CHAPTER III: BULL TROUT

A. Status of the Species

1. Listing History

Declining trends due to the combined effects of habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, angler harvest and poaching, entrainment into diversion channels and dams, and introduced nonnative species (e.g., brook trout, *Salvelinus fontinalis*) have resulted in declines in rangewide bull trout distribution and abundance (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 extirpations 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 1997).

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 coterminous United States population of the bull trout was listed as threatened on November 1, 1999 (64 FR 58910). The threatened bull trout occurs in the Klamath River Basin of south-central Oregon, the Jarbidge River in Nevada, north to various coastal rivers of Washington to the Puget Sound, east throughout major rivers within the Columbia River Basin to the St. Mary-Belly River, and east of the Continental Divide in northwestern Montana (Cavender 1978, Bond 1992, Brewin and Brewin 1997, Leary and Allendorf 1997).

The bull trout was initially listed as three Distinct Population Segments (DPSs) (63 FR 31647, 64 FR 17110). The preamble to the final listing rule for the United States coterminous population of the bull trout discusses the consolidation of these DPSs, plus two other population segments, into one listed taxon and the application of the jeopardy standard under section 7 of the Act relative to this species (64 FR 58930):

> "Although this rule consolidates the five bull trout DPSs into one listed taxon, based on conformance with the DPS policy for purposes of consultation under section 7 of the Act, we intend to retain recognition of each DPS in light of available scientific information relating to their uniqueness and significance. Under this approach, these DPSs will be treated as interim recovery units with respect to application of the jeopardy standard until an approved recovery plan is developed. Formal establishment of bull trout recovery units will occur during the recovery planning process."

The Service completed a 5-year Status Review for bull trout in 2008 (Service 2008). The review concluded that the species should remain listed as threatened and that the designation of multiple DPSs should be reevaluated.

2. Description of the Species

Bull trout *(Salvelinus confluentus*), member of the family Salmonidae, are char native to the Pacific Northwest and western Canada. The bull trout and the closely related Dolly Varden (*Salvelinus malma*) were not officially recognized as separate species until 1980 (Robins et al. 1980). Bull trout historically occurred in major river drainages in the Pacific Northwest from the southern limits in the McCloud River in northern California (now extirpated), Klamath River basin of south central Oregon, and the Jarbidge River in Nevada to the headwaters of the Yukon River in the Northwest Territories, Canada (Cavender 1978; Bond 1992). To the west, bull trout current range includes Puget Sound, coastal rivers of British Columbia, Canada, and southeast Alaska (Bond 1992). 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). Bull trout are wide-spread throughout the Columbia River basin, including its headwaters in Montana and Canada.

3. Life History and Habitat Requirements

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 the streams where they spawn and rear. Migratory bull trout spawn and rear in streams for one to four years before migrating to either a lake (adfluvial), river (fluvial), or, in certain coastal areas, to saltwater (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 more specific habitat requirements than 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. It was also concluded that these characteristics are not necessarily ubiquitous throughout these watersheds resulting in patchy distributions even in pristine habitats.

Bull trout are found primarily in colder streams, although individual fish are migratory in larger, warmer river systems throughout the range (Fraley and Shepard 1989; Rieman and McIntyre 1993, 1995; Buchanan and Gregory 1997; Rieman et al. 1997). Water temperature above 15°C (59°F) is believed to limit bull trout distribution, which may partially explain the patchy distribution within a watershed (Fraley and Shepard 1989; Rieman and McIntyre 1995). Spawning areas are often associated with cold-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 (44 to 46°F) and optimum water temperatures for egg incubation of 2 to 4°C (35 to 39°F).

All life history stages of bull trout 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). 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. Bull trout prefer relatively stable channel and water flow conditions (Rieman and McIntyre 1993). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997).

The size and age of bull trout at maturity depend upon life-history strategy. Growth of resident fish is generally slower than 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. Bull trout are iteroparous (they spawn more than once in a lifetime), and both repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented (Leathe and Graham 1982, Fraley and Shepard 1989, Pratt 1992, Rieman and McIntyre 1996).

Bull trout typically spawn from August to November during periods of decreasing water temperatures. Migratory bull trout frequently begin spawning migrations as early as April, and have been known to move upstream as far as 250 kilometers (km) (155 miles (mi)) 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 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).

The iteroparous reproductive system of bull trout has important repercussions for the management of this species. Bull trout require two-way passage up and downstream, not only for repeat spawning, but also for foraging. Most fish ladders, however, were designed specifically for anadromous semelparous (fishes that spawn once and then die, and therefore require only one-way passage upstream) salmonids. Therefore even dams or other barriers with fish passage facilities may be a factor in isolating bull trout populations if they do not provide a downstream passage route.

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, macro-zooplankton and small fish (Boag 1987; Goetz 1989; Donald and Alger 1993). Adult migratory bull trout are primarily piscivores, known to feed on various fish species (Fraley and Shepard 1989; Donald and Alger 1993).

4. Population Dynamics

The draft bull trout Recovery Plan (Service 2002) defined core areas as groups of partially isolated local populations of bull trout with some degree of gene flow occurring between them. Based on this definition, core areas can be considered metapopulations. A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them (Meefe and Carroll 1994). In theory, bull trout metapopulations (core areas) can be composed of two or more local populations, but Rieman and Allendorf (2001) suggest that for a bull trout metapopulation to function effectively, a minimum of between five and 10 local

populations are required. Bull trout core areas with fewer than five local populations are at increased risk of local extirpation, core areas with between five and 10 local populations are at intermediate risk, and core areas with more than 10 interconnected local populations are at diminished risk (Service 2002).

The presence of a sufficient number of adult spawners is necessary to ensure persistence of bull trout populations. In order to avoid inbreeding depression, it is estimated that a minimum of 100 spawners is required. Inbreeding can result in increased homozygosity of deleterious recessive alleles which can in turn reduce individual fitness and population viability (Whitesel et al. 2004). For persistence in the longer term, adult spawning fish are required in sufficient numbers to reduce the deleterious effects of genetic drift and maintain genetic variation. For bull trout, Rieman and Allendorf (2001) estimate that approximately 1,000 spawning adults within any bull trout population are necessary for maintaining genetic variation indefinitely. Many local bull trout populations individually do not support 1,000 spawners, but this threshold may be met by the presence of smaller interconnected local populations within a core area.

