed to occur in the Pend Oreille River basin. Adult bull trout would migrate out of Pend Oreille Lake, down the Pend Oreille River and into tributary stream to spawn. This migration pattern was eliminated with the construction and operation of the Albeni Falls Dam. Fragmentation of the mainstem by this dam and Boundary Dam as well as tributary dams places the Pend Oreille core area at an increased risk of extirpation.

Changes in Environmental Conditions and Population Status

Since the bull trout listing, Federal actions occurring in the Pend Oreille River core area have resulted in harm to, or harassment of, bull trout. These actions include timber harvest activities on lands administered by the U.S. Forest Service, statewide Federal restoration programs that

include riparian restoration, replacement of fish passage barriers, and fish habitat improvement projects; federally funded transportation projects involving repair and protection of roads and bridges; and section 10(a)(1)(B) permits for HCPs addressing forest management practices. Capture and handling during implementation of section 6 and section 10(a)(1)(A) permits have directly affected bull trout in the Pend Oreille River core area.

State forest practice regulations were significantly revised in 2000, following the Forest and Fish agreement (FFR 1999; WFPB 2001). Revised regulations increased riparian protection, unstable slope protection, and recruitment of large wood; road standards improved significantly over the old regulations. Because there is biological uncertainty associated with some of the prescriptions, the Forest and Fish agreement relies on an adaptive management program for assurance that the new rules will meet the conservation needs of bull trout. The updated regulations will significantly reduce the level of future timber harvest impacts to bull trout streams on private lands. However, most negative effects from past forest practices will likely continue to be a threat for decades.

Threats and Recovery Objectives

Threats to bull trout in the Pend Oreille core area include:

- Past timber harvest, and harvest-related activities (such as roads), have degraded habitat conditions in the especially in portions of Sullivan, Mill, Cedar, Ruby, Tacoma, Calispell, and Le Clerc Creek basins.
- Livestock grazing practices on both public and private lands has impacted upland and riparian areas of most tributaries in the Pend Oreille core area. Specific areas of concern where grazing has impacted stream habitat include the middle and east branches of Le Clerc Creek, Ruby Creek, and Calispell Creek.
- Agricultural, although limited in scope, has contributed to impacts through stream channelization, sediment inputs, and water quality problems.
- Mining is limited, but dredging and sluicing occurs primarily on Sullivan Creek and may effect fry and juveniles if present in the system.
- Impacts from residential development and urbanization are likely to increase as the population increases.
- Introduction of non-native species including brook trout, brown trout, bass and walleye and the migration of northern pike from the Clark Fork River, Montana, have impacted bull trout populations through a combination of hybridization, competition, and predation.
- The role harvest played in the decline of local populations is unknown, but fishing for bull trout in the Pend Oreille core area closed only as recently as 1992. Misidentification of bull trout by anglers may remain a threat.

- Road culverts pose a barrier to upstream passage especially on U.S. Forest Service roads in Sullivan Creek, Saucon Creek, and Le Clerc Creek basins.

Recovery objectives are focused on maintaining current bull trout distributions and restoring distribution in previously occupied areas, maintaining stable or increasing trends in abundance of bull trout, restoring and maintaining suitable habitat for all life history stages, and conserving genetic diversity and providing opportunity for genetic exchange. This can be achieved by correcting prevailing threats especially through improving connectivity, reducing the abundance of nonnative fishes, improving stream channel and riparian conditions, and operating dams to minimize negative effects. In addition, the establishment of fisheries management goals and objectives, research and monitoring programs, adaptive management approaches, and use of available conservation programs and regulations are recommended to achieve recovery objectives, and monitor progress in reaching recovery goals.

Priest Lakes Core Area

The majority of the Priest Lakes basin resides in northwest corner of Idaho. About 2.5 percent extends into Canada where the upper Priest River originates in the Nelson Mountain Range. Headwaters of the major tributaries on the western side of the basin originate in the Kaniksu National Forest and the Salmo-Priest Wilderness in northeast Washington. However, recent redd surveys and fish sampling have failed to document use by bull trout in several of these streams, perhaps indicating a further decline in their distribution within this core area. Bull trout spatial distribution in the main basin of Priest Lake and its direct tributaries is increasingly fragmented (IDFG 2004). The strongest remaining bull trout populations are found in Upper Priest Lake.

The status of a bull trout core population can be described based on four key elements: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity.

Number and Distribution of Local Populations

Twelve populations are currently identified in the Priest Lakes core area. They include the upper Priest River, Hughes Fork, Gold Creek, Trapper Creek, Lion Creek, Two Mouth Creek, Granite Creek, North Fork Granite, South Fork Granite, Indian Creek, Kalispell Creek, and Soldier Creek. Hughes Fork, Gold Creek, North Fork Granite Creek, South Fork Granite Creek, and Kalispell Creek originate in Washington.

Adult Abundance

Based on recent analysis, there are fewer than 100 adult bull trout in this core area and the recent trend is considered stable at best, more probably declining. The conclusion that bull trout in this core area are threatened with extirpation is inescapable.

Productivity

For a population to contribute to recovery, its growth rate must indicate that the population is stable or increasing for a period of time. Based on the depressed or variable population trend, bull trout in the Priest Lake core area are considered at increasing risk of extinction.

Connectivity

Bull trout spatial distribution in the main basin of Priest Lake and its direct tributaries is increasingly fragmented (IDFG 2004). Fish passage at Priest Lake dams needs to be addressed to provide year round fish passage. Barriers on smaller streams such as water diversions, road crossings, and culverts also impede connectivity between populations.

Changes in Environmental Conditions and Population Status

Critical habitat was formally designated in Priest Lake, Upper Priest Lake, and all or part of the following watersheds: Cedar Creek, Granite Creek, Hughes Fork, Indian Creek, Kalispell Creek, Lion Creek, North Fork Indian Creek, Soldier Creek, South Fork Granite Creek, South Fork Indian Creek, South Fork Lion Creek, South Fork Lion Creek, Trapper Creek, Two Mouth Creek, Upper Priest River (USFWS 2004).

Idaho Department of Fish and Game (2001) published a statewide fisheries management plan for 2001-2006 that included the specific objectives of “restoring a fishable population of bull trout in Upper Priest Lake” and “examining the potential to shift management emphasis in Priest Lake from lake trout to cutthroat, bull trout, and kokanee.” Identified management strategies to achieve those objectives included angler regulation and education along with active removal of non-native lake trout by intensive gill-netting in Upper Priest Lake.

The ongoing State and Federal management programs have identified opportunities that have not yet translated into meaningful recovery efforts in this core area. Bull trout population response as a result of lake trout control activities is not certain, but there do not appear to be other viable options. The critical habitat designation placed on this watershed will not produce any meaningful results in the near-term, given the magnitude of the nonnative lake trout threat that may lead to extirpation of bull trout.

Threats and Recovery Objectives

Threats to bull trout in the Priest Lakes core area include:

- The outlet control structure is probably a fish barrier during periods of operation.
- Impacts related to past forest practices have degrade habitat including loss of riparian habitat, sedimentation, poorly designed and located roads, and blocking culverts.
- Non-native, invasive species including brook, lake, and brown trout.

- Dewater occurs regularly on portions of Kalispell Creek.

