APPENDIX F

INFORMATION ABOUT THE STATUS OF BULL TROUT FROM FWS 2005 UPPER SNAKE RIVER BIOLOGICAL OPINION

BULL TROUT STATUS AND ENVIRONMENTAL BASELINE

(excerpt from March 2005 U.S. Fish and Wildlife Service's Biological Opinion on the U.S. Bureau of Reclamation's Upper Snake River Basin Projects)

Chapter 9
BULL TROUT
I. Status of the Species
A. Regulatory Status
The Service (1998) issued a final rule listing the Columbia River and Klamath River populations of bull trout as threatened. With the listing of the Jarbidge River population (Service 1999c) and the Coastal-Puget Sound and St. Mary-Belly River populations (Service 1999b) as threatened, all bull trout in the coterminous United States were considered threatened. The Service designated critical habitat for bull trout, but there is none designated within the action area. The Service (2002) published a draft recovery plan for bull trout, but the final recovery plan will not be released until the Service completes a 5-year status review (scheduled for completion in spring 2005). The purpose of the review is to determine if the bull trout should be removed from the threatened species list, if its status should be changed to endangered, or if its status should remain the same.

B. Description of the Species
Bull trout *(Salvelinus confluentus*), member of the family Salmonidae, is a char native to the Pacific Northwest and western Canada. Bull trout historically occurred in major river drainages in the Pacific Northwest from the southern limits in the McCloud River in northern California and the Jarbidge River in Nevada to their northern boundary in the headwaters of the Yukon River in the Northwest Territories, Canada (Cavender 1978; Bond 1992). To the west, the bull trout range includes Puget Sound, coastal rivers of British Columbia, Canada, and southeast Alaska (Bond 1992). Bull trout are widespread throughout the Columbia River basin, including its headwaters in Montana and Canada, and also occur in the Klamath River basin of south central Oregon. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta and the MacKenzie River system in Alberta and British Columbia (Cavender 1978; Brewin and Brewin 1997). Girard first described bull trout as *Salmo spectabilis* in 1856 from a specimen collected on the lower Columbia River, and it was subsequently described under a number of names such as *Salmo confluentus* and *Salvelinus malma* (Cavender 1978). Bull trout and Dolly Varden (*Salvelinus malma*) were previously considered a single species (Cavender 1978; Bond 1992). Cavender (1978) presented morphometric (measurement), meristic (geometrical relation), osteological (bone structure), and distributional evidence to document specific distinctions between bull trout and Dolly Varden. The American Fisheries Society formally recognized bull trout and Dolly Varden as separate species in 1980 (Robins *et al*. 1980).

C. Status and Distribution
Though widely distributed in parts of Oregon, Washington, Idaho, and Montana, bull trout in the interior Columbia River basin presently occur in only about 44 to 45 percent of their potential historical range (Quigley and Arbelbide 1997; Rieman *et al*. 1997). Habitat loss, fragmentation, and associated declining populations have been documented rangewide (Bond 1992; Schill 1992; Thomas 1992; Ziller 1992; Rieman and McIntyre 1993; Newton and Pribyl 1994; Idaho Department of Fish and Game, *in litt*., 1995). Several local extinctions have been reported, beginning in the 1950s (Rode 1990; Ratliff and Howell 1992; Donald and Alger 1993; Goetz 1994; Newton and Pribyl 1994; Berg and Priest 1995; Light *et al*.

1996; Buchanan and Gregory 1997; Washington Department of Fish and Wildlife 2004). The combined effects of habitat degradation and fragmentation, blockage of migratory corridors, degraded water quality, angler harvest and poaching, entrainment into diversion channels and dams, introduced non-native species (*e.g.*, brook trout (*Salvelinus fontinalis*)), and climate change (Reiman *et al*. 1997) have resulted in declines in bull trout distribution and abundance. Land and water management activities such as dams and other diversion structures, forest management practices, livestock grazing, agriculture, road construction and maintenance, mining, and urban and rural development continue to degrade bull trout habitat and depress bull trout populations (Service 2002).