For bull trout populations to remain viable (and recover) natural productivity should be sufficient for the populations to replace themselves from generation to generation. A population that consistently fails to replace itself is at an increased risk of extinction. Since estimates of population size are rarely available, the productivity or population growth rate is usually estimated from temporal trends in indices of abundance at a particular life stage. For example, redd counts are often used as an indicator of a spawning adult population. The direction and magnitude of a trend in an index can be used as a surrogate for growth rate.

Survival of bull trout populations is also dependent upon connectivity among local populations. Although bull trout are widely distributed over a large geographic area, they exhibit a patchy distribution even in pristine habitats (Rieman and McIntyre 1993). Increased habitat fragmentation reduces the amount of available habitat and increases isolation from other populations of the same species (Saunders et al. 1991). Burkey (1989) 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) and Rieman and Allendorf (2001), 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).

5. Distribution

As noted above, in recognition of available scientific information relating to their uniqueness and significance, five population segments[1] 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. IRAs only overlap the Columbia River population segment.

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 (Service 2002).

Central to the survival and recovery of the bull trout is the maintenance of viable core areas (Service 2002, 2004a,b). 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 in their use of spawning habitat. Each of the population segments listed above 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 (Service 2002; 2004a,b).

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 (Service 2005).

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 (Service 2004a). The draft bull trout recovery plan (Service 2004a) identifies the following conservation needs for this segment: maintain the current distribution of the bull trout within the core area, maintain stable or increasing trends in abundance of both resident and migratory bull trout in the core area, restore and maintain suitable habitat conditions for all life history stages and forms, and 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

[1] Population segment will be used in this Opinion rather than interim recovery unit to avoid confusion with recovery units identified in the draft bull trout Recovery Plans (Service 2002, 2004 a,b).

persistence and viability of the core area and to support both resident and migratory adult bull trout (Service 2004a). Currently this core area is at high risk of extirpation (Service 2005).

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 (Service 2002). Bull trout populations in this unit face a high risk of extirpation (Service 2002). The draft bull trout recovery plan (Service 2002) identifies the following conservation needs for this unit: maintain the current distribution of the bull trout and restore distribution in previously occupied areas, maintain stable or increasing trends in bull trout abundance, restore and maintain suitable habitat conditions for all life history stages and strategies, and 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 (Service 2002).

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 (Service 2004b). 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 (Service 2004b) identifies the following conservation needs for this unit: maintain or expand the current distribution of bull trout within existing core areas, increase bull trout abundance to about 16,500 adults across all core areas, and maintain or increase connectivity between local populations within each core area.

St. Mary-Belly River

This population segment currently contains six core areas and nine local populations (Service 2002). 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 (Service 2002). 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 (Service 2002). The draft bull trout recovery plan (Service 2002) identifies the following conservation needs for this unit: maintain the current distribution of the bull trout and restore distribution in previously occupied areas, maintain stable or increasing trends in bull trout abundance, restore and maintain suitable habitat conditions for all life history stages and forms, conserve genetic diversity and provide the opportunity for genetic exchange, and 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.

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). 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 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, the 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 (Service 2005).

The Columbia River population segment has declined in overall range and numbers of fish (63 FR 31647). Although some strongholds still exist with migratory fish present, bull trout generally occur as isolated local populations in headwater lakes or tributaries where the migratory life history form has been lost. Though still widespread, there have been numerous local extirpations reported throughout the Columbia River basin. In Idaho, for example, bull trout have been extirpated from 119 reaches in 28 streams (Idaho Department of Fish and Game in litt. 1995).

The draft bull trout recovery plan (Service 2002) identifies the following conservation needs for this population segment: maintain or expand the current distribution of the bull trout within core areas, maintain stable or increasing trends in bull trout abundance, maintain/restore suitable habitat conditions for all bull trout life history stages and strategies, and conserve genetic diversity and provide opportunities for genetic exchange.

6. Previously Consulted-on Effects

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 1 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.

The Service and NMFS have completed section 7 consultations on many programs and actions that benefit bull trout. Many of these are small scale actions such as removing passage barriers, installing 'fish friendly' crossing structures, and restoring habitat conditions in degraded streams and riparian areas. Large scale consultation which benefit bull trout include three primary documents that guide the management of federally listed fish species and their habitats on NFS lands in Idaho. These three documents amend the Forest Plans and provide standards and guidelines for land management related to federally listed anadromous and native inland fish species.

1. Interim Strategy for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH) (USFS and BLM 1995);
2. Inland Native Fish Strategy: Interim strategies for managing fish-producing watersheds in Eastern Oregon and Washington, Idaho, Western Montana, and portions of Nevada (INFISH) (USFS 1995) and;
3. Southwest Idaho Eco-group (Boise, Payette, and Sawtooth National Forests) land management plans (USFS 2003).

Although the aquatic conservation strategies in these three documents were developed for federally listed fish species, the requirements, including standards and guidelines, from these three documents apply to all activities that could occur in IRAs and would result in benefits to all aquatic species and their habitats.

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.

7. Conservation Needs

Recovery for bull trout will entail reducing threats to the long-term persistence of populations and their habitats, ensuring the security of multiple interacting groups of bull trout, and providing habitat conditions and access to them that allow for the expression of various life-history forms (Service 2002). The draft Bull Trout Recovery Plan 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 nonnative fishes, such as brook trout (*Salvelinus fontinalis*), and other nonnative 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; and (7) assess the implementation of bull trout recovery by management units, and revise management unit plans based on evaluations.

The conservation needs of the bull trout are often expressed as the four Cs: cold, clean, complex, and connected. Cold stream temperatures, clean water quality that is relatively free of sediment and contaminants, complex channel characteristics (including abundant large wood and undercut banks), and large patches of such habitat that are well connected by unobstructed migratory pathways are all needed to promote conservation of bull trout at multiple scales ranging from the coterminous to local populations. The recovery planning process for the bull trout (Service 2002) has also identified the following conservation needs for the bull trout: (1) maintain and restore multiple, interconnected populations in diverse habitats across the range of each interim recovery unit; (2) preserve the diversity of life-history strategies; (3) maintain genetic and phenotypic diversity across the range of each interim recovery unit; and (4) establish a positive population trend. Recently, it has also been recognized that bull trout populations need to be protected from catastrophic fires across the range of each interim recovery unit.

