populations of the same species (Saunders et al. 1991, p. 22). Burkey (1989, p. 76) concluded that when species are isolated by fragmented habitats, low rates of population growth are typical in local populations and their probability of extinction is directly related to the degree of isolation and fragmentation. Without sufficient immigration, growth of local populations may be low and probability of extinction high. Migrations also facilitate gene flow among local populations because individuals from different local populations interbreed when some stray and return to non natal streams. Local populations that are extirpated by catastrophic events may also become reestablished in this manner.

In summary, based on the works of Rieman and McIntyre (1993, pp. 9-15) and Rieman and Allendorf (2001, pp 756-763), the draft bull trout Recovery Plan identified four elements to consider when assessing long-term viability (extinction risk) of bull trout populations: (1) number of local populations, (2) adult abundance (defined as the number of spawning fish present in a core area in a given year), (3) productivity, or the reproductive rate of the population, and (4) connectivity (as represented by the migratory life history form).

4.1.6 Status and Distribution

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

A summary of the current status and conservation needs of the bull trout within these units is provided below. A comprehensive discussion of these topics is found in the draft bull trout Recovery Plan (Fish and Wildlife Service 2002a, entire; 2004a, b; entire).

Central to the survival and recovery of the bull trout is the maintenance of viable core areas (Fish and Wildlife Service 2002a, p. 54). A core area is defined as a geographic area occupied by one or more local bull trout populations that overlap in their use of rearing, foraging, migratory, and overwintering habitat, and in some cases their use of spawning habitat. Each of the population segments listed below consists of one or more core areas. One hundred and twenty one core areas are recognized across the United States range of the bull trout (Fish and Wildlife Service 2005, p. 9).

A core area assessment conducted by the Service for the five year bull trout status review determined that of the 121 core areas comprising the coterminous listing, 43 are at high risk of extirpation, 44 are at risk, 28 are at potential risk, four are at low risk and two are of unknown status (Fish and Wildlife Service 2008, p. 29).

4.1.6.1 Jarbidge River

This population segment currently contains a single core area with six local populations. Less than 500 resident and migratory adult bull trout, representing about 50 to 125 spawners, are estimated to occur within the core area. The current condition of the bull trout in this segment is attributed to the effects of livestock grazing, roads, angler harvest, timber harvest, and the introduction of non-native fishes (Fish and Wildlife Service 2004a, p. iii). The draft bull trout

Recovery Plan identifies the following conservation needs for this segment: (1) maintain the current distribution of the bull trout within the core area, (2) maintain stable or increasing trends in abundance of both resident and migratory bull trout in the core area, (3) restore and maintain suitable habitat conditions for all life history stages and forms, and (4) conserve genetic diversity and increase natural opportunities for genetic exchange between resident and migratory forms of the bull trout. An estimated 270 to 1,000 spawning fish per year are needed to provide for the persistence and viability of the core area and to support both resident and migratory adult bull trout (Fish and Wildlife Service 2004a, p. 62-63). Currently this core area is at high risk of extirpation (Fish and Wildlife Service 2005, p. 9).

4.1.6.2 Klamath River

This population segment currently contains three core areas and 12 local populations. The current abundance, distribution, and range of the bull trout in the Klamath River Basin are greatly reduced from historical levels due to habitat loss and degradation caused by reduced water quality, timber harvest, livestock grazing, water diversions, roads, and the introduction of non-native fishes. Bull trout populations in this unit face a high risk of extirpation (Fish and Wildlife Service 2002b, p. iv). The draft bull trout Recovery Plan (Fish and Wildlife Service 2002b, p. v) identifies the following conservation needs for this unit: (1) maintain the current distribution of the bull trout and restore distribution in previously occupied areas, (2) maintain stable or increasing trends in bull trout abundance, (3) restore and maintain suitable habitat conditions for all life history stages and strategies, and (4) conserve genetic diversity and provide the opportunity for genetic exchange among appropriate core area populations. Eight to 15 new local populations and an increase in population size from about 3,250 adults currently to 8,250 adults are needed to provide for the persistence and viability of the three core areas (Fish and Wildlife Service 2002b, p. vi).

4.1.6.3 Coastal-Puget Sound

Bull trout in the Coastal-Puget Sound population segment exhibit anadromous, adfluvial, fluvial, and resident life history patterns. The anadromous life history form is unique to this unit. This population segment currently contains 14 core areas and 67 local populations (Fish and Wildlife Service 2004b, p. iv; 2004c, pp. iii-iv). Bull trout are distributed throughout most of the large rivers and associated tributary systems within this unit. With limited exceptions, bull trout continue to be present in nearly all major watersheds where they likely occurred historically within this unit. Generally, bull trout distribution has contracted and abundance has declined, especially in the southeastern part of the unit. The current condition of the bull trout in this population segment is attributed to the adverse effects of dams, forest management practices (e.g., timber harvest and associated road building activities), agricultural practices (e.g., diking, water control structures, draining of wetlands, channelization, and the removal of riparian vegetation), livestock grazing, roads, mining, urbanization, angler harvest, and the introduction of non-native species. The draft bull trout Recovery Plan (Fish and Wildlife Service 2004b, pp. ix-x) identifies the following conservation needs for this unit: (1) maintain or expand the current distribution of bull trout within existing core areas, (2) increase bull trout abundance to about 16,500 adults across all core areas, and (3) maintain or increase connectivity between local populations within each core area.

4.1.6.4 St. Mary-Belly River

This population segment currently contains six core areas and nine local populations (Fish and Wildlife Service 2002c, p. v). Currently, bull trout are widely distributed in the St. Mary River drainage and occur in nearly all of the waters that were inhabited historically. Bull trout are found only in a 1.2-mile reach of the North Fork Belly River within the United States. Redd count surveys of the North Fork Belly River documented an increase from 27 redds in 1995 to 119 redds in 1999. This increase was attributed primarily to protection from angler harvest (Fish and Wildlife Service 2002c, p. 37). The current condition of the bull trout in this population segment is primarily attributed to the effects of dams, water diversions, roads, mining, and the introduction of non-native fishes (Fish and Wildlife Service 2002c, p. vi). The draft bull trout Recovery Plan (Fish and Wildlife Service 2002c, pp. v-ix) identifies the following conservation needs for this unit: (1) maintain the current distribution of the bull trout and restore distribution in previously occupied areas, (2) maintain stable or increasing trends in bull trout abundance, (3) maintain and restore suitable habitat conditions for all life history stages and forms, (4) conserve genetic diversity and provide the opportunity for genetic exchange, and (5) establish good working relations with Canadian interests because local bull trout populations in this unit are comprised mostly of migratory fish whose habitat is mainly in Canada.

4.1.6.5 Columbia River

The Columbia River population segment includes bull trout residing in portions of Oregon, Washington, Idaho, and Montana. Bull trout are estimated to have occupied about 60 percent of the Columbia River Basin, and presently occur in 45 percent of the estimated historical range (Quigley and Arbelbide 1997, p. 1177). This population segment currently contains 97 core areas and 527 local populations. About 65 percent of these core areas and local populations occur in Idaho and northwestern Montana.

The condition of the bull trout populations within these core areas varies from poor to good, but generally all have been subject to the combined effects of habitat degradation, fragmentation and alterations associated with one or more of the following activities: dewatering, road construction and maintenance, mining and grazing, blockage of migratory corridors by dams or other diversion structures, poor water quality, incidental angler harvest, entrainment into diversion channels, and introduced non-native species.

The Service has determined that of the total 97 core areas in this population segment, 38 are at high risk of extirpation, 35 are at risk, 20 are at potential risk, two are at low risk, and two are at unknown risk (Fish and Wildlife Service 2005, pp. 1-94).