Recovery objectives are focused on maintaining current bull trout distributions and restoring distribution in previously occupied areas, maintaining stable or increasing trends in abundance of bull trout, restoring and maintaining suitable habitat for all life history stages, and conserving genetic diversity and providing opportunity for genetic exchange. This can be achieved by correcting prevailing threats especially addressing low flow conditions, addressing impacts from dams and diversion structures, improving water quality parameters especially related to temperature and sediments, and improving stream channel and riparian conditions. In addition, the establishment of fisheries management goals and objectives, research and monitoring programs, adaptive management approaches, and use of available conservation programs and regulations are recommended to achieve recovery objectives, and monitor progress in reaching recovery goals.

EAST CASCADE MOUNTAINS GEOGRAPHIC AREA

Entiat Core Area

Bull trout in the Entiat core area are thought to be primary fluvial.

The status of a bull trout core population can be described based on four key elements: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity.

Number and Distribution of Local Populations

Currently two local populations of bull trout are found in the Entiat core area. Bull trout have been found in small numbers throughout the Entiat River up to Entiat Falls. A small amount of spawning has been observed below the falls, but no spawning aggregations have been documented. The other local population is found in Mad River, a tributary to the Entiat River. Most spawning on the Mad River occurs over a 7.7-mile reach between Young Creek and Jimmy Creek. Bull trout may also spawn in Tillicum Creek, a tributary to the lower Mad River, but additional survey information is needed to characterize the use on this system by bull trout.

Adult Abundance

Bull trout in the Entiat core area persists at a very low abundance. Only a few bull trout redds have been found the Entiat River from 1994 to 2001. In almost have those years no redds were observed. The most redds observed during that time period was six, while in 3 different years, a total of three redds were observed. The majority of bull trout spawning for this core area occurs in the Mad River between Young Creek and Jimmy Creek. Bull trout redd surveys have been conducted annually between 1989 in this reach, with counts ranging between 45 in 2000, and 10 in 1993. Total redd counts for the entire core area in 2002 and 2003 were 33 and 57, respectively. A concern is that there is currently only one strong spawning area for this core area, the Mad River, but it has only had 50 or more redds one time and numbers for the Entiat have averaged less than 10 redds. Overall, the trend for the whole core area looks stable and is

slightly increasing due to the Mad River adult abundance, due to overall low adult abundance the Entiat core area is still considered at risk of both genetic drift and inbreeding depression.

Productivity

For a population to contribute to recovery, its growth rate must indicate that the population is stable or increasing for a period of time. Given the overall lack of long-term population census information and complete record of redd count surveys, bull trout in this core area are at increased risk of extinction.

Connectivity

Within the Entiat core area, the migratory life history form is predominate within the existing populations, and therefore, this core area was considered at a diminished risk. While localized habitat problems currently exist that may impede connectivity, there are no large scale, man-made migration barriers affecting this core area.

Changes in Environmental Conditions and Population Status

The assessment in the Rock Creek Mine Biological Opinion (USFWS 2006a) of all of the biological opinions from the time of listing until July 2006 (335 biological opinions), confirmed that no actions that have undergone section 7 consultation, considered either singly or cumulatively, will appreciably reduce the likelihood of survival and recovery of the bull trout or result in the loss of any local populations and that many of them will benefit bull trout (see the Status section for additional information). Locally, there have been a few biological opinions in the Wenatchee core area, within the action area, that will cause adverse effects to the population and/or habitat such as in the following examples, though not an exhaustive list: 1) Washington Forest Practices and PUD HCPs, 2) Federal Columbia River Power System Project, 3) Washington State Department of Transportation programmatic consultation for road maintenance and repairs, 4) USFS programmatic consultation for culvert replacement and noxious weed treatments, 5) numerous Bureau of Reclamation diversion maintenance and work projects, 6) Mid-Columbia Coho Reintroduction project, 7) Preston Fox Recreation and Vegetation Management project, 8) Goose-Maverick Recreational Tie Trail and Mad River Trail Relocation project, and 9) the Bridge to Bridge Restoration Project, which will accrue both lethal and sub-lethal take.

Available information indicates implementation of section 6 and/or section 10(a)(1)(A) permits in the basin have resulted in direct effects to bull trout due to capture and handling and indirect mortality (BOR, WDFW, EPA, CWU, Yakama Nation, and FWS fisheries studies). Although projects associated with the restoration programs may result in long-term benefits for bull trout and their habitat, all projects included in the proposed action resulted in take of this species.

It is unknown how many non-Federal actions have occurred in the Entiat core area since the listing of bull trout. Activities such as emergency flood control, development, and infrastructure maintenance are conducted on a regular basis and affect riparian and instream habitat. Hydraulic Permits issued by the State also affect bull trout and their habitat. Recent land-use changes from agriculture to urban development along the riparian areas may also affect bull trout and their

habitat. County permits have likely increased for construction of homes in floodplain and riparian areas.

Statewide Federal restoration programs which include riparian restoration, restoration of fish passage at barriers, and habitat improvement projects have been authorized in the Entiat core area. The Entiat River watershed groups have coordinated to apply for monies to complete stream habitat work along the mainstem Entiat River and its tributaries and are working with the U.S. Forest Service to complete culvert repairs and road work. Most large fish passage culverts on national forest land have been replaced with open bottom arches or bridges. The biological opinion for the Chelan and Douglas County PUD HCP requires bull trout monitoring and the associated tributary funding is providing restoration for salmonid habitats. The FCRPS Biological Opinions also provides for bull trout monitoring and associated restoration project that will benefit bull trout.

State forest practice regulations were significantly revised in 2000, following the Forest and Fish agreement (FFR 1999; WFPB 2001). Revised regulations increased riparian protection, unstable slope protection, and recruitment of large wood; road standards improved significantly over the old regulations. Because there is biological uncertainty associated with some of the prescriptions, the Forest and Fish agreement relies on an adaptive management program for assurance that the new rules will meet the conservation needs of bull trout. The updated regulations will significantly reduce the level of future timber harvest impacts to bull trout streams on private lands. However, most negative effects from past forest practices will likely continue to be a threat for decades. Natural events such as fire, flooding, and global warming will continue to cause changes in the environment within the Entiat core area.

Threats and Recovery Objectives

Threats to bull trout in the Entiat core area include:

- Historically, dams on the major tributaries in the upper Columbia Recovery Unit probably contributed to the decline in bull trout by blocking migratory corridors and restricting connectivity to upstream spawning areas and downstream overwintering areas.
- Past timber harvest, and harvest-related activities (such as roads), have diminished natural channel complexity, streambank stability, and riparian conditions to a greater extent in the lower Entiat River but the Mad River has been impacted as well.
- Irrigation diversions and water withdrawals associated with agricultural practices may have exacerbated natural low flow conditions in the Entiat River.
- Small scale gold mining on Peshastin and Chiwawa River could have cumulative impacts to water quality.
- Impacts from residential development and urbanization like the degradation of water quality, instream habitats, and riparian areas are a concern as this area continues to experience socio-economic shifts away from agriculture to industry.

- Impacts from recreation developments such as campgrounds, trails, etc. include a reduction in large woody debris, loss of riparian habitat, streambank alterations, and poaching.
- The presence of non-native brook trout in above Entiat is a concern.

Recovery objectives are focused on maintaining current bull trout distributions and restoring distribution in previously occupied areas, maintaining stable or increasing trends in abundance of bull trout, restoring and maintaining suitable habitat for all life history stages, and conserving genetic diversity and providing opportunity for genetic exchange. This can be achieved by correcting prevailing threats through improving water quantity and quality, improving timber harvest practices, addressing past timber harvest impacts, and reducing the abundance of brook trout. In addition, the establishment of fisheries management goals and objectives, research and monitoring programs, adaptive management approaches, and use of available conservation programs and regulations are recommended to achieve recovery objectives, and monitor progress in reaching recovery goals.