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). Rieman et al. (2007) conclude that climate is a primary determining factor in bull trout distribution. Some populations at high risk already, such as the Jarbidge, may require "aggressive measures in habitat conservation or restoration" to persist (Rieman et al. 2007).

8. Critical Habitat

The Service issued a final rule designating critical habitat for bull trout range-wide on September 26, 2005 (70 FR 56212). The designation includes 4,813 miles of stream or shoreline and 143,218 acres of lake or reservoir. 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 (USFS and BLM 1995), INFISH (USFS 1995), the Interior Columbia Basin Ecosystem Management Project (USFS; BLM; Service; Environmental Protection Agency; and NMFS 2003), and the Northwest Forest Plan ACS (USFS and BLM 1994). The Service determined that these strategies provide a level of conservation and adequate protection and special management for the primary constituent elements 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 across the range of the species in Idaho. There is no designated critical habitat within the MIRR action area.

B. Environmental Baseline

1. Status of the Species 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 feeding, migrating, and overwintering (FMO). Spawning and early rearing habitat is typically found in headwater (often roadless) areas while mainstem rivers provide FMO habitat. Table 6 shows the overlap of bull trout distribution in Idaho with IRAs and with the proposed management themes. Approximately 33 percent of the bull trout range in Idaho overlaps with IRAs.

Table 6. Bull Trout Baseline Information (Modified from Assessment Table IV-19)

	Total	**IRA Overlap**	**WLR**	**PRIM**	**BCR**	**BCR CPZ**	**GFRG**	**SAHTS**
Range in Idaho (ac)	16,746,381	5,581,489 (33%)	963,524 (5.8%)	1,008,287 (6.0%)	2,917,368 (17.4%)	289,931 (1.7%)	139,213 (0.8%)	47,314 (0.3%)
Core Area (ac)	26,494,967	6,714,414 (25%)	1,080,718 (4.1%)	1,275,767 (4.8%)	3,577,047 (13.5%)	332,066 (1.2%)	141,782 (0.5%)	48,582 (0.2%)

** Shaded numbers are indicated under themes that have greater permissions for activities in IRAs*

As the proposed action (i.e., designation of management themes for USFS roadless areas in Idaho) 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 (Service 2002) 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. Core areas constitute the basic unit on which to gauge recovery (Service 2002).

Table 7 is derived from Table 3 in the Service's Bull Trout Core Area Conservation Status Assessment (Service 2005) and displays the risk rankings for core areas in Idaho. The information presented on brook trout occupancy and road density, used for risk ranking, is based on available GIS layers. The risk rankings are outputs of the Natural Heritage Ranking process

used in the core area assessment and incorporate input on population size, population distribution, population trend, and threats. Refer to the Service's (2005) core area assessment for more information.

Overall, 25 percent (6,714,414 acres) of bull trout core areas overlap with IRAs (Assessment p. 7, Table IV-19). Specific information on IRAs in each bull trout core area was not presented in the Assessment for the proposed action. We assume that some portion of all core areas in Idaho is within the action area and therefore will be affected by the proposed action.

2. Factors Affecting Bull Trout 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.

Table 7. Bull Trout Habitat Condition by Core Area [adapted from Table 3 in the Service's Bull Trout Core Area Conservation Status Assessment (Service 2005)].

	Management Unit – Core Area – In Idaho	**Brook Trout (% Key streams occupied)**	**Road Density (mi/mi^2)**	**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 – Lemhi 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
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

Land and water management activities that depress bull trout populations and degrade 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. The bull trout draft Recovery Plan (Service 2002) contains detailed discussions on these activities and effects within each core area.

Road building and land management activities have been extensive in some core areas. Roads directly affect natural sediment and hydrologic regimes by altering streamflow, sediment loading, sediment transport and deposition, channel morphology, channel stability, substrate composition, stream temperatures, water quality, and riparian conditions within a watershed (Lee et al. 1997, Jones et al. 2000, Luce et al. 2001). Roads contribute more sediment to streams than

any other land management activity (Gibbons and Salo 1973, Meehan 1991), and most land management activities, such as mining, timber harvest, grazing, recreation and water diversions are dependent on roads.

Because of the numerous ecological effects of road construction, including temporary roads (which present most of the same risks posed by permanent roads, although some may be of shorter duration), and associated activities such as timber harvest (Jones et al. 2000, Trombulak and Frissell 2000) road density can be used as an indicator of watershed condition where less than one mile of road per square mile of watershed indicates high condition, one to three miles indicates moderate condition, and greater than three miles indicates low condition (NMFS 1996). Core area road density ranges from 2.2 miles/square mile for Kootenai River to zero for Opal Lake and Granite Creek. The mean road density for all core areas is approximately 1 mile/square mile, equating with a moderate rating for habitat condition.

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 (Service 2002). The Service (1998a) found that bull trout are exceptionally sensitive to the direct, indirect, and cumulative effects of roads. Bull trout population strongholds occur most often in roadless areas (Quigley and Arbelide 1997, Kessler et al. 2001). Dunham and Rieman (1999) demonstrated that disturbance from roads was associated with reduced bull trout occurrence. They concluded that conservation of bull trout should involve protection of larger, less fragmented, and less disturbed (lower road density) habitats to maintain important strongholds and sources for naturally recolonizing areas where populations have been lost.

As shown in Table 7, 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 two percent (Squaw Creek).

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). Increases in water temperature may cause a shift in the thermal suitability of aquatic habitats (Poff *et al*. 2002). 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).

Summary of Environmental Baseline

Of the 33 core areas in Idaho with a designated threat ranking, nine are at High risk, 16 are At Risk, five are at Potential Risk, one is at Low Risk, and 2 are unknown. Core areas at High Risk include Coeur 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

that are At Risk include Fish Lake (Lochsa), Lochsa River, Middle-Lower Clearwater River, North Fork Clearwater River, South Fork Clearwater River, Kootenai River, Lake Creek, Lemhi 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.