The draft bull trout Recovery Plan (Fish and Wildlife Service 2002a, p. v) identifies the following conservation needs for this population segment: (1) maintain or expand the current distribution of the bull trout within core areas, (2) maintain stable or increasing trends in bull trout abundance, (3) maintain and restore suitable habitat conditions for all bull trout life history stages and strategies, and (4) conserve genetic diversity and provide opportunities for genetic exchange.

<u>4.1.6.5.1 Columbia River Recovery/Management Units</u>

Achieving recovery goals within each management unit is critical to recovering the Columbia River population segment. Recovering bull trout in each management unit would maintain the overall distribution of bull trout in their native range. Individual core areas are the foundation of management units and conserving core areas and their habitats within management units preserves the genotypic and phenotypic diversity that will allow bull trout access to diverse habitats and reduce the risk of extinction from stochastic events. The continued survival and recovery of each individual core area is critical to the persistence of management units and their role in the recovery of a population segment (Fish and Wildlife Service 2002a, p. 54).

The draft bull trout Recovery Plan (Fish and Wildlife Service 2002a, p. 2) identified 22 recovery units within the Columbia River population segment. These units are now referred to as management units. Management units are groupings of bull trout with historical or current gene flow within them and were designated to place the scope of bull trout recovery on smaller spatial scales than the larger population segments. The action area is encompassed by the Kootenai River, Clark Fork, Coeur d'Alene, Clearwater, Imnaha-Snake, Hells Canyon, and Southwest Idaho management units.

4.1.7 Previous Consultations and Conservation Efforts

4.1.7.1 Consultations

Consulted-on effects are those effects that have been analyzed through section 7 consultation as reported in a biological opinion. These effects are an important component of objectively characterizing the current condition of the species. To assess consulted-on effects to bull trout, we analyzed all of the biological opinions received by the Region 1 and Region 6 Service Offices, from the time of listing until August 2003; this summed to 137 biological opinions. Of these, 124 biological opinions (91 percent) applied to activities affecting bull trout in the Columbia Basin population segment, 12 biological opinions (9 percent) applied to activities affecting bull trout in the Coastal-Puget Sound population segment, 7 biological opinions (5 percent) applied to activities affecting bull trout in the Klamath Basin population segment, and one biological opinion (< 1 percent) applied to activities affecting the Jarbidge and St. Mary-Belly population segments (Note: these percentages do not add to 100, because several biological opinions applied to more than one population segment). The geographic scale of these consultations varied from individual actions (e.g., construction of a bridge or pipeline) within one basin to multiple-project actions occurring across several basins.

Our analysis showed that we consulted on a wide array of actions which had varying levels of effect. Many of the actions resulted in only short-term adverse effects – some with 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 local populations of bull trout.

4.1.7.2 Regulatory mechanisms

The implementation and effectiveness of regulatory mechanisms vary across the coterminous range. Forest practices rules for Montana, Idaho, Oregon, Washington, and Nevada include streamside management zones that benefit bull trout when implemented.

4.1.7.3 State Conservation Measures

State agencies are specifically addressing bull trout through:

- Washington Bull Trout and Dolly Varden Management Plan developed in 2000.

- Montana Bull Trout Restoration Plan (Bull Trout Restoration Team appointed in
- 1994, and plan completed in 2000).
- Oregon Native Fish Conservation Policy (developed in 2004).
- Nevada Species Management Plan for Bull Trout (developed in 2005).
- State of Idaho Bull Trout Conservation Plan (developed in 1996); the watershed advisory group drafted 21 problem assessments throughout Idaho, which address all 59 key watersheds. To date, a conservation plan has been completed for one of the 21 key watersheds (Pend Oreille).

4.1.7.4 Habitat Conservation Plans

Habitat Conservation Plans (HCP) have resulted in land management practices that exceed State regulatory requirements. Habitat conservation plans addressing bull trout cover approximately 472 stream miles of aquatic habitat, or approximately 2.6 percent of the Key Recovery Habitat across Montana, Oregon, Washington, Nevada, and Idaho. These HCPs include: Plum Creek Native Fish HCP, Washington Department of Natural Resources HCP, City of Seattle Cedar River Watershed HCP, Tacoma Water HCP, and Green Diamond HCP.

4.1.7.5 Federal Land Management Plans

PACFISH is the Interim Strategy for Managing Anadromous Fish-Producing Watersheds and includes Federal lands in Western Oregon and Washington, Idaho, and Portions of California. INFISH is the "Interim Strategy for Managing Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana, and Portions of Nevada." Each strategy amended Forest Service Land and Resource Management Plans and Bureau of Land Management Resource Management Plans. Together PACFISH and INFISH cover thousands of miles of waterways within 16 million acres and provide a system for reducing effects from land management activities to aquatic resources through riparian management goals, landscape scale interim riparian management objectives, RHCAs, riparian standards, watershed analysis, and the designation of Key and Priority watersheds. These interim strategies have been in place since 1992 and are part of the management plans for Bureau of Land Management and Forest Service lands.

The Interior Columbia Basin Ecosystem Management Plan (ICBEMP) is the strategy that replaces the PACFISH and INFISH interim strategies when federal land management plans are revised. The Southwest Idaho Land and Resource Management Plan (LRMP) is the first LRMP under the strategy and provides measures that protect and restore soil, water, riparian and aquatic resources during project implementation while providing flexibility to address both short- and long-term social and economic goals on 6.6 million acres of National Forest lands. This plan includes a long-term Aquatic Conservation Strategy that focuses restoration funding in priority subwatersheds identified as important to achieving Endangered Species Act, Tribal, and Clean Water Act goals. The Southwest Idaho LRMP replaces the interim PACFISH/INFISH strategies and adds additional conservation elements, specifically, providing an ecosystem management foundation, a prioritization for restoration integrated across multiple scales, and adaptable active, passive and conservation management strategies that address both protection and restoration of habitat and 303(d) stream segments.

The Southeast Oregon Resource Management Plan (SEORMP) and Record of Decision is the second LRMP under the ICBEMP strategy which describes the long-term (20+ years)plan for managing the public lands within the Malheur and Jordan Resource Areas of the Vale District. The SEORMP is a general resource management plan for 4.6 million acres of Bureau administered public lands primarily in Malheur County with some acreage in Grant and Harney Counties, Oregon. The SEORMP contains resource objectives, land use allocations, management actions and direction needed to achieve program goals. Under the plan, riparian areas, floodplains, and wetlands will be managed to restore, protect, or improve their natural functions relating to water storage, groundwater recharge, water quality, and fish and wildlife values.

The Northwest Forest Plan covers 24.5 million acres in Washington, Oregon, and northern California. The Aquatic Conservation Strategy (ACS) is a component of the Northwest Forest Plan. It was developed to restore and maintain the ecological health of watersheds and the aquatic ecosystems. The four main components of the ACS (Riparian Reserves, Watershed Analysis, Key Watersheds, and Watershed Restoration) are designed to operate together to maintain and restore the productivity and resiliency of riparian and aquatic ecosystems.

It is the objective of the Forest Service and the Bureau of Land Management to manage and maintain habitat and, where feasible, to restore habitats that are degraded. These plans provide for the protection of areas that could contribute to the recovery of fish and, overall, improve riparian habitat and water quality throughout the basin. These objectives are accomplished through such activities as closing and rehabilitating roads, replacing culverts, changing grazing and logging practices, and re-planting native vegetation along streams and rivers.

4.1.8 Conservation Needs

The recovery planning process for the bull trout (Fish and Wildlife Service 2002a, p. 49) has identified the following conservation needs (goals) for bull trout recovery: (1) maintain the current distribution of bull trout within core areas as described in recovery unit chapters, (2) maintain stable or increasing trends in abundance of bull trout as defined for individual recovery units, (3) restore and maintain suitable habitat conditions for all bull trout life history stages and strategies, and (4) conserve genetic diversity and provide opportunity for genetic exchange.