Methow Core Area

Within the Methow River, adfluvial, fluvial, and resident life history forms are present. Bull trout are known to occur in Gold Creek, Twisp River, Chewuch River, Wolf Creek, Early Winters Creek, Upper Methow River, Lost River, and Goat Creek. Resident life forms are found above passage barriers.

The status of a bull trout core population can be described based on four key elements: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity.

Number and Distribution of Local Populations

Currently 10 local populations of bull trout are found in the Methow core area. The lower Methow River is most likely used as a migratory corridor. Spawning occurs on tributary streams. Carter Creek, a tributary to Gold Creek which in turn is a tributary to the Methow River, has the only documented fluvial spawning population within the Gold Creek basin. A population also occurs on Beaver Creek another tributary to the Methow. Bull trout in the Twisp River local population are comprised of migratory and resident forms and spawning occurs in the mainstem Twisp River, Buttermilk Creek, Bridge Creek, Reynolds Creek, and North Creek. Wolf Creek is an important spawning and rearing stream for migratory bull trout, and resident bull trout also contribute to this local population. The Chewuck River local population includes the mainstem Chewuck and Lake Creek. The Upper Methow population includes the West Fork of the Methow River, Trout Creek, Robinson Creek, and Rattlesnake Creek. Local populations also occur in Goat Creek, Early Winters Creek, and Lost River.

Adult Abundance

Recent annual averages for adult abundance (174) in the Twisp River indicate that this local population may not be at risk of inbreeding depression. This is caveat by high variability in redd counts. Several other local populations in the Methow core area are mostly under 100 adults annually and are at risk of inbreeding depression. Overall, adult spawning abundance in the Methow core area is probably less than 1,000 individuals and therefore is at risk of deleterious effects of genetic drift.

Productivity

For a population to contribute to recovery, its growth rate must indicate that the population is stable or increasing for a period of time. Given the overall lack of long-term population census information and complete record of redd count surveys, bull trout in this core area are at increased risk of extinction.

Connectivity

Within the Methow core area, habitat degradation has fragmented bull trout populations. Reductions in habitat quality resulting from irrigation water withdrawals, diversion dams, grazing, and passage barriers have collectively contributed to the decline of bull trout in the basin. Bull trout in the Methow core area are considered to be at an increased risk of extinction.

Changes in Environmental Conditions and Population Status

The assessment in the Rock Creek Mine BO (USFWS 2006a) of all of the biological opinions from the time of listing, until July 2006 (335 biological opinions), confirmed that no actions that have undergone section 7 consultation, considered either singly or cumulatively, will appreciably reduce the likelihood of survival and recovery of the bull trout or result in the loss of any local populations and that many of them will benefit bull trout (see the Status section for additional information). Locally there have been a few biological opinions in the Methow core area, within the action area, that will cause adverse effects to the population and/or habitat such as in the following examples, though not an exhaustive list: 1) Washington Forest Practices and PUD HCPs, 2) Federal Columbia River Power System Project, 3) Washington State Department of Transportation programmatic consultation for road maintenance and repairs, 4) USFS programmatic consultation for culvert replacement and noxious weed treatments, 5) numerous BOR diversion maintenance and work projects, 6) Mid-Columbia Coho Reintroduction project, 7) Wolf Creek Diversion Restoration project, 8) Skyline Irrigation Company Operations and Special User Permit, 9) Chewuch Diversion Dam Fish Passage Renovation, 10) Fulton Dam Project, Aspen Meadows/Twisp Watershed Projects, Andrews Creek Bridge Removal Project, Thirtymile Bridge Replacement Project, Chewuch Flood Emergency Consultation, Thirtymile Farewell, Needles, Spur Peak and Tripod Fires Emergency Consultation and restoration projects, and 11) USFS ongoing projects, which will accrue both lethal and sub-lethal take.

Available information indicates implementation of section 6 and/or section 10(a)(1)(A) permits in the basin have resulted in direct effects to bull trout due to capture and handling and indirect

mortality (BOR, WDFW, EPA, CWU, Yakama Nation, and FWS fisheries studies). Although projects associated with the restoration programs may result in long-term benefits for bull trout and their habitat, all projects included in the proposed action resulted in take of this species.

It is unknown how many non-Federal actions have occurred in the Entiat core area since the listing of bull trout. Activities such as emergency flood control, development, and infrastructure maintenance are conducted on a regular basis and affect riparian and instream habitat. Hydraulic Permits issued by the State also affect bull trout and their habitat. Recent land-use changes from agriculture to urban development along the riparian areas may also affect bull trout and their habitat. County permits have likely increased for construction of homes in floodplain and riparian areas.

Statewide Federal restoration programs which include riparian restoration, restoration of fish passage at barriers, and habitat improvement projects have been authorized in the Methow core area. The Methow River watershed groups have coordinated to apply for monies to complete stream habitat work along the mainstem Methow River and its tributaries and are working with the U.S. Forest Service to complete culvert repairs and road work. Most large fish passage culverts on national forest land have been replaced with open bottom arches or bridges. The Biological Opinion for the Chelan and Douglas County PUD HCP requires bull trout monitoring and the associated tributary funding is providing restoration for salmonid habitats. The FCRPS Biological Opinions also provides for bull trout monitoring and associated restoration project that will benefit bull trout. The Washington State Forest Practice Rules HCP Biological Opinion will include some adverse impacts but will allow for restoration actions on state forested lands. Natural events such as fire, flooding, and global warming cause changes in the environment within the Methow core area.

Threats and Recovery Objectives

Threats to bull trout in the Methow core area include:

- Historically, dams on the major tributaries in the upper Columbia Recovery Unit probably contributed to the decline in bull trout by blocking migratory corridors and restricting connectivity to upstream spawning areas and downstream overwintering areas.
- Past timber harvest, and harvest-related activities (such as roads), have diminished natural channel complexity, streambank stability, and riparian conditions. Forest roads that access timberlands are often located in the narrow floodplains including sensitive bull trout areas. This is particularly true for the Twisp River, Chewuck River, and Lake Creek basins.
- Over 60 percent of the private bottom lands in the Methow River area have erosion problems related to grazing. Of specific concerns are riparian areas adjacent to the Twisp River, lower Wolf Creek, Upper Methow River, Chewuck River, Buttermilk Creek, Gold Creek, and Goat Creek.

- Irrigation diversions and water withdrawals associated with agricultural practices may have resulted in partial or complete barriers on many of the systems that support bull trout.
- Impacts from residential development and urbanization like the degradation of water quality, instream habitats, and riparian areas are a concern as this area continues to experience socio-economic shifts away from agriculture to industry.
- Impacts from recreation developments especially on the Twisp River such as campgrounds, trails, etc., include a reduction in large woody debris, loss of riparian habitat, streambank alterations, and poaching.
- Brook trout are widespread within the Methow River and the potential for introgression with bull trout is a concern.

Recovery objectives are focused on maintaining current bull trout distributions and restoring distribution in previously occupied areas, maintaining stable or increasing trends in abundance of bull trout, restoring and maintaining suitable habitat for all life history stages, and conserving genetic diversity and providing opportunity for genetic exchange. This can be achieved by correcting prevailing threats through improving water quantity and quality, reducing grazing impacts, minimizing water withdrawal impacts, and reducing the abundance of brook trout. In addition, the establishment of fisheries management goals and objectives, research and monitoring programs, adaptive management approaches, and use of available conservation programs and regulations are recommended to achieve recovery objectives, and monitor progress in reaching recovery goals.