C. Effects of the Proposed Action

In the USFS review of the three aquatic conservation strategies for bull trout (INFISH, PACFISH, and the SWIE LRMPs) they have determined that none of the species specific direction is inconsistent with the permissions or prohibitions provided in the management themes. These aquatic conservation strategies provide specific criteria for designing projects or activities; therefore the management direction found in these strategies would be applied during project implementation to assist in conserving bull trout. In these strategies are goals, objectives, delineated riparian habitat conservation areas (RHCAs or RCAs), and specific standards and guidelines. Project and site-specific standards and guidelines apply to projects and activities in RHCAs or RCAs and areas outside of RHCAs or RCAs that have the potential to affect RHCAs or RCAs. The purpose of these various directions is to ensure that actions do not retard the attainment of riparian management objectives or other management objectives. Various standards and guidelines were developed for various programs or management areas which include timber, roads, grazing, recreation, minerals, fire/fuels, and general riparian management. For example, under INFISH, timber harvest is generally prohibited in RHCAs, and road and landing locations are to be minimized in RHCAs. Refer to Appendix A of this Opinion for INFISH standards and guidelines. Other standards and guidelines exist for watershed, habitat, fisheries, and wildlife restoration. Additional strategy components are watershed analysis or a specific unit analysis, watershed restoration (with a restoration priority), and a monitoring component. Based on the Assessment, the Service expects that this direction will still be in place for activities that occur as conjunction of the MIRR. Approximately 33 percent of bull trout habitat in Idaho occurs within the Idaho Roadless Area.

The Service makes the assumption that of the five themes, the WLR, PRIM, and SAHTS themes are the most restrictive because they only allow road construction, road reconstruction or timber cutting under very limited situations. WLR is the most restrictive while PRIM and SAHTS allow more activities. Discretionary mineral activities are prohibited under these three themes. The bull trout range overlaps approximately 2,019,125 acres (12 percent) in Idaho or 9 percent of all bull trout core areas in these three themes. Because of the prohibitions on ground disturbing activities within the WLR, PRIM, and SAHTS themes they should provide for good conditions for bull trout and their habitats. Aquatic ecological values including water quality, channel processes, sediment regimes, instream flows and riparian vegetation should be maintained under these themes.

The BCR theme is divided into two areas: 1) Backcountry/ Restoration (BCR) and 2) Backcountry/ Restoration Community Protection Zone (BCR-CPZ). This overlaps approximately 19 percent of all bull trout areas in Idaho or 15 percent of all bull trout core areas.

The BCR theme (outside of CPZ) is very similar to the 2001 Roadless Rule guidance for land management and has a very low probability of leading to any future activities that would result in adverse effects to bull trout. However, the BCR-CPZ is more permissive and has a higher potential for future actions to occur that could result in adverse effects to bull trout. Emphasis of activities in the BCR-CPZ is fuel reduction near at-risk communities and municipal water supply systems. In both BCR and BCR-CPZ some temporary road construction, road reconstruction, and timber cutting are permissible with requirements. All road construction and reconstruction for timber cutting must minimize surface disturbance, be decommissioned when the contract is closed, and only be used for intended purposes. Outside the CPZ road construction and reconstruction must be approved by the Regional Forester and needs to link to reducing the significant risk of wildland fire. In BCR and BCR-CPZ timber cutting can be conducted to improve threatened, endangered, proposed, or sensitive species habitat or to maintain or restore the characteristics of ecosystem composition and structure, roads would not be constructed or reconstructed for these purposes but existing roads could be used. The USFS would not authorize road construction/reconstruction for new mineral leases, including phosphates, in IRAs managed in the BCR and BCR-CPZ sub-themes.

The majority of the bull trout range within the IRAs overlaps with the BCR theme (2,917,368 acres, 17 percent) while for core areas 13.5 percent occur within the BCR theme. Of the BCR/bull trout overlap 289,931 acres (2 percent, 1 percent for core areas) is within BCR-CPZ which is a fairly permissive theme that could result in future activities, such as timber cutting and temporary road building, adversely affecting bull trout and their habitats. A number of important bull trout areas fall into the BCR and BCR-CPZ areas. Of particular interest are larger IRAs (>100,000 acres) that overlap bull trout because they have a greater potential than smaller areas to provide for interconnected populations (metapopulations) due to their lack of potential population fragmentation factors such as roads and associated culverts.

The GFRG theme is the most permissive of all the themes. Road construction/reconstruction, timber cutting would be permissible in these areas. Road construction to access specific phosphate deposits would also be allowed; however none of the phosphate deposits overlap the range of bull trout. Although areas in the GFRG theme continue to be included in the IRAs, the roadless characteristics and values in GFRG theme areas may not be maintained into the future. The GFRC theme would provide the least protection for aquatic habitats and species. There is little overlap with the GFRG theme and bull trout. According to the Assessment, two percent of bull trout core areas in Idaho overlap the GFRG and BCR-CPZ themes.

Areas in the BCR-CPZ and GFRG are of particular interest because they have more permissions than the other themes and a higher likelihood that activities may be implemented in the future in these areas. The BCR (outside of CPZ) areas have a moderate likelihood of activities occurring in the future that could result in adverse effects to bull trout and their habitats. However, all actions require the implementation of INFISH, PACFISH, and SWIEG plan standards and guidelines to provide for fish and aquatic species and their habitats. Several of the bull trout core areas have a moderate amount of acres (approximate range of 10,000-99,000 ac) in the BCR-CPZ or GFRG themes. Table 8 displays bull trout core areas with moderate acres in the BCR-CPZ or GFRG themes.