The draft bull trout Recovery Plan (Fish and Wildlife Service 2002a, p. 62) identifies the following tasks needed for achieving recovery: (1) protect, restore, and maintain suitable habitat conditions for bull trout, (2) prevent and reduce negative effects of non-native fishes, such as brook trout, and other non-native taxa on bull trout, (3) establish fisheries management goals and objectives compatible with bull trout recovery, (4) characterize, conserve, and monitor genetic diversity and gene flow among local populations of bull trout, (5) conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks, (6) use all available conservation programs and regulations to protect and conserve bull trout and bull trout habitats, (7) assess the implementation of bull trout recovery by management units, and (8) revise management unit plans based on evaluations.

Another threat now facing bull trout is warming temperature regimes associated with global climate change. Because air temperature affects water temperature, species at the southern margin of their range that are associated with cold water patches, such as bull trout, may become restricted to smaller, more disjunct patches or become extirpated as the climate warms (Rieman et al. 2007, p. 1560). Rieman et al. (2007, pp. 1558, 1562) concluded that climate is a primary determining factor in bull trout distribution. Some populations already at high risk, such as the

Jarbidge, may require "aggressive measures in habitat conservation or restoration" to persist (Rieman et al. 2007, p. 1560). Conservation and restoration measures that would benefit bull trout include protecting high quality habitat, reconnecting watersheds, restoring flood plains, and increasing site-specific habitat features important for bull trout, such as deep pools or large woody debris (Kinsella 2005, entire).

4.1.9 Critical Habitat

4.1.9.1 Designated Critical Habitat

4.1.9.1.1 Legal Status

The Service published a final critical habitat designation for the coterminus United States population of the bull trout on September 26, 2005 (70 FR 56212); the rule became effective on October 26, 2005. The scope of the designation involved the Klamath River, Columbia River, Coastal-Puget Sound, and Saint Mary-Belly River population segments (also considered as interim recovery units). Rangewide, the Service designated 143,218 acres of reservoirs or lakes and 4,813 stream or shoreline miles as bull trout critical habitat. We designated areas as critical habitat that (1) have documented bull trout occupancy within the last 20 years, (2) contain features essential to the conservation of the bull trout, (3) are in need of special management, and (4) were not excluded under section 4(b)(2) of the Act. The Final Rule excluded from designation those federally managed areas covered under PACFISH, INFISH, the Interior Columbia Basin Ecosystem Management Project, and the Northwest Forest Plan Aquatic Conservation Strategy. The Service determined that these strategies provide a level of conservation and adequate protection and special management for the primary constituent elements (PCEs) of critical habitat at least comparable to that achieved by designating critical habitat. Areas managed under these strategies do not meet the statutory definition of critical habitat (i.e., areas requiring special management considerations) and were therefore excluded. The excluded areas include much of the proposed critical habitat in Idaho; the final rule only designates 294 miles of stream/shoreline and 50,627 acres of reservoirs or lakes.

4.1.9.1.2 Conservation Role and Description of Critical Habitat

The conservation role of bull trout critical habitat is to support viable core area populations (70 FR 56212). Core areas reflect the metapopulation structure of the coterminus United States population of the bull trout and are the closest approximation of a biologically functioning unit for the purposes of recovery planning and risk analyses. Critical habitat units generally encompass one or more core areas and may include foraging, migration, and overwintering areas, outside of core areas, that are important to the survival and recovery (i.e., conservation) of the bull trout.

Because there were numerous exclusions associated with the final critical habitat designation process that reflect land ownership, designated critical habitat is often fragmented. These individual critical habitat segments are expected to contribute to the ability of the stream to support viable local and core area populations of the bull trout in each critical habitat unit. The PCEs of designated bull trout critical habitat are as follows:

1. Water temperatures that support bull trout use. Bull trout have been documented in streams with temperatures from 32 to 72 °F (0 to 22 °C) but are found more frequently in temperatures ranging from 36 to 59 °F (2 to 15 °C). These temperature ranges may vary

depending on bull trout life-history stage and form, geography, elevation, diurnal and seasonal variation, shade, such as that provided by riparian habitat, and local groundwater influence. Stream reaches with temperatures that preclude bull trout use are specifically excluded from designation.

2. Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and instream structures.

3. Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. This should include a minimal amount of fine substrate less than 0.25 inch (0.63 centimeter) in diameter.

4. A natural hydrograph, including peak, high, low, and base flows within historic ranges or, if regulated, currently operate under a biological opinion that addresses bull trout, or a hydrograph that demonstrates the ability to support bull trout populations by minimizing daily and day-to-day fluctuations and minimizing departures from the natural cycle of flow levels corresponding with seasonal variation. This rule finds that reservoirs currently operating under a biological opinion that addresses bull trout provides management for PCEs as currently operated.

5. Springs, seeps, groundwater sources, and subsurface water to contribute to water quality and quantity as a cold water source.

6. Migratory corridors with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows.

7. An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish; and

8. Permanent water of sufficient quantity and quality such that normal reproduction, growth, and survival are not inhibited.

Critical habitat includes the stream channels within the designated stream reaches, the shoreline of designated lakes, and the inshore extent of marine nearshore areas, including tidally influenced freshwater heads of estuaries.

4.1.9.1.3 Current Range-wide Condition of Designated Bull Trout Critical Habitat

The condition of bull trout critical habitat varies across its range from poor to good. Although still relatively widely distributed across its historic range, the bull trout occurs in low numbers in many areas, and populations are considered depressed or declining across much of its range (67FR 71240). This condition reflects the condition of bull trout habitat.

Among the many factors that contribute to degraded PCEs, those which appear to be particularly significant and have resulted in a legacy of degraded habitat conditions are as follows: (1) fragmentation and isolation of local populations due to the proliferation of dams and water diversions that have eliminated habitat, altered water flow and temperature regimes, and impeded migratory movements; (2) degradation of spawning and rearing habitat and upper watershed areas, particularly alterations in sedimentation rates and water temperature, resulting from forest and rangeland practices and intensive development of roads; (3) the introduction and spread of nonnative species as a result of fish stocking and facilitated by degraded habitat conditions, particularly for brook trout and lake trout, which compete with bull trout for limited resources and, in the case of brook trout, hybridize with bull trout; (4) in the Coastal-Puget Sound region where amphidromous bull trout occur, degradation of mainstem river feeding, migrating, and overwintering (FMO) habitat, and the degradation and loss of marine nearshore foraging and migration habitat due to urban and residential development; and (5) degradation of foraging, migration, and overwintering habitat resulting from reduced prey base, roads, agriculture, development and dams.

4.1.9.2 Proposed Bull Trout Critical Habitat

4.1.9.2.1 Legal Status

Ongoing litigation resulted in the U.S. District Court for the District of Oregon granting the Service a voluntary remand of the 2005 critical habitat designation. Subsequently the Service published a proposed critical habitat rule on January 14, 2010 (75 FR 2260).

The Service proposed 32 critical habitat units (CHUs). Each CHU is comprised of a number of specific streams or reservoir /lake areas, which are identified as subunits in the proposed rule. Approximately 36,498 km (22,679 mi) of streams (which includes 1,585.7 km (985.3 mi) of marine shoreline area, and 215,870 ha (533,426 ac) of reservoirs or lakes) are being proposed as critical habitat throughout the range of bull trout. The 2005 designation will remain in effect until a new final rule is published. The projected publish date is September 30, 2010.

4.1.9.2.2 Conservation Role and Description of Critical Habitat

In general the conservation role of critical habitat is to support viable core area populations (75 FR 2291). The Service is proposing to designate critical habitat to support the following bull trout recovery goals: conserve the opportunity for diverse life-history expression, conserve the opportunity for genetic diversity, ensure that bull trout are distributed across representative habitats, ensure sufficient connectivity among populations, ensure sufficient habitat to support population viability, address threats, and ensure sufficient redundancy in conserving population units.

