CHAPTER 3

3.1 SPECIES NARRATIVE – Bull Trout

Endangered Species Act Status

Bull trout are currently listed throughout their range in the coterminous United States as a threatened species (USDI 1999). Two distinct population segments (DPS) occur in Montana, the Upper Columbia DPS and the St. Mary-Belly DPS.

Critical habitat has been proposed for bull trout for the Columbia River, and Saint Mary-Belly River recovery units (USDI 2010). There are three critical habitat units located in Montana: (1) Clark Fork River Basin with 5,332.1 km (3,313.2 mi) of streams and 119,473.5 ha (295,225.5 ac) of lakes/reservoirs (note that a portion of the Clark Fork River Basin is in northern Idaho); (2) Kootenai River Basin with 587.0 km (364.7 mi) of streams and 12,089.2 ha (29,873.1 ac) of lakes/reservoirs; and (3) Saint Mary River Basin with 116.8 km (72.6 mi) of streams and 2,555.4 ha (6,314.5 ac) of lakes/reservoirs.

Species Description

[The following species description was excerpted from three sources: (1) a US Fish and Wildlife Service (FWS) Biological Opinion for the Effects to Bull Trout from the Implementation of Proposed Actions Associated with Plan of Operation for the Revett RC Resources Inc., Rock Creek Copper/Silver Mine (USDI 1998a); (2) the guidance document for federal agencies to use when assessing the effects of their actions on bull trout (*A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale;* USDI 1998b); and (3) the bull trout Species of Special Concern page on the Montana Chapter of the American Fisheries Society website.]

Bull trout are in the family *Salmonidae*, genus *Salvelinus* (chars), which also includes brook trout, *S. fontinalis*, and lake trout *S. namaycush*. Bull trout *S. confluentus*, have an elongated body, somewhat rounded and slightly compressed laterally, and covered with cycloid scales numbering 190-240 along the lateral line. The mouth is large with the maxilla extending beyond the eye and with well-developed teeth on both jaws and head of the vomer bone (none on the shaft). Bull trout have 11 dorsal fin rays, 9 anal fin rays, and the caudal fin is slightly forked. Although they are often olive green to brown with paler sides, color is variable with locality and habitat. Their spotting pattern is easily recognizable, showing pale yellow spots on the back, and pale yellow, orange, pink, or red spots on the sides. Bull trout fins are often tinged with yellow or orange, while the pelvic, pectoral, and anal fins have white leading margins. Bull trout have no black markings on the dorsal fin and no halos around their spots, which is useful in distinguishing them from brook trout (*S. fontinalis*).

Prior to 1980, bull trout and Dolly Varden (*S. malma* Girard) were considered a single species *S. malma* (Walbaum). In 1980, the American Fisheries Society recognized bull trout *S. confluentus* and Dolly Varden as distinct species (Cavender 1978). Bull trout are found mostly inland and Dolly Varden are found primarily in coastal drainages. Though separation of the two species

based on phenotypic characteristics may be difficult (i.e., similarity of appearance), recent genetic analyses have supported the distinction between the two fishes.

Current known range in the United States and Canada

Bull trout are found throughout the northwestern United States and in British Columbia and Alberta in western Canada (Rieman and McIntyre 1993; USDI 2002a). Within Montana and Alberta, Canada bull trout also exist in the headwaters of the South Saskatchewan River basin and further north in drainages along the east side of the Continental Divide. The St. Mary River in the Saskatchewan basin, draining north into Canada, contains the only bull trout population east of the continental divide in Montana (and the United States). In the Klamath River basin, only isolated, resident bull trout are found in higher elevation headwater streams of the Upper Klamath Lake, Sprague River, and Sycan River watersheds (Goetz 1989; Light et al. 1996). In the state of Washington, bull trout are found in coastal drainages of the Olympic Peninsula and in streams surrounding Puget Sound (USDI 2004a). In Montana, bull trout occur in the headwaters of the Columbia River basin in the Clark Fork and the Kootenai subbasins. Within the Clark Fork subbasin of western Montana and northern Idaho, the Draft Bull Trout Recovery Plan (USDI 2002c) describes 38 bull trout core areas (now 35 core areas, memorandum to the ARD, Ecological Services, Region 1, Portland, OR, from Field Supervisor, Montana Ecological Services, Helena, MT., July 14, 2006) and at least 152 local populations. Within the Kootenai subbasin, four core areas and ten local populations are described (USDI 2002d).