Table 8. Bull trout Core Areas with Moderate Acres in the BCR CPZ and GFRG Themes (Modified from Assessment Table IV-21)

Forest	**Core Area Name**	**Risk of Extirpation**
Boise/Payette	South Fork Salmon River	At Risk
Challis/Salmon/Sawtooth	Upper Salmon River	Potential Risk
Idaho Panhandle	Lake Pend Oreille	Potential Risk
Idaho Panhandle	Kootenai River	At Risk
Idaho Panhandle/ Clearwater	Coeur D'Alene Lake	High Risk
Salmon/Challis	Middle Salmon River Panther	At Risk
Nez Perce/Payette	Middle Salmon River Chamberlain	Potential Risk
Nez Perce	South Fork Clearwater River	At Risk

The MIRR applies to 9.3 million acres in Idaho and although the MIRR does not compel actions, it is probable that this decision could lead to future actions of a ground disturbing nature which are not favorable to fish and their habitat. Activities (road construction/reconstruction, timber cutting, sale, removal and discretionary minerals) that could occur under the MIRR are likely to occur on a very small percent of the 9.3 million acres. However, activities on even a small percent of the landscape can result in adverse impacts to a species and its habitat. About 3 million acres of soils that are prone to surface erosion and have a susceptibility to landslides occur within IRAs (FEIS section 3.6 Physical Resources). However, only about 253,500 acres of highly sensitive soils overlap the GFRG and BCR-CPZ areas. The areas within the GFRG and BCR-CPZ have the highest likelihood of resulting in future activities and the highest risk of disturbance. LRMP components provide additional direction for minimizing or reducing adverse effects in sensitive soils. Areas in the BCR theme outside of the CPZ have a moderate likelihood of activities occurring depending on location in relation to at-risk communities, municipal water supply systems, CPZ, and the need to improve or restore TEPC habitat or ecosystem composition or structure.

Unlike most USFS project analyses of alternatives and environmental consequences, the analysis of the MIRR alternative does not include an analysis of project implementation and resulting direct effects; it is an analysis of activities that could occur pursuant to the MIRR and the indirect and cumulative effects that could occur from those actions. It is an analysis of what is allowed under the rule versus an analysis of on-the-ground activities, and therefore has no direct effects. The following section summarizes the general effects that roads, timber cutting, and discretionary mineral development could have on bull trout and their habitats.

Roads

Road construction/reconstruction, maintenance, use, and even the presence of roads in a watershed, can have numerous adverse effects to aquatic ecosystems and the species they support. Roads tend to be a 'press' disturbance which is longer in duration than a 'pulse'

disturbance and are generally associated with habitat alteration (Niemi et al. 1990, Yount and Niemi 1990, Allan and Flecker 1993). Watershed and aquatic habitat recovery tends to be more rapid from pulse than from press disturbances (Allan and Flecker 1993). Gurtz and Wallace (1984) hypothesized that stream biota may not be able to recover from the effects of anthropogenic disturbances, such as roads or timber harvest, because they have no analogues in the natural disturbance regime, and organisms may not have evolved the appropriate breadth of habitat or reproductive requirements. Recent changes in road designs and application of best management practices have been effective in some instances at moderating or avoiding many adverse effects. The discussion in this section captures the principal effects that have been associated with roads, but these are potential effects; furthermore not every road would necessarily exhibit each or even many of these effects. Also, the effects of roads may vary with physical and biological conditions and the physical location of the road (Luce et al. 2001).

Potential effects from roads include (Furniss et al. 1991, USDA, USFS 2000):

- Increasing sediment loads in streams,
- Modifying watershed hydrology and stream flows,
- Altering stream channel morphology,
- Increasing habitat fragmentation and loss of connectivity,
- Degrading water quality, including increasing chance of chemical pollution, and
- Altering water temperature regimes.

These physical alterations can potentially result in a variety of adverse effects to aquatic species including:

- Increased mortality of amphibians, from crushing,
- Loss of spawning and rearing habitat, and deep pools, from excess sediment deposition,
- Increased mortality of eggs and young from lower levels of oxygen in stream gravels,
- Increased susceptibility to disease and predation,
- Increased reproductive failure,
- Shifts in macro invertebrate communities to those tolerating increased sediment or other types of diminished water quality,
- Increased susceptibility to over harvest and poaching,
- Loss of protective cover and resting habitat through changes in channel structure including large woody debris, overhanging banks, and deep pools,
- Competition from nonnative species,
- Loss of habitat caused by reduced habitat quality, barriers to passage, increased gradient, high temperatures, and other factors, and
- Increased vulnerability of subpopulations to catastrophic events and loss of genetic fitness, related to loss of habitat connectivity.

Trombulak and Frissell (2000) concluded that, although all species and ecosystems are not affected to the same degree by roads, in general, the presence of roads in an area is associated with negative effects for both terrestrial and aquatic ecosystems including changes in species composition and population size. While the localized effect of an individual road-stream crossing may not have a substantial adverse effect, the cumulative effect of road networks and multiple crossings increases the potential for major adverse effects to aquatic habitats (USFS

2000). Analysis done for the Interior Columbia Basin Ecosystem Management Project (Lee et al. 1997) indicates that strong fish populations are often associated with low road density. The Sierra Nevada Ecosystem Project documented a negative correlation between the abundance of roads in a watershed and the integrity of native stream biota (Moyle and Randall 1996).

The Service (Service 1998a) found that bull trout are exceptionally sensitive to the direct, indirect, and cumulative effects of roads. Dunham and Rieman (1999) demonstrated that disturbance from roads was associated with reduced bull trout occurrence. They concluded that conservation of bull trout should involve protection of larger, less fragmented, and less disturbed (lower road density) habitats to maintain important strongholds and sources for naturally recolonizing areas where populations have been lost.

Roads contribute more sediment to streams than any other land management activity (Gibbons and Salo 1973, Meehan 1991), and most land management activities, such as mining, timber harvest, grazing, recreation and water diversions are dependent on roads. The majority of sediment from timber harvest activities is related to roads and road construction (Megahan et al. 1978, MacDonald and Ritland 1989, Chamberlin et al. 1991, Furniss et al. 1991) and associated increased erosion rates (Swanson and Dyrness 1975, Swanston and Swanson 1976, Beschta 1978, Gardner 1979, Reid and Dunne 1984, Meehan 1991, Reid 1993). Serious degradation of fish habitat can result form poorly planned, designed, located, constructed, or maintained roads (Furniss et al. 1991, MacDonald et al. 1991).