In determining which areas to propose as critical habitat, the Service considered the physical and biological features that are essential to the conservation of bull trout and that may require special management considerations or protection. These features are the PCEs laid out in the appropriate quantity and spatial arrangement for conservation of the species. The PCEs of proposed critical habitat are:

1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporehic flows) to contribute to water quality and quantity and provide thermal refugia.

2. Migratory habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including, but not limited to, permanent, partial, intermittent, or seasonal barriers.

3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

4. Complex river, stream, lake, reservoir, and marine shoreline aquatic environments and processes with features such as large wood, side channels, pools, undercut banks and substrates, to provide a variety of depths, gradients, velocities, and structure.

5. Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shade, such as that provided by riparian habitat; and local groundwater influence.

6. Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount (e.g., less than 12 percent) of fine substrate less than 0.85 mm (0.03 in.) in diameter and minimal embeddedness of these fines in larger substrates are characteristic of these conditions.

7. A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, they minimize departures from a natural hydrograph.

8. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.

9. Few or no nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass; inbreeding (e.g., brook trout); or competitive (e.g., brown trout) species present.

4.1.9.2.3 Current Range-wide Condition of Proposed Bull Trout Critical Habitat

The condition of proposed bull trout critical habitat varies across its range from poor to good. Although still relatively widely distributed across its historic range, the bull trout occurs in low numbers in many areas, and populations are considered depressed or declining across much of its range (67 FR 71240). This condition reflects the condition of bull trout habitat.

The primary land and water management activities impacting the physical and biological features essential to the conservation of bull trout include timber harvest and road building, agriculture and agricultural diversions, livestock grazing, dams, mining, urbanization and residential development, and non-native species presence or introduction (75 FR 2282).

4.2 Environmental Baseline of the Action Area

This section assesses the effects of past and ongoing human and natural factors that have led to the current status of the species, its habitat and ecosystem in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area which have already undergone section 7 consultations, and the impacts of state and private actions which are contemporaneous with the consultations in progress.

4.2.1 Status of the Bull Trout in the Action Area

Bull trout are found throughout the action area in spawning and early rearing habitat (local populations) as well as in habitat used for FMO. Spawning and early rearing habitat is typically found in headwater (often roadless) areas while mainstem rivers provide FMO habitat.

As the proposed Program is programmatic in nature and encompasses a large area, the analysis presented in this Opinion will assess bull trout baseline status at the core area level as opposed to the smaller, local population scale. The draft recovery plan (Fish and Wildlife Service 2002a, p. 98) identified a bull trout core area as the closest approximation of a biologically functioning unit for bull trout. By definition, a core area includes a combination of core habitat (i.e., habitat that could supply all elements for the long-term security of bull trout). Core areas contain both spawning and early rearing habitat and FMO habitat. Core areas constitute the basic unit on which to gauge recovery (Fish and Wildlife Service 2002a, p. 98).

Table 3. Bull Trout Habitat Condition and Extirpation Risk by Core Area [adapted from Table 3 in the Service's Bull Trout Core Area Conservation Status Assessment (Service 2005)].

	Management Unit – Core Area	Brook Trout (% Key streams occupied)	Road Density (mi/mi2)	Habitat Condition based on Road Density (<1 mi/sq.mi. = high, 1 – 3 mi/sq.mi. = moderate, and > 3 mi./sq.mi. = low)	Risk of extirpation
1	Coeur d'Alene – Coeur d'Alene Lake	20	1.9	Moderate	High risk
2	Clark Fork – Lake Pend Oreille	38	2.2	Moderate	Potential risk
3	Clark Fork – Priest Lakes	48	1.7	Moderate	High risk
4	Kootenai – Kootenai River	87	2	Moderate	At risk
5	Clearwater – NF Clearwater	18	1.4	Moderate	At risk
6	Clearwater – Fish Lake (NF)	0	0.2	High	High risk
7	Clearwater – Lochsa R	0	0.7	High	At risk
8	Clearwater – Fish Lake (Lochsa)	0	0.5	High	At risk
9	Clearwater – Selway R.	32	0.2	High	Potential risk
10	Clearwater – SF Clearwater	62	1.4	Moderate	At risk
11	Clearwater – Middle-Lower	25	1.9	Moderate	At risk
12	Salmon – Upper Salmon	51	0.5	High	Potential risk
13	Salmon – Pahsimeroi R.	12	0.7	High	At risk
14	Salmon – Lake Cr.	0	1	Moderate	At risk
15	Salmon – Lehmhi R.	41	0.8	High	At risk
16	Salmon – Middle Salmon R. – Panther	26	0.7	High	At risk
17	Salmon – Opal Lake	0	0	High	Potential risk
18	Salmon – Middle Fork Salmon	32	0.2	High	Low risk
19	Salmon – Middle Salmon-Chamberlain	28	0.3	High	Potential risk
20	Salmon – SF Salmon	51	0.5	High	At risk
21	Salmon – Little-Lower Salmon	70	1.6	Moderate	High risk

	Management Unit – Core Area	Brook Trout (% Key streams occupied)	Road Density (mi/mi2)	Habitat Condition based on Road Density (<1 mi/sq.mi. = high, 1 – 3 mi/sq.mi. = moderate, and > 3 mi./sq.mi. = low)	Risk of extirpation
22	SW Idaho – Arrowrock	13	0.9	High	At risk
23	SW Idaho – Anderson Ranch	26	0.8	High	At risk
24	SW Idaho – Lucky Peak	Present	1.8	Moderate	High risk
25	SW Idaho – Upper SF Payette R.	12	0.6	High	At risk
26	SW Idaho – MF Payette R.	35	1.3	Moderate	At risk
27	SW Idaho – Deadwood R.	0	0.5	High	High risk
28	SW Idaho – NF Payette R.	2	1.6	Moderate	High risk
29	SW Idaho – Squaw Creek	19	1.4	Moderate	High risk
30	SW Idaho – Weiser R.	39	1.4	Moderate	High risk
31	SW Idaho – Little Lost	84	0.4	High	At risk
32	Sheep	0	0.5	High	Unknown
33	Granite	0	0	High	Unknown

Of the 33 core areas in Idaho with a designated threat ranking, 9 are at High risk, 16 are At Risk, 5 are at Potential Risk, 1 is at Low Risk, and 2 are unknown. Core areas at High Risk include Couer d'Alene, Priest Lakes, Fish Lake (North Fork), Little-Lower Salmon River, Lucky Peak, Deadwood River, North Fork Payette River, Squaw Creek, and Weiser River. Core areas At Risk include Fish Lake (Lochsa), Lochsa River, Middle-Lower Clearwater River, North Fork Clearwater River, South Fork Clearwater River, Kootenai River, Lake Creek, Lehmi River, Middle Salmon River-Panther, Pahsimeroi River, South Fork Salmon River, Anderson Ranch, Arrowrock, Little Lost River, Middle Fork Payette River, and Upper South Fork Payette River. Core areas at Potential Risk include Lake Pend Oreille, Selway River, Middle Salmon-Chamberlain, Opal Lake, and Upper Salmon. The only core area at Low Risk is the Middle Fork Salmon River. The status of Sheep and Granite Creeks is unknown.