Yakima Core Area

Resident and migratory (both fluvial and adfluvial) bull trout are all found within the Yakima core area, which includes the Yakima River and various tributaries. Migratory bull trout persist at low levels within most of the 17 local populations identified in the Yakima core area. Fragmentation of habitat in the Yakima core area impedes bull trout migration and has resulted in restricted distribution. Historically, bull trout were more widely distributed, and likely migrated into the lower Yakima River to forage and overwinter. Currently, bull trout in the Yakima core area are found in 13 local populations. Many of these populations are separated from the Yakima River by dams while other populations are seasonally isolated by low water.

The status of a bull trout core population can be described based on four key elements: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity.

Number and Distribution of Local Populations

Historically, bull trout occurred throughout the Yakima River basin, but they are now fractured into isolated populations. Bull trout in the Yakima core area are currently found in 17 local populations including: the mainstem Yakima River (Keechelus to Easton Reach); Ahtanum

Creek (North, South, and Middle forks); Naches River tributaries (American River, Rattlesnake Creek, and Crow Creek); Rimrock Lake tributaries (South Fork Tieton and Indian Creek); Teanaway River; Kaches Lake tributaries (Box Canyon Creek and upper Kachess River); Keechelus lake (Gold Creek); the upper Cle Elum River, N. Fork Tieton, and Taneum.

Adult Abundance

Overall, bull trout in the Yakima Area persist at low numbers in fragmented, local populations. The strongest bull trout populations are represented by local populations in the South Fork Tieton River and Indian Creek. Based on average redd counts since 1996, conservative adult population estimates in South Fork Tieton and Indian Creek are 338 and 382, respectively. Adult abundance estimates for other local populations over the same time period include: Deep Creek (192), Gold Creek (64), Box Canyon (26), Ahtanum (18), American River (64), and Rattlesnake Creek (94). All but Deep Creek are considered to be at low or very low abundance levels. Estimates of adult abundance in other local populations are unknown due to short time span of redd surveys. Bull trout in the South Fork Tieton, Indian Creek, and Deep Creek are not considered at risk from inbreeding depression. All other populations were either at risk due to low abundance levels or classified as unknown due to lack of information. Because of the lack of interconnectivity, the Yakima core area is currently at intermediate risk from the deleterious effects of genetic drift.

Productivity

For a population to contribute to recovery, its growth rate must indicate that the population is stable or increasing for a period of time. Given the overall lack of long-term population census information in the Yakima core area, bull trout in this core area are at increased risk of extinction.

Connectivity

Lack of passage within the Yakima core area has fragmented bull trout populations and prevented migration to foraging and overwintering habitat. Migratory bull trout persist at low numbers within most local populations and accompanied with lack of passage, limits the possibility for genetic exchange and the reestablishment of local populations. Because four of the local populations have connectivity and low abundances and the other populations are fragmented and located above five BOR irrigation reservoirs with no passage, or are considered resident (Ahtanum), the Yakima core area continues to be at risk for genetic drift and inbreeding. There is research needed to further look at the genetics of these populations for this reason. Of further concern, is that with low abundances and reduced connectivity in the Yakima core areas due to the BOR dams and manipulations of downstream habitats, populations could be lost should a catastrophic event such as fire and flood occur.

Changes in Environmental Conditions and Population Status

With limited time to review all actions that have occurred in this core area, the current status of the Yakima core area seems to be a decreasing trend. Since listing in 1998, the redd numbers are

reduced. Since the development of the U.S. Fish and Wildlife Service Draft Recovery Plan in 2002, average redd numbers may look like they are stable but there have been three populations added by the USFWS Recovery Team, and numbers have not increased. Populations are low for the amount of habitat available. Only 4 of the 17 populations have greater than 50 redds/100 fish and 3 of those are disconnected and located above dams (two above just one dam-Rimrock). Two of which are located above one dam. There is a drastic reduction in numbers of redds with Indian Creek. There is less than 10 years of consistent data collected in the same stream reaches between all populations in the core area. The redd numbers are variable within and among populations. Redd data has been collected similarly since 1994 in only the S. Fork Tieton and numbers have increased and remain somewhat stable there. However, they are located above a dam lacking passage and connectivity to the rest of the populations.

State forest practice regulations were significantly revised in 2000, following the Forest and Fish agreement (FFR 1999; WFPB 2001). Revised regulations increased riparian protection, unstable slope protection, and recruitment of large wood; road standards improved significantly over the old regulations. Because there is biological uncertainty associated with some of the prescriptions, the Forest and Fish agreement relies on an adaptive management program for assurance that the new rules will meet the conservation needs of bull trout. The updated regulations will significantly reduce the level of future timber harvest impacts to bull trout streams on private lands. However, most negative effects from past forest practices will likely continue to be a threat for decades. Connectivity to high quality spawning habitat continues to be a problem as it has been since listing. This is still one of the most highly fragmented populations in the Columbia River distinct population segment and has entrainment at least one of the five BOR dams, and possibly all.

Threats and Recovery Objectives

Threats to bull trout in the Yakima core area include:

- Of the five major storage reservoirs in the Yakima core area, four were historically natural lakes. Potential impacts from each facility include: fragmentation of populations, entrainment, altered water temperatures, reservoir passage, and altered basin flow regimes.
- Past timber harvest, and harvest-related activities (such as roads), have degraded habitat conditions in the Yakima core area especially in the upper Yakima River, Cle Elum River, Taneum River, Ahtanum Creek, Teanaway River, Naches River, and the Tieton River.
- Livestock practices have degraded bull trout habitat in the Yakima core area especially in Ahtanum Creek, Teanaway River, and the Tieton River.
- Irrigation diversions and water withdrawals associated with agricultural practices result in low flow conditions, seasonal dewatering, entrainment, and water quality problems. Specific areas of concern include: Lower Rattlesnake Creek, Big Creek, Lower Taneum Creek, Teanaway River, Gold Creek, and Ahtanum Creek.

- Suction and hard rock mining occurs on a limited scale in several watersheds including the Little Naches and Cle Elum.
- Impacts from residential development and urbanization are likely to increase as the population increases.
- The combination of hatchery-stocked rainbows, large catch limits, use of bait, and easy public access to mainstem and tributaries have generated high angling pressures that have probably negatively impacted bull trout. In addition, poaching has been identified as a serious concern in Gold Creek, Box Canyon Creek, Deep Creek, South Fork Tieton River, and Indian Creek.
- Introduction of non-native species including brook trout, brown trout, lake trout, bass, catfish, bluegill, sunfish, and crappie have impacted bull trout populations through a combination of hybridization, competition, and predation.

Recovery objectives are focused on maintaining current bull trout distributions and restoring distribution in previously occupied areas, maintaining stable or increasing trends in abundance of bull trout, restoring and maintaining suitable habitat for all life history stages, and conserving genetic diversity and providing opportunity for genetic exchange. This can be achieved by correcting prevailing threats through improving water quality, providing passage, eliminating entrainment, improving timber harvest and grazing practices, minimizing mining impacts, repairing roads and culverts, operating dams to minimize negative effects, and reducing the abundance of nonnative fishes. In addition, the establishment of fisheries management goals and objectives, research and monitoring programs, adaptive management approaches, and use of available conservation programs and regulations are recommended to achieve recovery objectives, and monitor progress in reaching recovery goals.