Roads directly affect natural sediment and hydrologic regimes by altering streamflow, sediment loading, sediment transport and deposition, channel morphology, channel stability, substrate composition, stream temperatures, water quality, and riparian conditions within a watershed (Lee et al. 1997, Jones et al. 2000, Luce et al. 2001). Road-related mass soil movements can continue for decades after the roads have been constructed (Furniss et al. 1991). Megahan et al. (1992) found that 88 percent of landslides within Idaho were associated with roads. Such habitat alterations can adversely affect all life-stages of fishes, including migration, spawning, incubation, emergence, and rearing (Furniss et al. 1991, MacDonald et al. 1991, Henjum et al. 1994).

Road/stream crossings can also be a major source of sediment to streams resulting from channel fill around culverts and subsequent road crossing failures (Furniss et al. 1991). Plugged culverts and fill slope failures are frequent and often lead to catastrophic increases in stream channel sediment, especially on old abandoned or unmaintained roads (Weaver et al. 1987). Unnatural channel widths, slope, and stream bed form occur upstream and downstream of stream crossings (Heede 1980), and these alterations in channel morphology may persist for long periods of time. Because improper culverts can reduce or eliminate fish passage (Belford and Gould 1989), road crossings are a common migration barrier to fishes (Evans and Johnson 1980, Clancy and Reichmuth 1990, Clarkin et al. 2003,).

Temporary roads present most of the same risks posed by permanent roads, although some may be of shorter duration. Many of these roads are designed to lower standards than permanent roads, are typically not maintained to the same standards, and are associated with additional ground disturbance during their removal. Also, use of temporary roads in a watershed to support

timber harvest or other activities often involves construction of multiple roads over time, providing a more continuous disturbance to the watershed than a single, well-designed, maintained, and use-regulated road. While temporary roads may be used temporarily, for periods ranging up to 10 years before decommissioning, their short- and long-term effects on aquatic species and habitats can be extensive.

Roads facilitate increased use of an area by humans, who themselves often cause diverse and persistent ecological effects (Trumbulak and Frissell 2000). New roads increase ease of access into formally remote areas. Perhaps more important, roads often increase the efficiency with which natural resources can be exported. Human uses of the landscape made increasingly possible by roads include hunting and fishing, recreation, and changes in use of the land and water (Trumbulak and Frissell 2000). Native fish populations in previously inaccessible areas are often vulnerable to even small increases in fishing effort (Trumbulak and Frissell 2000).

Roads can provide dispersal of invasive species by: 1) providing habitat by altering conditions, 2) making invasion more likely by stressing or removing native species, and 3) allowing easier movement by wild or human vectors (Trombulak and Frissell 2000). Introductions of nonnative fishes and other aquatic species, whether authorized or unauthorized, have the potential to affect the distribution and abundance of native fishes, amphibians, and other aquatic organisms through competition, hybridization, predation, and introduction of parasites and diseases. Nonnative aquatic plants may also be inadvertently introduced to lakes and streams from boats and boat trailers. Unauthorized releases of aquarium fishes, bait fishes, nonnative amphibians and reptiles, and nonnative plants to streams and lakes are strongly influenced by the presence of roads (Allan and Flecker 1993, Lee et al. 1997, USFS 1999). Illegal introduction and harvest of aquatic species is less likely to occur in inventoried roadless areas due to lack of ready access.

The broad view of the ecological effects of roads reveals a multiplicity of effects, it also suggests that it is unlikely that the consequences of roads will ever be completely mitigated or remediated (Trumbulak and Frissell 2000). Because bull trout strongholds are associated with roadless areas (Quigley and Arbelide 1997, Kessler et al. 2001), it is critical to retain remaining roadless or near-roadless portions of the landscape in their natural state (Trumbulak and Frissell 2000).

For the purpose of this Opinion, existing roads are features that are present on the land, and as such considered under section 7 of the Act to be part of the baseline conditions for bull trout, in cases representing limitations to movement, survival, and recovery of local populations.

However, under the aquatic conservation strategies (e.g., INFISH, Appendix A of this Opinion), standards and guidelines address road construction in RHCAs and are designed to minimize adverse effects. For example, Watershed Analysis must be completed prior to construction of new roads or landings in RHCAs, and road construction activities must avoid disrupting natural hydrographic flow paths.

Timber Cutting

The effects of activities associated with timber cutting (e.g., tree felling, yarding, landings, site preparation by burning or scarification, fuels reduction, brush removal and whip felling, and

forest regeneration) are often difficult to separate from the effects of roads and road construction. The road systems developed to cut/harvest timber are often a significant factor affecting aquatic habitats, as discussed above. Negative effects from timber cutting tend to increase when activities occur on environmentally sensitive terrain with steep slopes comprised of highly erodible soils (Lee et al. 1997).

Some of the potential effects to aquatic habitat from timber harvest can include the following (Beschta et al. 1987, Chamberlin et al. 1991, Hicks et al. 1991):

- Increasing erosion,
- Increasing sediment supply and storage in channels,
- Modifying watershed hydrology and streamflow, including the timing or magnitude of runoff events,
- Decreasing stream bank stability, and altering stream channel morphology,
- Changes in water quality and quantity,
- Decreased recruitment of large woody debris to aquatic habitats,
- Diminishing habitat complexity,
- Altering energy relationships involving water temperature, snowmelt and freezing, and,
- Altering riparian composition and function.

If present, these physical changes in habitat would have many of the same biological effects as previously listed under the effects of roads, above. With the recent increased emphasis on use of best management practices and other protective measures in the design and implementation of timber harvest activities, the effects can often be mitigated to some extent. Cumulatively, however, timber harvest activities within a watershed can have pronounced and lasting effects to aquatic habitat (Chamberlin et al. 1991).

Again, the standards and guidelines of the aquatic conservation strategies (e.g., INFISH, see Appendix A of the Opinion) are designed to minimize the effects of land management actions such as timber harvest. For example, except under certain conditions such as fire or insect damage, no timber harvest is allowed in RHCAs.