The Columbia River distinct population segment includes bull trout residing in portions of Oregon, Washington, Idaho, and Montana. The Columbia River distinct population segment has declined in overall range and numbers of fish. In some areas within the distinct population segment, robust populations of bull trout still exist. However, many occur as isolated local populations in headwater lakes or tributaries where migratory fish have been lost, potentially as a result of habitat fragmentation, isolation, and barriers that limit bull trout distribution and migration within the basin.

In its draft recovery plan for bull trout, the Service (2002) divides the Columbia River distinct population segment into 22 recovery units, each of which is comprised of one or more core areas and further divided into local populations. These divisions were intended to provide a structure that considers both the genetic relationship of local population and management options (recovery units), to reflect metapopulation structure (core areas), and to approximate a panmictic (completely random breeding) group of individuals (Service 2002; Whitesel *et al*. 2004). Whitesel *et al*. (2004) evaluated the appropriateness of these divisions. They found that the definitions and delineations of local populations and core areas hold true to theory in some cases but not all. In general, they indicated that this scale of delineation is appropriate. However, they found that recovery units, as defined, did not adequately represent biological groupings of bull trout, and they recommended the use of Conservation Units instead, as described below.

Recent literature (Spruell *et al*. 2003) provides updated information on the genetic population structure of bull trout across the northwestern United States. Based on analysis of four microsatellite loci, Spruell *et al*. (2003) suggested that there are three major genetically differentiated groups (lineages) of bull trout represented within the Columbia River distinct population segment. They described these as “Coastal” populations, “Snake River” populations, and “Upper Columbia” populations (including primarily the Lake Pend Oreille and Clark Fork basin populations), with populations further subdivided, primarily at the level of major river basins. Whitesel *et al*. (2004) used this and other information to describe four “Conservation Units” (upper Columbia River, Snake River, Klamath River, and Coastal- Puget Sound) that are thought to represent the best estimate for delineation of areas that are necessary to ensure evolutionary persistence of bull trout.

The action area for this consultation falls within the Snake River Conservation Unit, which includes the Clearwater, Salmon, Grande Ronde, Umatilla/Walla Walla, John Day, Malheur, Boise, Payette, Weiser, Imnaha/Snake, Jarbidge, and Powder River basins, and Pine and Indian Creeks. The status of populations within these basins varies widely, and overall abundance of bull trout in some populations is largely unknown *(e.g.*, in the Salmon River basin). We do not have reliable abundance information for all of these basins, but we can characterize them in a qualitative way based on number of local populations and some incomplete abundance information. For the purposes of this document, strong populations are those that are considered well distributed and relatively abundant within the capability of the watersheds in which they exist. The Clearwater, Salmon, Umatilla/Walla Walla, and Imnaha/Snake River basins have bull trout populations in a variety of conditions, including some that are relatively strong (areas with 2,500 to 5,000 adults or more). The Grande Ronde, John Day, Boise, and Payette River basins also have bull trout populations in a variety of conditions, with the whole basin abundance best characterized as moderate (*e.g.*, approximately 500 adults). Populations in the Weiser, Jarbidge, Malheur, and Powder

River basins, and Pine and Indian Creeks are weak, with less than 500 adults in the total basin.

1. Historical Distribution

The historical range of bull trout includes major river basins in the Pacific Northwest at about 41 and 60 degrees North latitude, from the southern limits in the McCloud River in northern California and the Jarbidge River in Nevada to the headwaters of the Yukon River in the Northwest Territories, Canada (Cavender 1978; Bond 1992). The range extended east of the continental divide in the headwaters of the Saskatchwan River in Alberta and Montana and in the Mackenzie River system in Alberta and British Columbia, Canada (Cavender 1978; Brewin and Brewin 1997).

Bull trout were present throughout the Snake River basin and in the western section of Idaho downstream from Shoshone Falls, including the Clearwater, Salmon, Boise, and Payette River systems. The species is reported to have been widely dispersed throughout the basin, limited only by natural passage and thermal barriers. In this drainage, their historical range approximates that of spring, summer, and fall Chinook salmon (Thurow 1987; Rieman and McIntyre 1993) and possibly included the Owyhee and Bruneau River basins and other tributaries upstream as far as Salmon Falls Creek. They are not known to have occurred in the Snake River upstream from Shoshone Falls, the Wood River system, Birch Creek, or any stream in Idaho that drains the Centennial Mountains between Henrys Lake and the Bitterroot Range. An isolated population exists in the Little Lost River near Howe, Idaho, between the Lost River and Lemhi mountain ranges (Batt 1996).