Wenatchee Core Area

Resident and migratory (both fluvial and adfluvial) bull trout are all found within the Wenatchee core area, which includes the Chiwawa River, White River, Little Wenatchee River, Nason Creek, Chiwaukum Creek, and Peshastin Creek. The majority of spawning and fry rearing habitat are within U.S. Forest Service lands including Glacier Peak and Alpine Wilderness areas. Resident bull trout occur in Icicle Creek above the barrier falls, and migratory bull trout frequent habitat below the falls most likely for foraging. It is unknown if migratory bull trout can navigate the falls.

The status of a bull trout core population can be described based on four key elements: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity.

Number and Distribution of Local Populations

Seven local populations are currently known for the Wenatchee core area. The Chiwawa River local population complex is a strong-hold for bull trout in the upper Wenatchee River. Spawning has been documented in Rock Creek, Chikamin Creek, Phelps Creek, Chiwawa River and Buck Creek. Rock Creek supports the strongest population of bull trout in the basin. The White River local population is known to spawn in the White River (a major tributary of Wenatchee River) and Panther Creek a tributary to the White River. Bull trout have been observed in other tributaries to the White River (Napeequa River, Canyon Creek and Sears Creek), but no spawning has been documented. The Little Wenatchee River local population spawns in the Little Wenatchee River (tributary to Lake Wenatchee) up to Little Wenatchee Falls at river mile 6.8. The Nason Creek originates at Steven's Pass and flows into the Wenatchee River just below the outlet of Lake Wenatchee. Limited redd surveys indicate that spawning for the local population occurs in Nason Creek and Mill Creek. In addition to these four local populations, three other populations have been identified. These populations are in Chiwaukum Creek, Peshastin Creek (including Ingalls Creek), and Icicle Creek.

Adult Abundance

Overall, the Wenatchee core area persists at low abundance. The strongest population in the Wenatchee core area is in the Chiwawa River. Since 1999, the number of redds in the Chiwawa River has ranged from 246 to 538, or conservatively 492 to 1,076 spawning adults. Since 2002 there are an average of 443 redds in the Wenatchee core area. The Chiwawa River local population is not at risk of inbreeding, but other local populations in the Wenatchee core area persist in low numbers and are considered at risk.

Productivity

For a population to contribute to recovery, its growth rate must indicate that the population is stable or increasing for a period of time. Given the overall lack of long-term population census information and complete record of redd count surveys, bull trout in this core area are at increased risk of extinction.

Connectivity

Within the Wenatchee core area, the migratory life history form is predominant within the existing populations; therefore, this core area was considered at a diminished risk. While localized habitat problems currently exist that may impede connectivity, there are no large scale man-made migration barriers affecting this core area.

Changes in Environmental Conditions and Population Status

The assessment in the Rock Creek Mine BO (USFWS 2006a) of all of the biological opinions from the time of listing, until July 2006 (335 biological opinions), confirmed that no actions that have undergone section 7 consultation, considered either singly or cumulatively, will appreciably reduce the likelihood of survival and recovery of the bull trout or result in the loss of any local

populations and that many of them will benefit bull trout (see the Status section for additional information). Locally, there have been a few biological opinions in the Wenatchee core area, within the action area, that will cause adverse effects to the population and/or habitat such as in the following examples, though not an exhaustive list: 1) Washington Forest Practices and PUD HCPs, 2) Federal Columbia River Power System Project, 3) Washington State Department of Transportation programmatic consultation for road maintenance and repairs, 4) USFS programmatic consultation for culvert replacement and noxious weed treatments, 5) numerous BOR diversion maintenance and work projects, 6) Mid-Columbia Coho Reintroduction project, Icicle Creek and Restoration projects, 7) White River Road Relocation project, Icicle Complex Fire Emergency Consultation and Rehabilitation projects, Dirtyface Fire Emergency Consultation, and 8) Leavenworth National Fish Hatchery Ongoing Operations project, which will accrue both lethal and sub-lethal take.

Available information indicates implementation of section 6 and/or section 10(a)(1)(A) permits in the basin have resulted in direct effects to bull trout due to capture and handling and indirect mortality (BOR, WDFW, EPA, CWU, Yakama Nation, and FWS fisheries studies). Although projects associated with the restoration programs may result in long-term benefits for bull trout and their habitat, all projects included in the proposed action resulted in take of this species.

It is unknown how many non-Federal actions have occurred in the Wenatchee core area since the listing of bull trout. Activities such as emergency flood control, development, and infrastructure maintenance are conducted on a regular basis and affect riparian and instream habitat. Hydraulic Permits issued by the State also affect bull trout and their habitat. Recent land-use changes from agriculture to urban development along the riparian areas may also affect bull trout and their habitat. County permits have likely increased for construction of homes in floodplain and riparian areas.

Statewide Federal restoration programs which include riparian restoration, restoration of fish passage at barriers, and habitat improvement projects have been authorized in the Wenatchee core area. The Wenatchee River watershed groups have coordinated to apply for monies to complete stream habitat work along the mainstem Wenatchee River and its tributaries and are working with the U.S. Forest Service to complete culvert repairs. Most large fish passage culverts on national forest land have been replaced with open bottom arches or bridges. The biological opinion for the Chelan and Douglas County PUD HCP requires bull trout monitoring and the associated tributary funding is providing restoration for salmonid habitats. The FCRPS Biological Opinions also provides for bull trout monitoring and associated restoration project that will benefit bull trout. The Washington State Forest Practice Rules HCP Biological Opinion will include some adverse impacts but will allow for restoration actions on state forested lands. Natural events such as fire, flooding, and global warming cause changes in the environment within the Wenatchee core area.

Threats and Recovery Objectives

Threats to bull trout in the Wenatchee core area include:

- Historically, dams on the major tributaries in the upper Columbia Recovery Unit probably contributed to the decline in bull trout by blocking migratory corridors and restricting connectivity to upstream spawning areas and downstream overwintering areas.
- Past timber harvest, and harvest-related activities (such as roads), have diminished natural channel complexity and riparian conditions in many of the drainages that support bull trout.
- Irrigation diversions and water withdrawals associated with agricultural practices result in low flow conditions, seasonal dewatering, entrainment, and water quality problems in many of the drainages that support bull trout especially Peshastin Creek, Mill Creek, Icicle Creek, Chiwaukum Creek, Chiwawa River, and Phelps Creek.
- Small scale gold mining on Peshastin and Chiwawa River could have cumulative impacts to water quality.
- Impacts from residential development and urbanization like the degradation of water quality, instream habitats, and riparian areas are a concern as this area continues to experience socio-economic shifts away from agriculture to industry.
- Impacts from recreation developments such as campgrounds, trails, etc., include a reduction in large woody debris, loss of riparian habitat, streambank alterations, and poaching.
- The presence of non-native brook trout in many of the drainages is a concern due to possible competition and inbreeding.
- Prior to harvest restrictions, large numbers of adult bull trout were harvested in Lake Wenatchee.

Recovery objectives are focused on maintaining current bull trout distributions and restoring distribution in previously occupied areas, maintaining stable or increasing trends in abundance of bull trout, restoring and maintaining suitable habitat for all life history stages, and conserving genetic diversity and providing opportunity for genetic exchange. This can be achieved by correcting prevailing threats through improving water quality, improving timber harvest and grazing practices, minimizing small scale mining impacts, repairing roads and culverts, and reducing the abundance of brook trout. In addition, the establishment of fisheries management goals and objectives, research and monitoring programs, adaptive management approaches, and use of available conservation programs and regulations are recommended to achieve recovery objectives, and monitor progress in reaching recovery goals.