4.2.1.1 Status of Designated Critical Habitat in the Action Area

The following streams and lakes are designated as bull trout critical habitat in Idaho:

<u>Clark Fork River Basin</u>

Lake Pend Oreille Subunit – East River, Gold Creek, Granite Creek, Grouse Creek, Lightning Creek, Middle Fork East River, North Fork Grouse Creek, Pack River, Priest River, Tarlac Creek, Trestle Creek, Twin Creek, Uleda Creek

Priest Lake and River Subunit – 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, Trapper Creek, Two Mouth Creek, and Upper Priest River

Coeur d'Alene Lake Basin

Beaver Creek, Coeur d'Alene Lake and River, Eagle Creek, Fly Creek, North Fork Coeur d'Alene River, Prichard Creek, Ruby Creek, Saint Joe River, Steamboat Creek, and Timber Creek

Snake River

Sections between Farewell Bend State Park and Pine Creek.

4.2.1.2 Status of Proposed Critical Habitat in the Action Area

In Idaho, the proposed critical habitat includes 9,670.6 miles of stream and shoreline and 197,914.7 acres of reservoir and lake area. The proposed critical habitat in Idaho is located within the following counties; Adams, Benewah, Blaine, Boise, Bonner, Boundary, Butte, Camas, Canyon, Clearwater, Custer, Elmore, Gem, Idaho, Kootenai, Lemhi, Lewis, Nez Perce, Owyhee, Shoshone, Valley and Washington.

4.2.2 Factors Affecting the Bull Trout and Critical Habitat in the Action Area

As previously described in the Status of the Species section of this Opinion, bull trout distribution, abundance, and habitat quality have declined rangewide primarily from the combined effects of habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, angler harvest, poaching, entrainment, loss or reduction in runs of anadromous salmonids, and the introduction of nonnative fish species such as the brook trout.

Land and water management activities that depress bull trout populations and degrade proposed and designated critical habitat include dams and other water diversion structures, forest management practices, livestock grazing, agriculture, road construction and maintenance, mining, and urban and rural development. All of these activities have occurred or are occurring in the action area to varying degrees with resulting adverse impacts on bull trout and bull trout habitat.

Road building and land management activities have been extensive in some watersheds containing local populations. Because of the numerous ecological effects of road construction and associated activities, such as timber harvest, (Jones et al. 2001, p.76, Trombulak and Frissell 2000, p.18) road density can be used as an indicator of watershed condition. Road density of less than 1 mile of road per square mile of watershed indicates high watershed condition, 1 to 3 miles indicates moderate condition, and greater than 3 miles indicates low condition (National Marine Fisheries Service 1996, entire). There appears to be an inverse relationship between watershed road density and bull trout occurrence in that bull trout typically do not occur where road densities exceed 1.7 miles per square mile (Fish and Wildlife Service 2002a, p. 18). Bull trout population strongholds occur most often in undisturbed/roadless areas (Quigley and Arbelide 1997, p. 1183; Kessler et al. 2001, p. ES-1). Table 3 shows that for the Idaho core areas; habitat condition is rated as high for 19 core areas and moderate for 14 core areas. No core area is rated as low for habitat condition.

As shown in Table 3, brook trout, an introduced species that competes and hybridizes with bull trout (and is therefore considered a threat factor), are present in all but seven of the core areas. For the core areas with brook trout, the percentage of key streams occupied ranges from 87 percent (Kootenai River) to 2 percent (NF Payette River).

Changes in hydrology and temperature caused by changing climate have the potential to negatively impact aquatic ecosystems in Idaho, with salmonid fishes being especially sensitive. Average annual temperature increases due to increased carbon dioxide are affecting snowpack, peak runoff, and base flows of streams and rivers (Mote et al. 2003, p. 45). Increases in water temperature may cause a shift in the thermal suitability of aquatic habitats (Poff et al. 2002, p. iii). For species that require colder water temperatures to survive and reproduce, warmer temperatures could lead to significant decreases in available suitable habitat. Increased frequency and severity of flood flows during winter can affect incubating eggs and alevins in the streambed and over-wintering juvenile fish. Eggs of fall spawning fish, such as bull trout, may suffer high levels of mortality when exposed to increased flood flows (ISAB 2007, p. iv).

Table 4. Matrix of Pathways and Indicators showing baseline condition for selected habitat indicators and the effects to those indicators from implementing Program activities (from the Assessment). Note: The matrix only includes baseline condition for those indicators that may be affected by implementation of Program actions.

Pathways	Environmental Baseline			Effects of the Actions		
Indicators	**Properly Functioning**	**At Risk**	**Unacceptable Risk**	**Restore**	**Maintain**	**Degrade**
Watershed Conditions:						
Riparian Vegetation Condition	...	X	...	...	...	X
Sediment Yield	...	X	...	...	...	X
Channel Condition & Dynamics:						
Width/Depth Ratio	...	X	...	...	...	X
Streambank Stability	...	X	...	...	...	X
Water Quality:						
Temp – Snake River Basin Steelhead and Chinook	...	...	X	...	X	...
Temp – Bull Trout	...	...	X	...	X	...
Suspended Sediment	...	X	...	...	...	X
Chemical Contamination/Nutrients	X	...	...	...	X	...
Habitat Elements:						
Cobble Embeddedness	...	X	...	...	...	X
Percent Surface Fines	...	X	...	...	...	X
Percent Fines by Depth	X	...	...	...	...	X
Large Woody Debris	...	X	...	...	X	...
Pool Frequency	...	X	...	...	...	X
Pool Quality	...	X	...	...	...	X

4.3 Effects of the Proposed Action

The implementing regulations for section 7 define "effects of the action" as "the direct and indirect effects of an action on the species together with the effects of other activities that are interrelated or interdependent with that action, which will be added to the environmental baseline" (50 CFR § 402.02). "Indirect effects" are caused by or result from the agency action, are later in time, but are still reasonably certain to occur. Indirect effects may occur outside of the immediate footprint of the project area, but would occur within the action area as defined (50 CFR § 402.02).

4.3.1 Direct and Indirect Effects of the Proposed Action

As shown in Table 4 (Matrix of Pathways and Indicators or MPI), relevant Program project types involving instream work or work below the ordinary high water mark (OHWM) are expected to degrade the baseline condition of the following bull trout habitat indicators: riparian vegetation condition, sediment yield, width/depth ratio, streambank stability, suspended sediment, cobble embeddedness, percent surface fines, percent fines by depth, pool frequency, and pool quality.

The relevant project types that may affect these indicators include two-lane bridge replacement, bank stabilization (riprap), bank stabilization (gabion), culvert installation – perennial stream, culvert extension – perennial stream, and culvert maintenance – perennial stream, geotechnical drilling, and small structure repair (see Table 2). Refer to the Assessment for a completed description of these work types including activity specific BMPs. The effects of these relevant work types on affected indicators are discussed in more depth below. The following discussion is excerpted from the Assessment with minor edits added for clarification. The discussion follows the layout in Table 4 showing the specific affected Indicator(s) under their associated Pathway. Only those indicators that will be degraded (i.e., adversely affected) are addressed here. We assume that effects to all other indicators in Table 4 are insignificant or discountable (as indicated by "maintain"). Additionally, Table 4 does not include indicators that will not be affected by the Program.

4.3.1.1 Watershed Conditions

4.3.1.1.1 Riparian Vegetation Condition

All of the relevant project types have the capacity to adversely affect riparian vegetation condition through both temporary and permanent ground disturbing activities. The proposed action for the two-lane bridge replacement is the only action that has specific measures to replace disturbed vegetation. Bank stabilization actions typically involve the covering of some riparian vegetation for the length of the project, as do culvert installation and extension actions. Culvert maintenance actions might have a small adverse impact on riparian vegetation, but this will only be short-term in nature.

Although these actions might have an adverse impact on riparian vegetation, these impacts are typically small relative to the project's action area and even smaller when considered in a watershed context.

4.3.1.1.2 Sediment Yield

All of the relevant project types have the capacity to adversely affect sediment yield and all have preventative measures (BMPs) in place to minimize sediment yield effects. These BMPs are primarily directed at minimizing sediment delivery from on-shore ground disturbance (e.g., using fiber wattles or silt fences). However, as all of these actions have the potential for in-stream work, there will be sediment produced through the disturbance of the stream substrate and will result in temporary elevated suspended sediment/turbidity.