In eastern Oregon, bull trout are present in the Grand Ronde, Malheur, and Powder River systems, but they are not known to occur in the Burnt River system. Data on its historical distribution in the Malheur River drainage is limited and dates from Oregon Department of Fish and Wildlife observations beginning in 1955 (Buchanan *et al*. 1997). Before the construction of dams, bull trout could access the Snake River from the Malheur and North Fork Malheur Rivers. Anadromous salmon and steelhead historically spawned in the upper Malheur River basin (Northwest Power and Conservation Council 2002). The lower Malheur River was most likely too warm for bull trout spawning or juvenile rearing but would have provided migratory habitat to and from the Snake River and overwintering habitat (Hanson *et al*. 1990 in Buchanan *et al*. 1997).

The Snake River Hells Canyon subbasin lies within the historical native range of bull trout, although no clear documentation of the historical distribution of bull trout within the subbasin exists (Nez Perce Tribe 2004). According to Buchanan *et al*. (1997), there is no documentation of bull trout in the Powder River basin prior to the 1960s. It is suspected that they were widespread in the upper Powder River drainage and seasonally connected to the Snake River. Historical information about the distribution of bull trout below Hells Canyon Dam in the mainstem Snake River is very limited (Chandler 2003). Buchanan *et al*. (1997) reported that the Idaho Department of Fish and Game observed bull trout at the mouth of Sheep, Granite, Deep, and Wolf Creeks between Hells Canyon Dam and the Imnaha River. The distribution of bull trout may have paralleled the distribution of potential prey such as whitefish and sculpins. In several river basins where bull trout evolved with populations of juvenile salmon, bull trout abundance declined when juvenile salmon prey declined or were eliminated (Ratliff 1992).

2. Current Distribution

The Service (2002) has identified 22 management units for bull trout in the Columbia River basin. Draft recovery plans for each of these units contain information relating to the current distribution of bull trout. The "Environmental Baseline" discussion in Section II of this chapter describes the current distribution of bull trout within the action area.

D. Life History

Bull trout exhibit resident and migratory life history strategies throughout much of the current range (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in or near the streams where they spawn and rear. Migratory bull trout spawn and rear in streams for 1 to 4 years before migrating downstream to either a lake/reservoir (adfluvial), river (fluvial), or in certain coastal areas, to salt water (anadromous), where they reach maturity (Fraley and Shepard 1989; Goetz 1989). Resident and migratory forms often occur together, and it is suspected that individual bull trout may give rise to offspring exhibiting both resident and migratory behavior (Rieman and McIntyre 1993).

Bull trout have specific habitat requirements that distinguish them from other salmonids (Rieman and McIntyre 1993). Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide habitat requirements for bull trout to successfully spawn and rear, and that the characteristics are not necessarily ubiquitous throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993), the fish should not be expected to simultaneously occupy all available habitats (Rieman *et al*. 1997).

Bull trout are found primarily in colder streams, although individual fish are migratory in larger, warmer river systems throughout the Columbia River basin (Fraley and Shepard 1989; Rieman and McIntyre 1993, 1995; Buchanan and Gregory 1997; Rieman *et al*. 1997). Dunham *et al*. (2003) found that the probability of bull trout occurrences is low when mean daily temperatures exceed 14 to 16 °C; Selong *et al*. (2001) reported that maximum growth of bull trout occurred at 13.2 °C. These temperature requirements may partially explain the patchy distribution within a watershed (Fraley and Shepard 1989; Rieman and McIntyre 1995). Spawning areas are often associated with high elevation, colE-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992; Rieman and McIntyre 1993; Rieman *et al*. 1997). Goetz (1989) suggested optimum water temperatures for rearing of about 7 to 8 °C and optimum water temperatures for egg incubation of 2 to 4 °C. In Granite Creek, Idaho, Bonneau and Scarnecchia (1996) observed that juvenile bull trout selected the coldest water available in a plunge pool, 8 to 9 °C within a temperature gradient of 8 to 15 °C. Dunham *et al*. (2003) found that maximum bull trout use during the summer (July 15 to September 30) occurred between 7 and 12 °C. All bull trout life history stages are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Oliver 1979; Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Pratt 1992; Thomas 1992; Rich 1996; Sexauer and James 1997; Watson and Hillman 1997). In general, bull trout prefer relatively stable channel and water flow conditions (Rieman and McIntyre 1993). Jakober (1995) observed bull trout overwintering in deep beaver ponds or pools containing large woody debris in the Bitterroot River drainage, Montana, and suggested that suitable winter habitat may be more restrictive than summer habitat. Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997).