BLUE MOUNTAINS GEOGRAPHIC AREA

Walla Walla Core Area

Bull trout in the Walla-Walla core area exhibit both fluvial and resident life histories. Both forms spawn in headwater tributaries. After spawning, fluvial bull trout return to overwintering areas in the mainstem Walla Walla River until upstream migration begins. They spend the summer through fall in lower-order tributaries or the upper mainstem Walla Walla River.

The status of a bull trout core population can be described based on four key elements: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity.

Number and Distribution of Local Populations

The Walla Walla core area currently has two known local populations: upper Walla Walla complex, which includes the North and South Forks of the Walla Walla River; and Mill Creek and its tributaries. Fish in the upper Walla Walla complex spawn mainly in the North and South Forks of the Walla Walla River between Table Creek and the second major tributary above Reser Creek with the majority of spawning fish found in Bear Creek. Fish from the Mill Creek population spawn in Mill Creek and its tributaries upstream of the National Forest boundary.

Adult Abundance

Due to the lack of abundance data, bull trout local populations in the Walla Walla core area could not be evaluated relative to the risk of inbreeding depression. Abundance estimates for the Walla Walla core area were conservatively estimated by doubling the number of redds counted in 1999 and 2000 and taking the average of both years for an adult abundance estimate of 1,437 individuals. Based on this adult abundance estimate, the Walla Walla core area is not at risk from genetic drift.

Productivity

For a population to contribute to recovery, its growth rate must indicate that the population is stable or increasing for a period of time. Based on the depressed or variable population trend, bull trout in the Walla Walla core area are considered at increasing risk of extinction.

Connectivity

Migratory bull trout continue to persist in some local populations. Connectivity among populations is limited by numerous dams and diversion structures on the mainstem Walla Walla River and many of its tributaries creating physical and thermal barriers at certain times of the year. Because of these factors, the Walla Walla core area is considered at an intermediate risk.

Changes in Environmental Conditions and Population Status

In June 2000, the Walla Walla settlement agreement was signed by three local irrigation districts and the U.S. Fish and Wildlife Service. This agreement provided for the maintenance of instream flows in a stretch of the Walla Walla River that had been seasonally dewatered by irrigation diversions (Mendel et al. 2002, 2003). In 1999, over 6,500 fish, including 108 bull trout, were salvaged after being stranded in this dewatered reach. In 2000, a total of 3,887 fish, including 15 bull trout, were salvaged from the area. In 2001, for the first summer in nearly a century, the increased flows resulted in a watered stretch of the Walla Walla River between Milton-Freewater, Oregon, and the Washington/Oregon state line. Since implementation of the agreement, there has not been a fish stranding problem in this area.

The settlement agreement has been amended several times since 2000 to accommodate increased flow requirements; a new 3-year agreement was signed on June 28, 2004. A Bi-State watershed habitat conservation plan is seen as the best long-term solution for bull trout conservation in the Walla Walla River Basin, and the Upper Columbia Fish and Wildlife Office is working with local agencies and organizations to develop this plan (M. Eames, USFWS, *in litt.*).

In 2001, a major new fish ladder was installed at Nursery Bridge near Milton-Freewater to facilitate passage of large salmon, steelhead, and bull trout. Considerable progress has been made in eliminating barriers to fish passage on the Walla Walla River and Mill Creek through screening irrigation ditches, consolidating ditches, and modifying diversion structures.

Threats and Recovery Objectives

Threats to bull trout in the Walla Walla core area include:

- Numerous dams and diversion structures have been constructed on the mainstem Walla Walla and tributaries for agriculture and flood control.
- Increased sediment loads associated with logging roads and recreation trails, loss of future large wood, and passage barriers associated with road culverts are problems that have result from past and present forest practices in several basins within the Walla Walla core area.
- Past livestock grazing on Forest Service lands has contributed to the degradation of aquatic habitats and present day livestock grazing on private lands continues to degrade the same habitats.
- Flood control and agricultural practices have simplified aquatic habitats and dewatered others. Poorly maintained diversions also strand bull trout.
- Residential development has meant the loss of floodplain habitats as well as low flow conditions due to municipal water withdrawals.

- The mainstem Walla Walla from the Little Walla Walla River downstream to the mouth contain numerous non-native species, but at this time the impacts are not well known.
- Angling impacts past and present have adversely effected and continue to effect bull trout through direct harvest and incidental harvest. Poaching also is a threat to bull trout in the Walla Walla River and some tributaries.

Recovery objectives are focused on maintaining current bull trout distributions and restoring distribution in previously occupied areas, maintaining stable or increasing trends in abundance of bull trout, restoring and maintaining suitable habitat for all life history stages, and conserving genetic diversity and providing opportunity for genetic exchange. This can be achieved by correcting prevailing threats especially addressing low flow conditions, addressing impacts from dams and diversion structures, improving water quality parameters especially related to temperature and sediments, improving stream channel and riparian conditions, maintaining intakes to prevent entrainment, and providing passage dams and diversions. In addition, the establishment of fisheries management goals and objectives, research and monitoring programs, adaptive management approaches, and use of available conservation programs and regulations are recommended to achieve recovery objectives, and monitor progress in reaching recovery goals.

Walla Walla Core Area - Touchet River

Resident and migratory (both fluvial and adfluvial) bull trout are all found within the Touchet River core area which includes the mainstem Touchet River, North Fork Touchet River, Wolf Fork Touchet River, and South Fork Touchet River.

The status of a bull trout core population can be described based on four key elements: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity.

Number and Distribution of Local Populations

The current known spawning distribution in the Touchet River population occurs in the North Fork Touchet River from Bluewood Creek to Spangler Creek, in Sprangler Creek, Wolf Fork Touchet River from Whitney Creek upstream of the Forest Service boundary, and in Burnt Fork of the South Fork Touchet River. Bull trout in the Touchet River core area are primarily restricted to upper portions of the Wolf Fork and North Fork (Mendel et al., 2003a). An additional local population was discovered in the South Fork, but it appears to be very small and tenuous. Water flows and temperature in lower and middle sections of the South Fork have been identified as potential limiting factors (Kuttel 2001). Habitat conditions are relatively good in the North Fork and Wolf Fork and the local populations in these drainages appear to be holding their own. Annual variability in redd count totals is high, so it is difficult to make reliable inferences on long-term population trends.

Adult Abundance

Redd counts have been done annually on the Wolf Fork Touchet River (from 1990-2004), North Fork Touchet River (1994-2004), and South Fork Touchet River (2000-2004) (annual redd count results up to 2003 are summarized in Mendel et al., 2004; unpublished 2004 results obtained from Glen Mendel, WDFW, Dayton, WA). Wolf Fork continues to support the largest population, although redd totals on that stream have fluctuated a great deal (from 71 in 1994, down to 4 in 1997, then up to 101 in 2003). Despite the high variability, the overall trend in redds per year has been upward in Wolf Fork since 1998. On the North Fork, redd totals hovered in the 40s from 1998 to 2001, but have dropped each year since to a low of 22 in 2004, which is in the vicinity of counts from the mid-1990s. It is unclear if this represents natural fluctuations or a steady decline. A local population was discovered in the South Fork Touchet River in 2000. However, after 16 redds were observed in the South Fork in 2001, the count dropped to one in 2002, and no redds were seen in 2003 and 2004 surveys.