Exposure to suspended sediment concentrations of 55 milligrams per liter (mg/l) for 3 hours or more is likely to negatively affect (minor physiological distress and reduced feeding rate) adult and juvenile salmonids (Newcombe and Jensen 1996, p. 698). Bash et al. (2001, p. 24) note that bull trout are more sensitive than other salmonids to elevated suspended sediment and turbidity. The Service expects that any bull trout present in the action area during in-channel work may be adversely affected by exposure to suspended sediment concentrations exceeding 55 mg/l for durations of 3 hours or more. Because there is a limited amount of in-stream work expected, the amount of sediment produced during Program implementation is also expected to be relatively small and the Service expects adverse effects to bull trout to be limited in duration and spatial extent. Additionally, the Department will meet Idaho state water quality standards during the implementation of any in-stream work.

4.3.1.2 Channel Conditions and Dynamics

4.3.1.2.1 Width/Depth Ratio

Width/depth ratios could be adversely affected by activities that produce sediment and consequently result in a decrease in pool depths. All of the relevant project types have the capacity to adversely affect sediment yield and all have preventative measures (BMPs) in place to minimize sediment yield effects. These BMPs are primarily directed at minimizing sediment delivery from on-shore ground disturbance (e.g., using fiber wattles or silt fences). However, as all of these actions have the potential for in-stream work, there will be sediment produced through the disturbance of the stream substrate and will result in temporary elevated suspended sediment/turbidity.

Although these actions may have an adverse impact on sediment yield, these impacts are typically small relative to the project's action area and even smaller when considered in a watershed context. As the effects on sediment yield are small, the effects on width/depth ratios would likewise be small.

4.3.1.2.2 Streambank Stability

Streambanks could be temporarily destabilized by activities conducted during the two-lane bridge replacement, culvert installation, culvert extension and culvert maintenance activities. However, the areas disturbed by these activities would be very small and the disturbance effects are not likely to last longer than one year.

Streambank stability could be negatively affected by any actions involving bank stabilization. Many areas that will receive rip-rap are areas that have already had armoring treatments. The net change in streambank disturbance in these areas will be minimal. The immediate area of the project would be negatively affected because of the rigidity of the structures — a rigidity that is not typically found in most stream types. This rigidity often reduces the biological availability of the streambank habitat by simplifying habitat features. Energy from streamflow is transferred downstream after streambanks are hardened; this often leads to destabilized streambanks. The proposed action includes measures to increase habitat availability such as the development of an irregular toe and bank line and the use of large, irregular rocks to create interstitial spaces and small alcoves. These measures will also create roughness which will reduce the velocity of the streamflow being directed downstream; this will therefore reduce the potential for downstream streambank destabilization.

4.3.1.3 Water Quality

4.3.1.3.1 Suspended Sediment

All of the relevant project types have the capacity to adversely affect sediment yield and all will have preventative measures in place to minimize sediment yield effects. The measures proposed are primarily directed at minimizing sediment delivery from on-shore ground disturbance. However, as all of these actions have the potential for in-stream work, there will be sediment produced through the disturbance of the stream substrate. Because there is a limited amount of in-stream work, the amount of sediment produced will be relatively small. Idaho state water quality standards will be met during project implementation. (See Sediment Yield, section 4.3.1.1.2 above.)

Although these actions may have an adverse impact on sediment yield, these impacts are typically small relative to the project's action area and even smaller when considered in a watershed context.

4.3.1.4 Habitat Elements

4.3.1.4.1 Cobble Embeddedness

Cobble embeddedness is primarily affected by changes in streamflow or sediment delivery. There are no proposed actions that will affect streamflows, which means that the key factor which could affect embeddedness is sediment yield. All of the relevant project types have the capacity to adversely affect sediment yield and all have preventative measures in place to minimize sediment yield effects. The measures proposed are primarily directed at minimizing sediment delivery from on-shore ground disturbance. However, as all of these actions have the potential for in-stream work, there will be sediment produced through the disturbance of the stream substrate. Because there is a limited amount of in-stream work, the amount of sediment produced will be relatively small. Idaho state water quality standards will be met during project implementation (See Sediment Yield, section 4.3.1.1.2 above.)

Although these actions may have an adverse impact on sediment yield, these impacts are typically small relative to the project's action area and even smaller when considered in a watershed context.

4.3.1.4.2 Percent Surface Fines

Percent surface fines is primarily affected by changes in streamflow or sediment delivery. There are no proposed actions that will affect streamflows, which means that the key factor which could affect surface fines is sediment yield. All of the relevant project types have the capacity to adversely affect sediment yield and all have preventative measures in place to minimize sediment yield effects. The measures proposed are primarily directed at minimizing sediment delivery from on-shore ground disturbance. However, as all of these actions have the potential for in-stream work, there will be sediment produced through the disturbance of the stream substrate. Because there is a limited amount of in-stream work, the amount of sediment produced will be relatively small. Idaho state water quality standards will be met during project implementation.

Although these actions may have an adverse impact on sediment yield, these impacts are typically small relative to the project's action area and even smaller when considered in a watershed context.

4.3.1.4.3 Percent Fines By Depth

Percent fines by depth is primarily affected by changes in streamflow or sediment delivery. There are no proposed actions that will affect streamflows, which means that the key factor which could affect the percentage of fines by depth is sediment yield. All of the relevant project types have the capacity to adversely affect sediment yield and all have preventative measures in place to minimize sediment yield effects. The measures proposed are primarily directed at minimizing sediment delivery from on-shore ground disturbance. However, as all of these actions have the potential for in-stream work, there will be sediment produced through the disturbance of the stream substrate. Because there is a limited amount of in-stream work, the amount of sediment produced will be relatively small. Idaho state water quality standards will be met during project implementation (See Sediment Yield, section 4.3.1.1.2 above.)

Although these actions might have an adverse impact on sediment yield, these impacts are typically small relative to the project's action area and even smaller when considered in a watershed context.

4.3.1.4.4 Pool Frequency

Pool Frequency is most likely affected by excessive sediment yield or reductions in the large woody debris that helps form pools in small to medium size streams.

All of the relevant project types have the capacity to adversely affect sediment yield and all have preventative measures in place to minimize sediment yield effects. The measures proposed are primarily directed at minimizing sediment delivery from on-shore ground disturbance. However, as all of these actions have the potential for in-stream work, there will be sediment produced through the disturbance of the stream substrate. Because there is a limited amount of in-stream work, the amount of sediment produced will likely also be relatively small. Idaho state water quality standards will be met during project implementation.

Most of the streams which Department roads border are larger streams in which pool formation is not driven by large woody debris processes. Also, there are not large areas where riparian vegetation will be affected, further minimizing the risk of affecting pool formation from a lack of large woody debris.

4.3.1.4.5 Pool Quality

Pool Quality is most commonly affected by excessive sediment yield or reductions in the large woody debris that helps form pools in small to medium streams.

All of the relevant project types have the capacity to adversely affect sediment yield and all have preventative measures in place to minimize sediment yield effects. The measures proposed are primarily directed at minimizing sediment delivery from on-shore ground disturbance. However, as all of these actions have the potential for in-stream work, there will be sediment produced through the disturbance of the stream substrate. Because there is a limited amount of in-stream work, the amount of sediment produced will likely also be relatively small. Idaho state water quality standards will be met during project implementation.

Most of the streams bordered by Department roads are larger streams in which pool formation is not driven by large woody debris processes. Also, there are not large areas where riparian vegetation will be affected, further minimizing the risk of affecting pool formation from a lack of large woody debris.