Fraley and Shepard (1989) found that bull trout select spawning habitat in low gradient stream sections with gravel substrates; Goetz (1989) found preferred spawning water temperatures of 5 to 9 °C. They typically spawn from August to mid-October during periods of decreasing water temperatures. High juvenile densities were observed in Swan River, Montana, and tributaries with diverse cobble substrate and low percentage of fine sediments (Shepard *et al*. 1984). Pratt (1992) indicated that increases in fine sediments reduce egg survival and emergence.

Life history strategy influences bull trout size. Growth of resident fish is generally slower than growth of migratory fish; resident fish tend to be smaller at maturity and less fecund (Fraley and Shepard 1989; Goetz 1989). Bull trout normally reach sexual maturity in 4 to 7 years and live as long as 12 years. Repeat and alternate-year spawning has been reported, although repeat spawning frequency and post-spawning

mortality are not well understood (Leathe and Graham 1982; Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1996).

Migratory bull trout frequently begin migrations as early as April and have been known to move upstream as far as 250 kilometers (155 miles) to spawning grounds (Fraley and Shepard 1989). Depending on water temperature, incubation is normally 100 to 145 days (Pratt 1992), and after hatching, juveniles remain in the substrate. Time from egg deposition to fry emergence may exceed 200 days. Fry normally emerge from early April through May, depending upon water temperatures and increasing stream flows (Pratt 1992; Ratliff and Howell 1992).

Bull trout are opportunistic feeders with food habits primarily a function of size and life history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987; Goetz 1989; Donald and Alger 1993). Adult migratory bull trout are primarily piscivores (Fraley and Shepard 1989; Donald and Alger 1993). Rieman and McIntyre (1993) indicated that diverse life history strategies are important to the stability and persistence of populations of any species. Such diversity is thought to stabilize populations in highly variable environments or to reestablish segments of populations that have disappeared due to anthropogenic or natural events.

Variation in the timing of migration and in the timing and frequency of spawning within a metapopulation also represents diversity in life history. A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them (Meffe and Carroll 1994). Bull trout may spawn each year or in alternate years (Block *et al*. in Batt 1996). It is possible that four or more age-classes could comprise any spawning population, with each age-class including up to three migration strategies (Rieman and McIntyre 1993). This theory supports the idea that the multiple life history strategies found in bull trout populations represent important diversity within populations.

E. Population Dynamics

Migratory corridors link seasonal habitats for all bull trout life history forms, and the ability to migrate is important to the persistence of local bull trout populations (Rieman and McIntyre 1993; Rieman *et al*. 1997). Pre- and post-spawning migrations facilitate gene flow among local populations because individuals from different local populations interbreed when some stray and return to non-natal streams. Local populations extirpated by catastrophic events may also become reestablished in this manner. Metapopulation concepts of conservation biology theory are applicable to the distribution and characteristics of bull trout (Rieman and McIntyre 1993). Local populations may become extinct, but they may be reestablished by individuals from other nearby local populations. Metapopulations provide a mechanism for reducing the risk of local extinction because the simultaneous loss of all local populations is unlikely, and multiple local populations distributed and interconnected throughout a watershed provide a mechanism for spreading risk from stochastic events (Rieman and McIntyre 1993).

F. Conservation Needs

Bull trout conservation requires the long-term persistence of self-sustaining, complex, interacting groups of fish distributed throughout the species' native range. Two of the factors identified as necessary for recovery also translate into general factors that address the conservation needs of the species. These two factors include restoring and maintaining suitable habitat conditions for all bull trout life stages and life history strategies, and conserving genetic diversity and providing opportunity for genetic exchange. To achieve these general needs, several specific conservation measures should be addressed. The first involves metapopulation theory. As described above, a functioning metapopulation is comprised of multiple local populations distributed and interconnected throughout a watershed, which provides a

mechanism for reducing the risk of extirpation associated with stochastic events.