Prescribed fire activities associated with timber cutting can affect aquatic and riparian habitats. In general prescribed fire activities do not result in similar physical and ecological impacts to aquatic and riparian systems as wildfire. Prescribed fires that burn within prescription are often smaller in scale (fewer acres) and burn under lower burn intensities than wildfires because of pre-fire fuels treatments and tree retention objectives (Gresswell 1999). Prescribed fires involving riparian areas often result in a patchy burn pattern because of higher humidity and fuel moisture in these areas. Similar to wildfire, prescribed fire can affect riparian vegetation composition, structure and function (Bêche et al. 2005), woody debris abundance and recruitment, shade, and steam/riparian areas temperatures, sediment transport, and aquatic species. The role of prescribed fire in maintaining and restoring aquatic and riparian ecosystems is not well understood (Bêche et al. 2005). Effects from prescribed fire can be both positive and negative to aquatic species and their habitats. For example, if trees in a riparian area are killed from a prescribed fire shade could be reduced and stream temperatures could increase, however tree mortality could also result in woody debris recruitment and increased habitat complexity.

Fire is a natural disturbance element of the aquatic ecosystems in Idaho and helps to maintain important habitat characteristics.

Mineral Activities

IRAs contain salable, leasable, and locatable mineral resources. Discretionary mining includes activities associated with saleable minerals (i.e. sand, stone, gravel, pumice, pumicite, cinders and clay) and leasable minerals (i.e. oil, oil shale, gas, coal, phosphate, potassium, sodium, sulphur, gilsonite, geothermal resources and hardrock minerals). Locatable minerals, such as gold and silver, are subject to the General Mining Law of 1872 and are not discretionary. The MIRR does not seek to impose limits regarding activities undertaken regarding locatable minerals and therefore will not be discussed further in this document. Mining for these materials occurs as surface mining or underground mining. Often mining operations need road access involving road construction and reconstruction. Ground disturbance, such as road and equipment pad construction, associated with mining activities can result in adverse impacts to aquatic habitats and species (Meehan 1991). Although any mining activity may have negative effects on aquatic ecosystems, the largest impacts have generally been associated with surface mining (Lee et al. 1997).

Mining activities can affect aquatic ecosystems in a number of ways: through the addition of large quantities of sediments; the addition of solutions contaminated with metal or acids; the acceleration of erosion; increased bank and streambed instability; changes in channel formation and stability; and removal of riparian vegetation (Lee et al. 1997). The MIRR prohibits road construction and reconstruction to access any new mineral lease areas, except specific phosphate deposits in the GFRG theme. The phosphate deposits do not overlap bull trout habitat. Surface use and occupancy is permissible, unless prohibited in the LRMP. It is unlikely mineral resources in IRAs would be explored or developed because (1) there is very limited oil and gas in IRAs and there is no past experience of directional drilling; (2) there is an abundance of geothermal resources outside of IRAs where existing infrastructure exists; (3) and in general it is very difficult to mine without road access.

In general, surface mining causes higher stream flows and greater storm flow volumes than underground mining due to a greater amount of surface area disturbance with associated removal of vegetation and topsoil, greater amounts of spoils, and general compaction of the area (Southern Appalachian Man and the Biosphere 1996). While stream channels can adjust to increased flows and sediment loads such alterations can have adverse effects on the quality of aquatic habitat.

Sediments can enter streams through erosion of mine tailings (Besser and Rabeni 1987), by direct discharge of mining wastes to aquatic systems, and through movement of groundwater (Davies-Colley et al. 1992). Coarse sediments delivered to channels are likely to be deposited relatively quickly, affecting nearby aquatic habitat. Finer materials settle out more slowly and may create turbid water conditions for long distances downstream, affecting primary production and biomass by reducing the amount of light available to algae and rooted aquatic plants (Lee et al. 1997). Increases in turbidity can cause direct mortality to aquatic species, reduce growth and feeding activity (Nelson et al. 1991), and can affect the abundance and diversity of benthic

invertebrates (Lee et al. 1997). Excessive fine sediment deposition in stream substrates can degrade spawning habitat for salmonids, and eliminate habitat for some bottom dwelling aquatic species by filling in spaces in gravels (Nelson et al. 1991).

As previously stated, the standards and guidelines of the aquatic conservation strategies (e.g., INFISH, see Appendix A of the Opinion) are designed to minimize the effects of land management actions such as timber harvest. For example, INFISH Standard MM-1 requires avoidance of adverse effects to listed species and designated critical habitat from mineral operations.

For aquatic habitats, the indirect effects of disturbances associated with road construction and timber harvest could extend well beyond those areas directly impacted, given the influence that upslope areas and upstream reaches have on the condition of downstream habitat (Chamberlin et al. 1991). The types and extent of impacts on aquatic habitats would depend on road location and design, proximity to accessible habitat, mitigation measures applied, and the activities enabled. For fish populations, habitat alterations can adversely affect all life-stages, from egg to adult, and habitat essential for migration, spawning, incubation, emergence, rearing, feeding, and security (Furniss et al. 1991).

The duration of effects, or recovery time, is dependent on a variety of factors. Site productivity, rainfall, and length of growing season influence the rate and success of vegetation regrowth. The type, location, extent and duration of an activity, magnitude of adverse effects, dominant hydrologic and geomorphic processes within the watershed, overall watershed condition, and the effectiveness of mitigation and reclamation activities are some of the other factors influencing the duration of physical effects on a watershed and associated stream channels. The duration of biological effects can extend beyond the recovery time for the physical environment, and can be irreversible if a species is extirpated from the watershed.

The Service did not identify any interrelated or interdependent actions associated with the proposed Idaho Roadless Rule that have the potential to affect bull trout or bull trout critical habitat. Interrelated and interdependent effects will be considered during future consultations on programs or actions implemented under the various LRMPs.

Summary of Effects

Since the proposed action is rule-making rather than an on-the-ground activity, it should not have direct effects on the bull trout or bull trout habitat. The effects of the MIRR would occur indirectly through subsequent actions proposed by the individual national forests. However, those proposed actions would be subject to project level ESA-consultation and the standards and guidelines of individual Forest Plans. The Forest Plans have been modified to include either the aquatic conservation strategies of PACFISH (USFS and BLM 1995), INFISH (USFS 1995) or the SWIE land management plans (USFS 2003), and the Service expects the USFS to act in accordance with these strategies when bringing forward future projects.