4.3.1.5 Effects to Fish

4.3.1.5.1 Harassment

All of the proposed actions with potential adverse effects to bull trout involve in-stream work. As noted above in sediment yield, excessive sediment in the river may cause bull trout to avoid the project area. These effects are expected to be short in duration and small in scale. Instream work will only occur in coordination with IDFG personnel and will only occur during approved in-stream work windows. These inwater works windows are typically mid-summer when bull trout are often in headwater reaches of streams; these stream reaches do not often coincide with the highways considered in this consultation. Pile driving may occur during construction of two-lane bridge projects or retaining walls. Pile driving creates sound effects which adversely affect fish. All pile-driving work will take place in dewatered work areas. As such, pile-driving sound effects will be non-lethal and limited to harassment of listed species.

4.3.1.5.2 Redd Disturbance

All of the proposed actions that are likely to adversely affect listed species involve in-stream work. In-stream work will only occur during approved in-stream work windows and in coordination with IDFG personnel. Because of this adherence to in-stream work window (a time when redds are not typically present in the stream) the redds of listed species will not likely be adversely affected.

4.3.1.6 Bull Trout Subpopulation Characteristics and Habitat Integration

Effect to the action will potentially degrade existing conditions for bull trout subpopulation characteristics and habitat integration. Projects may potentially adversely impact bull trout habitat. Effects are anticipated to be small in scale and short in duration.

4.3.1.7 Fish Salvage Effects

Bull trout may be injured or killed during fish relocation efforts associated with Program in-water work activities. Injuries and mortality could occur from electroshocking; however, mortality associated with handling stress is unlikely. Releasing captured fish into new habitat may lead to competitive interactions with other fish and, in some cases, could lead to predation on any disoriented fish being released. The effects from electrofishing and fish relocation efforts will be reduced by having a fisheries biologist or technician from the IDFG conduct the salvage efforts. The use of electrofishing or other methods to remove bull trout from these work sites requires the possession of a current Scientific Collecting Permit issued by IDFG. The permit holder must follow all associated permit requirements. The Service has already analyzed the effect of work conducted under the Department's permits in a February 2000 intra-Service Biological Opinion (Fish and Wildlife Service 2000).

4.3.2 Effects to Critical Habitat

Both designated and proposed critical habitat for bull trout are present in the action area and will be addressed separately in the following sections. The MPI for bull trout is used to evaluate and document baseline conditions and to aid in determining whether a project is likely to adversely affect or result in the incidental take of bull trout. See Table 4 above for the MPI used to assess effects to bull trout.

Analysis of the affected MPI habitat indicators can provide a thorough evaluation of the existing baseline condition and potential project impacts to the Primary Constituent Elements (PCEs) of designated and proposed bull trout critical habitat (see Tables 5 and 6).

4.3.2.1 Designated Bull Trout Critical Habitat

The effects to the PCEs from Program implementation are summarized in Table 5.

Table 5. The PCEs of designated critical habitat, associated MPI habitat indicators affected by the Program, and indicators degraded by implementing Program actions for each PCE.

	2005 Final CH PCEs	Associated Habitat Indicators	Habitat Indicators Degraded by Proposed Action
1	Water temperatures that support bull trout use. Bull trout have been documented in streams with temperatures from 32 to 72 °F (0 to 22 °C) but are found more frequently in temperatures ranging from 36 to 59 °F (2 to 15 °C). These temperature ranges may vary depending on bull trout life history stage and form, geography, elevation, diurnal and seasonal variation, shade, such as that provided by riparian habitat, and local groundwater influence. Stream reaches with temperatures that preclude any bull trout use are specifically excluded from designation.	Temperature, refugia, pool frequency and quality, width/depth ratio, peak/base flow, streambank stability, floodplain connectivity, road density	Width/depth ratio, streambank stability, riparian vegetation condition
2	Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and instream structures.	Large woody debris, pool frequency and quality, width/depth ratio, off-channel habitat, streambank stability, riparian vegetation condition, floodplain connectivity, disturbance history and regime, refugia	Pool frequency and quality, width/depth ratio, streambank stability, riparian vegetation condition
3	Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. This should include a minimal amount of fine substrate less than 0.25 inch (0.63 centimeter) in diameter.	Sediment, cobble embeddedness, large woody debris, pool frequency and quality, streambank stability	Sediment, cobble embeddedness, pool frequency and quality
4	A natural hydrograph, including peak, high, low, and base flows within historic ranges or, if regulated, currently operate under a biological opinion that addresses bull trout, or a hydrograph that demonstrates the ability to support bull trout populations by minimizing daily and day-to-day fluctuations and minimizing departures from the natural cycle of flow levels corresponding with seasonal variation.	Peak/base flow, road density, riparian vegetation condition, floodplain connectivity	Riparian vegetation condition
5	Springs, seeps, groundwater sources, and subsurface water to contribute to water quality and quantity as a cold water source.	Flood plain connectivity, changes in peak/base flows, cobble embeddedness, road density, streambank stability, chemical contamination/nutrients	Sediment
6	Migratory corridors with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows.	Temperature, sediment, chemical contamination/nutrients, physical barriers, peak/base flow, width/depth ratio, refugia	Width/depth ratio
7	An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.	Floodplain connectivity, riparian vegetation condition, pool frequency and quality, cobble embeddedness, temperature, chemical contaminants and nutrients	Riparian vegetation condition

	2005 Final CH PCEs	Associated Habitat Indicators	Habitat Indicators Degraded by Proposed Action
8	Permanent water of sufficient quantity and quality such that normal reproduction, growth, and survival are not inhibited.	Floodplain connectivity, peak/base flow, temperature, sediment, chemical contaminant and nutrients	Sediment

As shown in Table 5, relevant Program actions may adversely affect (indicated by degrade in the Table) all of the PCEs of designated bull trout critical habitat when those actions occur in that habitat. Designated critical habitat intersects with Department administered roads only in the Panhandle region of Idaho, so the number of Program actions that may impact critical habitat is expected to be small. Due to the programmatic nature of the proposed action, the Service cannot predict exactly where (in terms of specific critical habitat segments) these adverse effects may occur. We do expect that these effects will be short in duration and limited in spatial extent, as discussed above in the sections addressing effects to the species. The BMPs are expected to further reduce the magnitude of those effects.

4.3.2.2 Proposed Bull Trout Critical Habitat

Table 6. The PCEs of proposed critical habitat, associated MPI habitat indicators affected by the Program, and indicators degraded by implementing Program actions for each PCE.

	2010 Proposed CH PCEs	Associated Habitat Indicators	Habitat Indicators Degraded by Proposed Action
1	Springs, seeps, groundwater sources, and subsurface water connectivity (hyporehic flows) to contribute to water quality and quantity and provide thermal refugia.	Flood plain connectivity, changes in peak/base flows, cobble embeddedness, road density, streambank stability, chemical contamination/nutrients	Cobble embeddedness, streambank stability,
2	Migratory habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.	Temperature, sediment, chemical contamination/nutrients, physical barriers, peak/base flow, width/depth ratio, refugia	Sediment, width/depth ratio
3	An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.	Floodplain connectivity, riparian vegetation condition, pool frequency and quality, cobble embeddedness, temperature, chemical contaminants and nutrients	Riparian vegetation condition, pool frequency and quality, cobble embeddedness
4	Complex river, stream, lake, reservoir, and marine shoreline aquatic environments and processes with features such as large wood, side channels, pools, undercut banks and substrates, to provide a variety of depths, gradients, velocities, and structure.	Large woody debris, pool frequency and quality, width/depth ratio, off-channel habitat, streambank stability, riparian vegetation condition, floodplain connectivity, disturbance history and regime, refugia	Pool frequency and quality, width/depth ratio, streambank stability, riparian vegetation condition
5	Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shade, such as that provided by riparian habitat; and local groundwater influence.	Temperature, refugia, pool frequency and quality, width/depth ratio, change in peak/base flows, streambank stability, floodplain connectivity, road density	Pool frequency and quality, width/depth ratio, streambank stability
6	Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount (e.g., less than 12 percent) of fine substrate less than 0.85 mm (0.03 in.) in diameter and minimal embeddedness of these fines in larger substrates are characteristic of these conditions.	Sediment, cobble embeddedness, large woody debris, pool frequency and quality, streambank stability	Sediment, cobble embeddedness, pool frequency and quality, streambank stability
7	A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, they minimize departures from a natural hydrograph.	Peak/base flow, road density, riparian vegetation condition, floodplain connectivity,	Riparian vegetation condition
8	Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.	Floodplain connectivity, peak/base flow, temperature, sediment, chemical contaminant and nutrients	Sediment
9	Few or no nonnative predatory (e.g., lake trout,	Physical barriers	N/A

	2010 Proposed CH PCEs	Associated Habitat Indicators	Habitat Indicators Degraded by Proposed Action
	walleye, northern pike, smallmouth bass; inbreeding (e.g., brook trout); or competitive (e.g., brown trout) species present.		