The second measure involves connectivity between populations. A migratory component in bull trout populations is recognized as important to overall health, long-term persistence, and recovery because it allows for reestablishment of populations in reaches where bull trout have been extirpated (Rieman and McIntyre 1993; Whiteley *et al*. 2003). In addition, migratory bull trout are larger and more fecund than their resident counterparts. The greater reproductive capacity of migratory bull trout is also thought to provide an important contribution to the abundance and long-term persistence of local populations (Rieman and McIntyre 1993). In addition, migrations facilitate gene flow among local populations when individuals from different local populations interbreed or stray to non-natal streams. Dams, irrigation diversions, and other waterway alterations have interrupted bull trout migration. Dams need adequate fish passage to maintain populations with migratory life histories that habitat conditions are not available. Without fish passage, dams may isolate upstream and downstream bull trout populations or limit them exclusively to one or the other.

An adequate prey base is another essential component for bull trout conservation. Bull trout are described as having voracious appetites, which makes them vulnerable to angling injury or mortality (Post *et al*. 2003). Fish are considered to be the major item in the diet of large bull trout. They feed primarily along the bottom and mid-water levels, consuming insects and other fish species such as suckers, sculpins, minnows, and trout (Pratt 1992). Mountain whitefish and kokanee salmon are two of the bull trout's preferred prey (Fraley and Shepard 1989; Vidergar 2000).

Appropriate habitat conditions are also essential for bull trout survival. Bull trout have more specific habitat requirements than other native trout species, mainly because they require water that is especially cold with clean cobble or gravel size substrate for spawning and development of embryos and alevins. Available overwintering habitat, bank stability, winter precipitation, drought, substrate type, available cover, cold water temperature, and the presence of migration corridors consistently appear to influence bull trout distribution and abundance (see Allan *et al*. in Batt 1996; Dunham and Rieman 1999; Salow 2001; Salow and Cross 2003). Reductions in road construction for timber harvest and fire control measures are needed since they lead to increased siltation, channelization, and loss of habitat complexity and may have lead to historical declines in bull trout.

Conservation of bull trout is also dependent on protecting bull trout genetic diversity and phenotypic adaptation within each distinct population segment and spreading or reducing the risk of extinction through the maintenance of multiple populations across the range. Retaining a species' genetic variation is important because this variation allows populations to adapt to changing environmental conditions over short (inter-generational) and long (evolutionary) time frames (Allendorf and Leary 1986) and is the basis for maintaining a species' evolutionary legacy, including its geographical distribution, and morphological, physiological, and life-history variation (Allendorf *et al*. 1997).

Loss of genetic variation negatively affects the development, growth, fertility, and disease resistance of fishes. This loss of variation may also reduce fitness and preclude adaptive change in populations (Frankham 1995) or affect the species' ability to recover from disturbance events (Rieman *et al*. 1997). Genetic variation needs to be preserved in order to increase the likelihood of a species survival (Allendorf and Leary 1986), and maintaining genetic variation within populations should be a primary goal of conservation and management of species (Wang *et al*. 2002), bull trout included. In general, an effective population size (Ne) of 50 is necessary to avoid inbreeding depression, and a Ne of 500 is necessary to avoid the loss of genetic and phenotypic variation through genetic drift over the long term. However, Rieman and Allendorf (2001) found that populations with a Ne of 500 may still lose genetic variation over the long term (200 years) and recommended that long-term management goals, where appropriate, include populations with at least 1,000 spawning adults each year. Bull trout populations on the margin of