Productivity

For a population to contribute to recovery, its growth rate must indicate that the population is stable or increasing for a period of time. Based on the depressed or variable populations trends, bull trout in the Touchet River core area were at increasing risk of extinction.

Connectivity

Migratory bull trout persist in some local populations in the Touchet River core area. Physiological barriers and impediments to bull trout passage and rearing were extensive in terms of stream miles affected. Water temperature appears to be the most critical physiological barrier, particularly for passage or rearing. Seasonal temperature related barriers for bull trout generally occur in lower areas of the Touchet River.

Changes in Environmental Conditions and Population Status

Since the bull trout listing, Federal actions occurring in the Touchet River core area have resulted in harm to, or harassment of, bull trout. These actions include timber harvest activities on lands administered by the U.S. Forest Service, statewide Federal restoration programs that include riparian restoration, replacement of fish passage barriers, and fish habitat improvement projects; federally funded transportation projects involving repair and protection of roads and bridges; and section 10(a)(1)(B) permits for HCPs addressing forest management practices. Capture and handling during implementation of section 6 and section 10(a)(1)(A) permits have directly affected bull trout in the Touchet River core area.

State forest practice regulations were significantly revised in 2000, following the Forest and Fish agreement (FFR 1999; WFPB 2001). Revised regulations increased riparian protection, unstable slope protection, and recruitment of large wood; road standards improved significantly over the old regulations. Because there is biological uncertainty associated with some of the prescriptions, the Forest and Fish agreement relies on an adaptive management program for assurance that the new rules will meet the conservation needs of bull trout. The updated

regulations will significantly reduce the level of future timber harvest impacts to bull trout streams on private lands. However, most negative effects from past forest practices will likely continue to be a threat for decades.

Threats and Recovery Objectives

Threats to bull trout in the Touchet River core area include:

- Numerous dams' physiological barriers and impediments to bull trout passage and rearing were extensive in terms of stream miles affected.
- Increased sediment loads associated with logging roads and recreation trails, loss of future large wood, and passage barriers associated with road culverts are problems that have result from past and present forest practices in Touchet River core area.
- Multiple reaches of the mainstem Touchet River are dewatered as a result of agricultural irrigation practices.
- The mainstem Walla Walla from the Little Walla Walla River downstream to the mouth contain numerous non-native species, but at this time the impacts are not well know.
- Angling impacts past and present have adversely effected and continue to effect bull trout through direct harvest and incidental harvest. Poaching also is a threat to bull trout in the Touchet River upstream of Dayton and the North Fork Touchet River. Brown trout also occur on parts of the Touchet River drainage, but their impacts are not well understood.

Recovery objectives are focused on maintaining current bull trout distributions and restoring distribution in previously occupied areas, maintaining stable or increasing trends in abundance of bull trout, restoring and maintaining suitable habitat for all life history stages, and conserving genetic diversity and providing opportunity for genetic exchange. This can be achieved by correcting prevailing threats especially addressing low flow conditions, addressing impacts from dams and diversion structures, improving water quality parameters especially related to temperature and sediments, improving stream channel and riparian conditions, maintaining intakes to prevent entrainment, and providing passage dams and diversions. In addition, the establishment of fisheries management goals and objectives, research and monitoring programs, adaptive management approaches, and use of available conservation programs and regulations are recommended to achieve recovery objectives, and monitor progress in reaching recovery goals.

Grand Ronde Core Area

The Grand Ronde core area is made up of eight known populations of bull trout distributed throughout the tributaries of the upper Grand Ronde River. Only a portion of one of those populations (Wenaha River) is found in Washington. Bull trout have been observed throughout the mainstem Wenaha River, South Fork Wenaha River, North Fork Wenaha River, Butte Creek, Crooked Creek and Mill Creek, a tributary the South Fork Wenaha River. Wenatchee Creek, a

Washington tributary to the Grande Ronde, historically supported fluvial bull trout. However, a barrier waterfall that formed in the 1960's, has impeded migration since. A survey in the mid 1980's documented one resident bull trout. More recent surveys have not been able to confirm bull trout presence. The general status for all populations in this core area appears to be stable. The Wenaha River local population is one of the strongholds as it has multiple age classes, contains fluvial fish, has an anadromous prey base, has connectivity with the Grande Ronde and Snake Rivers, and contains pristine habitat (consistent redd count data is not available for this population, and the status appears to be stable with a low risk of extinction).

The status of a bull trout core population can be described based on four key elements: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity.

Number and Distribution of Local Populations

The Wenaha River drainage may have the most abundant and well distributed population in the Grand Ronde core area. It is thought that this population exhibits both resident and fluvial life histories. Bull trout have been observed throughout the mainstem Wenaha River, South Fork Wenaha River, North Fork Wenaha River, Butte Creek, Crooked Creek and Mill Creek, a tributary the South Fork Wenaha River. Spawning occurs in the headwaters of Wenaha River and many of its tributaries. All known summer rearing and holding areas in the Wenaha River or its tributaries are on National Forest land. This population is considered to be at low risk of extinction. The Wenaha River population is one of eight populations that make up the Grande Ronde core area. The Wenatchee Creek is not considered a local population, but is identified as a research need. Additional research is needed to determine whether a local population exists and its relative risk of extinction.

Adult Abundance

Bull trout in the Grand Ronde core area persist at moderate levels and best estimates are that approximately 4,000 bull trout spawned in each of the past few years. Both resident and fluvial life history forms are known to occur in the Grande Ronde core area. The majority of spawning likely occurs in the Wenaha River and its tributaries. Little information about the abundance of bull trout in Wenaha River exists, but this population is considered to be at low risk of extinction. Overall, the Grande Ronde core area is considered to be at a diminished risk from genetic drift.

Productivity

For a population to contribute to recovery, its growth rate must indicate that the population is stable or increasing for a period of time. Given the overall lack of long-term population census information in Grande Ronde core area and the variability in abundance estimates, the Grande Ronde core area is considered at increased risk of extinction. The Wenaha River local population is thought to be at low risk of extinction.

Connectivity

There are few physical or thermal barriers obstructing connectivity and migratory forms are present in many local populations within the Grande Ronde core area. Assuming that all the local populations are connected, bull trout in this core area are currently at an intermediate risk.

Changes in Environmental Conditions and Population Status

The U.S. Forest Service has conducted an extensive culvert inventory to determine fish passage concerns and limited replacements have been conducted for bull trout in the Grande Ronde River core area to date. The Oregon Department of Environmental Quality (ODEQ) TMDL and Water Quality Management Plan for the Upper Grande Ronde River management plan has recently been completed. Wallowa County is currently conducting a TMDL and Water Quality Management Plan for the Lower Grande Ronde River. (ODEQ, 2000).

Threats and Recovery Objectives

Threats to bull trout in the Grande Ronde core area include:

- The construction of dams both inside and outside the Grande Ronde core area has contributed to the decline of bull trout.
- Past and present forest management practices on Federal, State, and private lands have and continue to adversely affect bull trout and bull trout habitat via siltation, creation thermal barriers, and loss of instream structure.
- Livestock grazing has contributed to the decline of bull trout through impacts to both upland and riparian areas of many of the tributary streams including Wenaha River and its tributaries.
- Bull trout in the Grande Ronde core area have been and continue to be adversely affected by irrigation diversions and water withdrawals.
- Road densities are high in many watersheds in the Grande Ronde core area and road construction, reconstruction, and maintenance has and continues to contribute to the decline of bull trout.
- Historic harvest of bull trout may have eliminated local populations in the Grand Ronde core area. Continued harvest of bull trout although prohibited, still occurs in many streams in the core area including the Wenaha River.
- Brook trout, which pose a serious threat to bull trout, are found in the Grande Ronde River and many of its tributaries. Hatchery weirs and intakes may also be contributing to bull trout declines.