As shown in Table 6, eight of the nine PCEs of proposed critical habitat for bull trout may be adversely affected (indicated by degrade in the Table) when the relevant Program work types occur in that habitat. The only PCE not affected by the Program is PCE 9. Due to the programmatic nature of the proposed action, the Service cannot predict exactly where (in terms of specific proposed critical habitat segments) these effects may occur. However, because proposed critical habitat approximates the range of bull trout in Idaho, there is an increased probability of Program actions affecting that habitat. We do expect that adverse effects, when they occur, will be short in duration and limited in scope as discussed above in the sections addressing effects to the species. The BMPs are expected to further reduce the magnitude of those effects.

It should be noted that due to the programmatic nature of the proposed action, we lack site specificity regarding potential effects to the bull trout and its proposed and designated critical habitat. We will be able to better address potential effects during the pre-project review process where the Agencies provide site-specific information for each proposed Program action. The Service can then ensure consistency with the analyses and conclusions included in this Opinion. If the pre-project review identifies that a Program action is not consistent with our Opinion, that action will need to undergo a separate section 7 consultation.

4.3.3 Effects of Interrelated or Interdependent Actions

The Service did not identify any interrelated or interdependent actions associated with the proposed action.

4.4 Cumulative Effects

The implementing regulations for section 7 define cumulative effects to include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this Biological Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

U.S. Census data (http://quickfacts.census.gov/qfd/states/16/16035.html) indicates that some counties within the action area have decreasing populations while some have increasing populations. However, between 2000 and 2008, the overall population in the 24 Idaho counties that encompass the range of bull trout in Idaho increased by approximately 7 percent. In that same time period, the population of Idaho grew from 1,293,953 to 1,523,816 people, or an 18 percent increase. Thus, population growth within the action area lagged behind that of both Idaho as whole and the nation during that time period. From 1990 to 2000, population density in the action area increased from 3.2 to 3.5 persons per square mile, which remains much lower than either the densities for the State of Idaho as a whole or the nation, 15.6 and 79.6 persons per square mile, respectively. Thus, the Service assumes that future private and state actions will continue within the action area, increasing as population density rises. As the human population in the action area continues to grow, demand for agricultural, commercial, or residential development is also likely to grow. The effects of new development caused by that demand are likely to reduce the conservation value of the habitat within the action area.

Illegal and inadvertent harvest of bull trout is also considered a cumulative effect. Harvest can occur through both misidentification and deliberate catch. Schmetterling and Long (1999, p. 1) found that only 44 percent of the anglers they interviewed in Montana could successfully identify bull trout. Being aggressive piscivores, bull trout readily take lures or bait (Ratliff and Howell 1992, pp. 15-16). IDFG report that 400 bull trout were caught and released in the regional (Clearwater administrative region) waters of the Salmon and Snake Rivers during the 2002 salmon and steelhead fishing seasons. In the Little Salmon River, 89 bull trout were caught and released during the same fishing seasons (Idaho Department of Fish and Game 2004, p. 11). Spawning bull trout are particularly vulnerable to harvest because the fish are easily observed during autumn low flow conditions. Hooking mortality rates range from 4 percent for non-anadromous salmonids with the use of artificial lures and flies (Schill and Scarpella 1997, p. 1) to a 60 percent worst-case scenario for bull trout taken with bait (Cochnauer et. al. 2001, p. 21). Thus, even in cases where bull trout are released after being caught, some mortality can be expected.

Warming of the global climate seems quite certain. Changes have already been observed in many species' ranges consistent with changes in climate (ISAB 2007, p. iii; Hansen et al. 2001, p. 767). Future climate change may lead to fragmentation of suitable habitats that may inhibit adjustment of plants and wildlife to climate change through range shifts (ISAB 2007, p. iii; Hansen et al. 2001, pp. 768-773). Changes due to climate change and global warming could be compounded considerably in combination with other disturbances such as fire and invasive species. Fire frequency and intensity have already increased in the past 50 years, particularly in the past 15 years, in the shrub steppe and forested regions of the west (ISAB 2007, p. iii). Larger climate-driven fires can be expected in Idaho and Montana in the future. Small isolated bull trout populations will be at increased risk of extirpation in the event of larger and more numerous fires. In addition, the preference of bull trout for colder water temperatures gives them a competitive advantage over invasive species, such as brook trout, inhabiting warmer stream reaches. Rahel et. al. (2008, p. 552) state that "climate change will produce a direct threat to bull trout through thermally stressful temperatures and an indirect threat by boosting the competitive ability of other trout species present."

Although cumulative effects can be identified, we cannot quantify the magnitude of their impacts on bull trout populations. Except for climate change, we do not expect cumulative effects to appreciably alter the existing baseline condition in the action area during the five-year lifetime of the project. We cannot be so certain on the effects of climate change.

4.5 Conclusion

The Service has reviewed the current status of bull trout, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects. The Service concludes that direct effects to bull trout will be limited to short-term disturbance, feeding rate reduction, and physiological distress to adult and subadult bull trout resulting in take in the form of harm from in-water sediment effects. Sound effects from pile-driving may harass individual adult or sub-adult bull trout. All of these anticipated effects should be minimized by the BMPs incorporated into the Program. Because Department roads are generally located in FMO habitat, Program activities are not anticipated in bull trout spawning areas; therefore, egg, alevins, or fry are not expected to be affected by the Program. The Service expects that the numbers, distribution, and reproduction of bull trout in the action area or in the Columbia Basin population segment will not be significantly changed as a result of this project. Therefore, it is the Service's biological opinion that the proposed action will not jeopardize the coterminous population of bull trout.

Although the PCEs of designated bull trout critical habitat may be adversely affected by the Program, we expect these effects to be limited in duration and spatial extent. We also expect the BMPs incorporated into the Program to minimize effects. Designated critical habitat occurs in only a limited portion of the action area, so the number of Program activities potentially impacting critical habitat will be small. Impacts to critical habitat segments will not affect the functioning of Critical Habitat Units. Therefore, we conclude that the Program will not destroy or adversely modify designated critical habitat.

We also conclude that the Program will not destroy or adversely modify proposed bull trout critical habitat. Although the number of Program activities occurring in proposed critical habitat is larger than those occurring in designated critical habitat (because proposed critical habitat occurs throughout the action area), we again anticipate that effects will be limited in duration and spatial extent. All affected Critical Habitat Units will remain functional.

4.6 Incidental Take Statement

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering.

Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of an Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Agencies so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply.

4.6.1 Amount or Extent of Take Anticipated

Bull trout occur throughout the action area; however, it is difficult for us to anticipate the exact number of individual bull trout that will be taken as a result of Program activities. Therefore, to