the species' range may be adapted to unique environments and may represent a disproportionate part of the total diversity within the species, although the importance of this in a given population is affected by gene flow, generational time, life history, and ecological conditions (Rieman *et al*. 1997; Lesica and Allendorf 1995). The preceding section, "Status and Distribution," describes new scientific information indicating that Conservation Units (as described in Whitesel *et al*. 2004) may be the most accurate representation of the evolutionary lineage and genetic structure of populations of bull trout (see Spruell *et al*. 2003; Whitesel *et al*. 2004). Each Conservation Unit across the range of bull trout contains an environmental template that allows the full expression of genotypic, phenotypic, and spatial diversity among bull trout populations. The conservation of this template will help ensure resilience and persistence of the species when environmental changes occur. To ensure the evolutionary persistence of bull trout within a Conservation Unit, Whitesel *et al*. (2004) suggested that an effective population size of at least 5,000 is necessary. They also suggested that conservation of the species within a Conservation Unit is necessary to ensure the evolutionary persistence of the species as a whole. This represents the most recent scientific information available regarding appropriate conservation units for bull trout. In this Opinion, the Service will consider effects to bull trout within the Snake River Conservation Unit and the subsequent relationship to the larger Columbia River distinct population segment.

A related conservation need of the species involves the development of conservation assessments and prioritization of populations for management and conservation actions across the range (see Epifanio *et al*. 2003; Allendorf *et al*. 1997). Currently, work has not been completed range-wide to describe the conditions affecting individual populations or metapopulations, the risk of local extinction, or the ecological and evolutionary importance of metapopulations or river basins to the larger Conservation Units or to the Columbia River distinct population segment. Because bull trout are a wide-ranging species, and scientific, financial, and human resources are limited, it is likely an unrealistic goal to treat and conserve all populations equally (Epifanio *et al*. 2003). Prioritizing areas or populations for protection should consider the risk of extinction, any potentially unique genetic or phenotypic expressions, including habitat usage and life history, and evolutionary and ecological legacy (Allendorf *et al*. 1997). Epifanio *et al*. (2003) described six strategies that could be used to prioritize bull trout populations based on the factors described above. The prioritization of bull trout populations would help ensure that those populations with disproportionately high conservation value are more strictly managed to ensure their persistence, and that over the long term, the fullest range of ecological and evolutionary characteristics is conserved. These activities would provide a better mechanism for protecting the long-term viability of bull trout populations. Prevention of human-caused mortality is another conservation need for bull trout. Adequate angler education and enforcement of existing fishing regulations are necessary to reduce both unintentional angler mortality and poaching.

II. Environmental Baseline

Regulations implementing the Act (50 CFR §402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. The environmental baseline also includes the anticipated impacts of all proposed Federal projects in the action area that have already undergone section 7 consultations, and the impacts of state and private actions that are contemporaneous with the consultations in progress.

A. Status of the Species in the Action Area

Bull trout within the action area are located in the Boise, Payette, Malheur, and Powder River basins, and in the mainstem Snake River downstream from Brownlee Dam. Many bull trout populations in the Boise, Payette, and Malheur River basins have developed life history strategies associated with Reclamation facilities (adfluvial form), although it is not known to what degree this has altered the productivity and diversity of existing populations. Resident populations of bull trout also occur in tributaries to the mainstem rivers affected by the action (*e.g.*, Deadwood River). In the Boise River basin, Reclamation and

Corps dams have constrained bull trout movement patterns within the larger stream network, and this has resulted in discontinuities in genetic factors related to dispersal and gene flow (Whiteley *et al*. 2003). Populations in the Powder River basin, and some populations in the other basins, consist primarily or exclusively of resident bull trout, which use headwater streams and tributaries year-round and do not migrate seasonally.

The action area lies entirely within the Snake River Conservation Unit (Spruell *et al*. 2003; Whitesel *et al*. 2004). The proposed action will affect bull trout in 3 of 15 watersheds: the Boise, Payette, and Malheur River basins. The Boise and Malheur River basins are on the extreme southern edge of the Snake River Conservation Unit (excepting the Jarbidge River basin). Bull trout populations on the margin of the species' range may be adapted to unique environments and may represent a disproportionate part of the total diversity within the species (Rieman *et al*. 1997; Lesica and Allendorf 1995), although we do not have information regarding the specific role of these populations in conserving the Snake River Conservation Unit. Spruell *et al*. (2003) found that the Boise, Malheur, and Jarbidge River basins formed a discrete genetic cluster compared to other river basins within the Conservation Unit, indicating a similar evolutionary lineage.

Figure 18 shows the known bull trout distributions and upstream migratory, spawning, and rearing habitats in the middle Snake River basin. The following sections describe the current known distribution of bull trout in the action area by river basin.