As previously stated, these aquatic conservation strategies provide specific criteria for designing projects or activities; therefore the management direction found in these strategies would be

applied during project implementation to assist in conserving bull trout. In these strategies are goals, objectives, delineated riparian habitat conservation areas (RHCAs or RCAs), and specific standards and guidelines. Project and site-specific standards and guidelines apply to projects and activities in RHCAs or RCAs and areas outside of RHCAs or RCAs that have the potential to affect RHCAs or RCAs. The purpose of these various directions is to ensure that actions do not retard the attainment of riparian management objectives or other management objectives. Standards and guidelines were developed for various programs or management areas which include timber, roads, grazing, recreation, minerals, fire/fuels, and general riparian management. Other standards and guidelines exist for watershed, habitat, fisheries, and wildlife restoration. Additional strategy components are watershed analysis or a specific unit analysis, watershed restoration (with a restoration priority), and a monitoring component.

As such, the Service expects that these strategies will minimize effects to bull trout and bull trout habitat resulting from any future actions implemented under the MIRR.

D. Cumulative Effects

Cumulative effects are the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this 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.

Portions of the action area downstream of the IRAs could be affected by non-Federal activities. Roadless areas are unlikely to contain significant non-Federal lands (inholdings) given their current roadless character and thus effects on such intervening non-Federal lands are unlikely within IRAs.

In those areas of the action area downstream of the IRAs, there are numerous state, tribal, local, and private actions that potentially affect bull trout. Many of the categories of on-going activities with potential effects to bull trout and bull trout habitat were identified in the Status of the Species and Environmental Baseline sections of this Opinion. These activities include timber harvest and road building, grazing, water diversion, residential development, and agriculture. 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) 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). Idaho Department of Fish and Game (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 (IDFG 2004). 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 nonanadromous salmonids with the use of artificial lures and flies (Schill and Scarpella 1997) to a 60 percent worst case scenario for bull trout taken with bait (Cochnauer et. al. 2001). Thus, even in cases where bull trout are released after being caught some mortality can be expected.

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 2006, the overall population in the 11 Idaho counties that encompass the range of anadromous salmonids in Idaho increased by approximately 2.4 percent. In that same time period, the population of Idaho grew from 1,293,953 to 1,466,465 people, or a 13.3 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.

Warming of the global climate seems quite certain. Changes have already been observed in many species' ranges, consistent with changes in climate (ISAB 2007; Hansen *et al*. 2001). 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; Hansen *et al*. 2001). Changes due to climate change and global warming could be compounded considerably in combination with other disturbances such as fire. Fire frequency and intensity have already increased in the past 50 years, and especially in the past 15 years, in the shrub steppe and forested regions of the west (ISAB 2007). Larger climate-driven fires can be expected in Idaho in the future.

E. Conclusion

After reviewing the current status of the bull trout, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the MIRR, as proposed, is not likely to jeopardize the continued existence of the bull trout. Although future Federal actions allowed by the MIRR may result in adverse impacts to individual bull trout and local populations, these effects are not likely to be measurable at the core area, interim recovery unit, or rangewide scales primarily due to USFS compliance with INFISH and PACFISH standards in conjunction with the design of those actions. Critical habitat has been designated for the bull trout. However, none occurs in the action area for this consultation and no destruction or adverse modification of that critical habitat is anticipated.

Future actions implemented under the MIRR will be implemented under the continued guidance from PACFISH, INFISH, and the SWIE LRMPs. These aquatic conservation strategies contain riparian goals, riparian management objectives, RHCAs or RCAs, and standards and guidelines designed to provide for the protection of aquatic species and their habitats. Therefore, in the Biological Opinions for these strategies, the Service determined that, at the plan level, implementation of Forest Service management actions in accordance with PACFISH, INFISH, or the SWIE LRMP is not likely to jeopardize the bull trout (Service 1998 , 2003).

F. Incidental Take Statement

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without specific exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm in the definition of take in the Act means an act which actually kills or injures wildlife. Such acts may 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 listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is 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 this Incidental Take Statement.

1. Amount or Extent of the Take – No incidental take is exempted herein as a result of the FS adopting the MIRR, although specific actions developed in accordance with the MIRR and associated LRMPs may cause effects that constitute take. The mere potential for take is not a legitimate basis for providing such an exemption. Subsequent consultation, as appropriate, on specific actions developed pursuant to the MIRR and relevant provisions of LRMPs will serve as the basis for determining if an exemption from the section 9 take prohibitions is warranted. If so, the Service will provide Reasonable and Prudent Measures and Terms and Conditions, as appropriate, to minimize the impacts of the taking on the listed species in accordance with 50 CFR 402.14i.

2. Effect of the Take – Not applicable to this Opinion.

3. Reasonable and Prudent Measures and Terms and Conditions – As there is not take exemption under 7(o) of the Act in this Opinion, the Service is not providing Reasonable and Prudent Measures or Terms and Conditions.

G. Conservation Recommendations

Section 7(a)(1) of the Act requires Federal Agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends that the USFS implement the following conservation measures.

1. Continue to survey and monitor bull trout populations and habitat in the action area to gather baseline and population trend information.

2. In future actions developed under the auspices of the MIRR, the USFS should include the conservation of bull trout and their habitat, as a project objective, with associated design criteria in the planning document for those projects where bull tout may be affected by the action.

3. All projects proposed within IRAs where bull trout might be affected should be brought forward to the interagency Level 1 Teams for adequate pre-consultation with the regulatory agencies.

4. The USFS should compile an annual report documenting what projects by IRA were completed under the MIRR, the scope of activities for those projects, and what management themes the activities occurred in. The report should address watershed conditions after projects are completed, including review of changes to the environmental baseline for bull trout to determine status and trend of habitat conditions.

5. As part of this annual report the USFS should identify whether projections of activities in each of the five themes were accurate. These projections were part of the basis of the effects analysis in this Opinion and are considered key assumptions of the analysis.

6. The USFS should develop a road analysis for every proposed project in MIRR areas that consider (as appropriate) placement of roads, road obliteration, and road improvements at the site-specific level. The USFS should also consider an analysis at a larger scale such as a watershed unit to promote multi-scale analyses to assist in promoting or identifying restoration opportunities for bull trout.

To keep the Service informed of actions that minimize or avoid adverse effects or that benefit listed species or their habitats, the Service requests notification on implementation of any conservation recommendations.