Recovery objectives are focused on maintaining current bull trout distributions and restoring distribution in previously occupied areas, maintaining stable or increasing trends in abundance of bull trout, restoring and maintaining suitable habitat for all life history stages, and conserving genetic diversity and providing opportunity for genetic exchange. This can be achieved by correcting prevailing threats especially reducing the abundance of brook trout, addressing low flow conditions, improving stream channel and riparian conditions via improved forestry and grazing practices, operating mainstem dams to minimize negative affects, enforcing angling regulations and restoring fish passage on tributary streams. In addition, the establishment of fisheries management goals and objectives, research and monitoring programs, adaptive management approaches, and use of available conservation programs and regulations are recommended to achieve recovery objectives, and monitor progress in reaching recovery goals.

Tucannon River Core Area

Both resident and migratory forms of bull trout occur in the Tucannon River core area. Migratory bull trout probably also use the mainstem Snake River on a seasonal basis. Spawning occurs in the upper Tucannon River and at least seven tributary streams. Bull trout spawn in Sheep, Cold, Bear, and Panjab Creeks, all tributaries to the upper Tucannon River. Spawning also occurs in three tributaries to Panjab Creek: Turkey Creek, Meadow Creek, and Little Turkey Creek; a tributary to Meadow Creek. Multiple age classes of bull trout have been sampled within the Cummings Creek watershed on several occasions. However, spawning activity has yet to be documented, but surveys have been limited.

The status of a bull trout core population can be described based on four key elements: 1) number and distribution of local populations, 2) adult abundance, 3) productivity, and 4) connectivity.

Number and Distribution of Local Populations

There are currently eight known local populations distributed in the Tucannon River core area. These populations coincide with the mainstem and tributary streams where spawning is known to occur. Genetic work has been initiated to determine population structuring within these streams, but results are not yet available. Some spawning streams are very close to one another, which may promote free movement of adults among spawning areas from 1 year to the next. Such a situation could result in a single population of fish with a common genetic make-up using more than one stream for spawning and rearing. With eight interconnected local populations, bull trout the Tucannon River core area are at intermediate risk of extinction.

Adult Abundance

Bull trout redd surveys have been occurring in portions of this core area since 1990. However, they have not been done consistently year-to-year and index reaches have not been established. From the data set obtained from WDFW (2004), there are four areas that have been surveyed on a fairly consistent basis. An average number of redds per stream over all the years surveyed for these streams resulted in an adjusted estimate for each stream per year and finally for the core area. For the years 1990-1997, the adjusted estimate resulted in an average of 200 redds/year,

and for the years 1998-2004 an estimate of 197 redds/year. Therefore, the trend in this core area appears to be stable.

Adult abundance in the Tucannon River core area is estimated (based on redd counts) at 600 to 700 adult spawners per year for the eight known local populations. Other spawning areas in the Tucannon River watershed have not been surveyed. Bull trout in this core area were considered at intermediate risk of extinction.

Productivity

For a population to contribute to recovery, its growth rate must indicate that the population is stable or increasing for a period of time. The Tucannon River core area is considered at intermediate risk of extinction because of an apparent population trend that is not declining and has low to moderate annual variability.

Connectivity

There is some evidence that Tucannon River bull trout use the Snake River as habitat for foraging and overwintering. Additional evidence suggests that some Tucannon River bull trout also encounter dams on the Snake River. At least two dams on the Tucannon River had documented impacts on bull trout from the early 1900's until recently. The De Ruwe dam no longer exists and, therefore, is no longer a barrier to bull trout. The Starbuck Dam has been only partially removed and whether it interferes with bull trout migration is unknown. Recreational dams in numerous tributary streams in recent years have been known to kill bull trout or severely limit their ability to reach spawning areas. Migratory bull trout persist in most local populations in the Tucannon River core area and, therefore, it was considered to be at intermediate risk.

Changes in Environmental Conditions and Population Status

Since the bull trout listing, Federal actions occurring in the Tucannon core area have resulted in harm to, or harassment of, bull trout. These actions include timber harvest activities on lands administered by the U.S. Forest Service, statewide Federal restoration programs that include riparian restoration, replacement of fish passage barriers, and fish habitat improvement projects; federally funded transportation projects involving repair and protection of roads and bridges; and section 10(a)(1)(B) permits for HCPs addressing forest management practices. Capture and handling during implementation of section 6 and section 10(a)(1)(A) permits have directly affected bull trout in the Tucannon core area.

State forest practice regulations were significantly revised in 2000, following the Forest and Fish agreement (FFR 1999; WFPB 2001). Revised regulations increased riparian protection, unstable slope protection, and recruitment of large wood; road standards improved significantly over the old regulations. Because there is biological uncertainty associated with some of the prescriptions, the Forest and Fish agreement relies on an adaptive management program for assurance that the new rules will meet the conservation needs of bull trout. The updated regulations will significantly reduce the level of future timber harvest impacts to bull trout

streams on private lands. However, most negative effects from past forest practices will likely continue to be a threat for decades.

Threats and Recovery Objectives

Threats to bull trout in the Tucannon River core area include:

- Dams on the mainstem Snake River and two dams on the Tucannon River have had an impact on bull trout since their construction. One of the smaller dams has been completely removed, while the other still presents a partial barrier. Dams on the Snake River remain and present a passage issue.
- In the Tucannon watershed, the majority of current logging impacts and legacy effects from roads and harvest activities occurred prior to the listing of spring Chinook in 1992. Most U.S. Forest Service lands in the watershed has been harvested and 50 to 75 percent have been cut two to three times.
- Livestock practices have degraded bull trout habitat in the Tucannon River core area. Grazing on pasture and rangeland is one of the three predominant land uses in the Tucannon Watershed.
- Agricultural practices in the Tucannon watershed have resulted in high erosion rates and low seasonal water levels can in part be attributed to irrigation diversion.
- Expanding residential subdivisions, numerous individual homes, and associated infrastructure are located primarily in floodplain areas of the Tucannon River.
- The Tucannon River and its tributaries receive substantial fishing pressure all year, that probably has a corresponding effect on adult bull trout escapement.
- Road densities and locations in the Tucannon River core area are described as “functionally at risk”. Culverts impede passage and roads funnel sediment into the creeks.

Recovery objectives are focused on maintaining current bull trout distributions and restoring distribution in previously occupied areas, maintaining stable or increasing trends in abundance of bull trout, restoring and maintaining suitable habitat for all life history stages, and conserving genetic diversity and providing opportunity for genetic exchange. This can be achieved by correcting prevailing threats through addressing roads throughout the watershed, providing passage, improving riparian conditions, improving grazing practices, repairing roads and culverts, operating dams to minimize negative effects, and reducing the abundance of nonnative fishes. In addition, the establishment of fisheries management goals and objectives, research and monitoring programs, adaptive management approaches, and use of available conservation programs and regulations are recommended to achieve recovery objectives, and monitor progress in reaching recovery goals.