Figure 18. Bull trout distribution within the action area at the watershed scale.

1. Boise River Basin [omitted]

2. Payette River Basin [omitted]

3. Weiser River Basin [omitted]

4. Malheur River Basin [omitted]

5. Powder River Basin

Current distribution of bull trout in the Powder River basin is in two headwater tributaries of the Powder River in the Elkhorn Mountain range; one local population is located 8 to 17 miles upstream from Phillips Lake, and the other 20 to 25 miles upstream from Thief Valley Reservoir. All bull trout inhabiting the Powder River basin are thought to be resident fish (Service 2002). To date, no bull trout have been documented in either Phillips Lake or Thief Valley Reservoir (Buchanan *et al*. 1997; Schwabe *et al*. 2003). Historical dredge mining along most of the Powder River upstream from Phillips Lake severely degraded habitats in those reaches; this likely limits the current bull trout distribution to the headwater tributaries (Service 2002).

6. Snake River from Brownlee Reservoir to the Columbia River and the Columbia River below the Snake River Confluence

Historically, the mainstem Snake River served as a migratory corridor for anadromous salmonids, including steelhead and Chinook, that were documented throughout the Owyhee, Malheur, Weiser, Payette and Boise River drainages in the 1800s and 1900s (Pratt *et al*. 2001; Welsh *et al*. 1965). Bull trout also used the area Brownlee Reservoir currently inundates. Bull trout were reported in creel records from Brownlee Reservoir before and after the dam's completion in 1959. Although bull trout are not currently

known to occur in or use Brownlee Reservoir, it is likely that bull trout would use the reservoir as overwintering habitat if migratory individuals become reestablished in the Weiser River drainage.

Currently, the mainstem Snake River, specifically downstream from the Weiser River within the Southwest Idaho Recovery Unit, may have the potential to function as both migratory and overwintering habitat for bull trout. However, the extent and nature of bull trout use, as well as the quality of habitat provided by the reservoirs on the mainstem Snake River, are not well understood. To function as migratory habitat, the mainstem Snake River and reservoirs must provide holding water with adequate temperature, depth, and cover to ensure successful bull trout movement. To function as overwintering habitat, the mainstem Snake River and reservoirs must also provide sufficient forage for bull trout to either maintain or gain mass.
Information about the use of the mainstem Snake River by bull trout from the Weiser River drainage (the only major river that lacks large dams) has been identified as a research need in the Southwest Idaho Recovery Unit. Habitat conditions in lakes and reservoirs can determine the relative availability of bull trout forage and may mediate interactions of bull trout with potential competitors, predators, or prey in complex and lake/reservoir-specific ways (Montana Bull Trout Scientific Group 1998). Relationships between depth distributions of potential forage and bull trout habitat use have not been thoroughly investigated in Brownlee Reservoir and the mainstem Snake River upstream. These interactions are likely important in determining whether Brownlee Reservoir and the mainstem Snake River could provide suitable bull trout foraging and overwintering habitat in the future. Further investigation is needed to determine if bull trout from the Weiser River could use Brownlee Reservoir as foraging, migrating and overwintering habitat in a recovered condition.

Bull trout currently occur in Oxbow Reservoir, the Oxbow Bypass Reach, and Hells Canyon Reservoir (Chandler 2003). No bull trout have been documented above Brownlee Dam (Chandler 2003). Bull trout occur in several tributaries to the Hells Canyon Projects, including the Wildhorse River, Indian Creek, and Pine Creek; they also occur in the mainstem Snake River below Hells Canyon Dam.

B. Factors Affecting Species Environment within the Action Area

There are numerous natural and anthropogenic influences on bull trout in the action area. Although some restoration actions and ongoing research efforts have positively affected bull trout, the majority of anthropogenic influences have contributed to the species decline by reducing bull trout numbers, reproduction, and distribution. Factors affecting the species within the action area include migration barriers; diversions; water, forestry, and past sport fisheries management practices; habitat fragmentation and degradation through grazing and road construction; reduced water quality from development, road construction, and mining; and introduction of non-native competitive species (Service 2002).

The Service (1999a, 2002) determined that the Reclamation facilities that affect bull trout within the action area include Arrowrock, Anderson Ranch, Deadwood, and Agency Valley Dams. Winter pool content is an important habitat factor for bull trout at Arrowrock, Anderson Ranch, Deadwood, and Beulah Reservoirs. This consultation also considers Reclamation operations that control the conveyance and storage of irrigation water at Lucky Peak Dam and Reservoir. Construction and operation of these facilities have modified streamflows, changed stream temperature regimes, blocked migration routes, entrained bull trout, and changed bull trout forage bases. None of these facilities has fish passage, and they function as barriers to upstream and downstream fish migration. Though little information is known about the extent of the impacts to historical migration of bull trout from these facilities, populations of bull trout have been found upstream, downstream, or adjacent to these facilities.

1. Boise River Basin [omitted]

2. Payette River Basin [omitted]

3. Malheur River Basin [omitted]

4. Snake River from Brownlee Reservoir to the Columbia River and the Columbia River below the Snake River Confluence

Chandler (2003) reported that bull trout found in the Oxbow Bypass Reach and Hells Canyon Reservoir appeared to be extremely low in abundance. Chandler (2003) also reported that bull trout populations found in the tributaries to the Complex upstream from Hells Canyon Dam had extremely low numbers and that they were absent from lower reaches in the drainage. A significant number of bull trout captured in Oxbow and Hells Canyon Reservoirs showed signs of hybridization with brook trout, a result of bull trout and brook trout being present in the tributaries (Chandler 2003); this is a major concern for bull trout populations in this area. Below the Hells Canyon Complex, bull trout do not show any signs of hybridization with brook trout, an exotic species that has been widely introduced in Snake River tributaries (Chandler 2003).

Chandler (2003) found that bull trout use the Oxbow Bypass Reach and Hells Canyon Reservoir primarily during late fall and winter. Telemetry studies showed fluvial bull trout within the Complex migrating to tributaries between April and early June where they likely oversummer and then spawn in the fall (Chandler 2003).

Chandler (2003) documented bull trout below Hells Canyon Dam that exhibited "classic fluvial migrations" during the years that they monitored movement. Over half of the bull trout monitored made spring migratory movements downstream to the Imnaha River after wintering in the mainstem Snake River (Chandler 2003). Other bull trout that spawned the previous year but did not exhibit fluvial behavior may have remained in the Snake River throughout the summer. Fluvial bull trout were then documented to return to the Snake River following spawning in the tributaries, sometime in November and December, and to remain in the Snake River from January to April (Chandler 2003). Chapter 9 – Bull Trout Effects of the Proposed Action 234 U.S. Fish and Wildlife Service March 2005

C. Recent Section 7 Consultations

Effects from activities or projects that have already undergone section 7 consultation, as reported in a biological opinion, are an important component of objectively characterizing the current condition of the species. The Snake River Fish and Wildlife Office (for the Deadwood/South Fork Payette River and Boise River basins) and La Grande Field Office (for the Malheur River basin) have completed 20 biological opinions for bull trout in the action area since the year 2000. Eight of these biological opinions applied to activities affecting bull trout in the Boise River basin (including Anderson Ranch, Arrowrock, and Lucky Peak Reservoirs). Activities or projects included a hydroelectric plant, Arrowrock Dam valve replacement, a forest plan revision, water quality standards criteria, and emergency wildfire and road repairs. Three biological opinions applied to activities affecting bull trout in the Deadwood River drainage (South Fork Payette basin) and addressed flow augmentation, a forest plan revision, and water quality standards (the forest plan revision and water quality standards criteria consultations are common to both the Deadwood and Boise River watersheds). Eleven biological opinions applied to activities affecting bull trout in the Malheur River basin and addressed grazing programs, emergency fire consultation, road reconstruction, and bridge removal.

Our analysis showed that we consulted on a wide array of actions, which had varying levels of effects. Many of the actions consisted of only short-term adverse effects, but some had long-term beneficial effects. Some of the actions resulted in long-term adverse effects. No actions that have undergone

consultation were found to appreciably reduce the likelihood of survival and recovery of the bull trout. Furthermore, no actions that have undergone consultation were anticipated to result in the loss of any subpopulations or local populations of bull trout. A more detailed analysis of consulted-on effects to bull trout is available in our files and is hereby incorporated by reference.