Life History

Two distinct life-history types, migratory and resident, occur throughout the range of bull trout (Pratt 1992; Rieman and McIntyre 1993). Migratory bull trout live in natal tributaries for several years before moving to larger rivers (fluvial form), lakes (adfluvial form), or the ocean (amphidromous) to mature (USDI 2002b). Migratory forms return to natal tributaries to spawn (USDI 2002b). Migratory bull trout may use a wide range of habitats ranging from first to sixth order streams and varying by season and life stage. Resident populations often live in small headwater streams where they spend their entire lives (Thurow 1987; Goetz 1989).

Most bull trout spawning occurs between late August and early November (Pratt 1992; USDI 2002b). They may spawn each year or in alternate years (Fraley and Shepard 1989). Eggs hatch in winter or early spring, and alevins may stay in the gravel for extended periods, typically emerging in April. Growth is variable in different environments, but first spawning usually occurs after age four, and the fish may live ten or more years (Pratt 1992; Rieman and McIntyre 1993). Although spawning typically occurs in second to fifth order streams, juveniles may move upstream or downstream of reaches used by adults for spawning, presumably to forage in other accessible waters (Fraley and Shepard 1989; Ratliff 1992). Seasonal movements by adult bull trout may range up to 186 miles (300 kilometers) as migratory fish move from spawning and rearing areas into over-winter habitat in large lakes or rivers in the downstream reaches of large basins (Bjornn and Mallet 1964; Fraley and Shepard 1989).

Habitat Requirements

Bull trout are sensitive to environmental disturbance at all life stages, and have very specific habitat requirements. Bull trout growth, survival, and long-term population persistence appear to

be dependent upon five habitat characteristics: water temperature, substrate composition, migratory corridors, channel stability and cover (Rieman and McIntyre 1993). Cover includes undercut banks, large woody debris, boulders, and pools that are used as rearing, foraging and resting habitat, and protection from predators (Fraley and Shepard 1989; Watson and Hillman 1997). Deep pools also help moderate stream temperatures, offering refuge from warmer water temperatures during summer low-flow conditions. Stream temperatures and substrate types are especially important to bull trout.

Temperature

Bull trout are relatively intolerant of warm water and are typically associated with the coldest stream reaches within basins they inhabit (Craig 2001; Selong et al. 2001). The most heavily populated reaches in several Oregon streams seldom exceed 59° F (15° C) (Buckman et al. 1992; Ratliff 1992; Ziller 1992). Cold-water temperatures are required for successful bull trout spawning. Many studies report water temperatures near 50° F (10° C) during the onset of spawning (Riehle et. al.1997; Chandler et al. 2001). Bull trout spawning typically occurs in areas influenced by ground water (Allan 1980; Shepard et al. 1982; Fraley and Shepard 1989; Ratliff 1992). In Montana's Swan River drainage, bull trout spawning site selection occurs primarily in stream reaches directly influenced by ground water upwelling or directly downstream from upwelling reaches (Baxter et al. 1999; Baxter and Hauer 2000). Cold water upwellings may moderate warmer summer stream temperatures (Bonneau and Scarnecchia 1996; Adams and Bjornn 1997) and extreme winter cold temperatures, which can result in anchor ice.

Cold water temperature also influences the development of embryos and the distribution of juveniles (Fraley and Shepard 1989; Saffel and Scarnecchia 1995; Dunham and Chandler 2001). Selong et al. (2001) report the predicted ultimate upper incipient lethal temperature for age-0 bull trout during 60-day lab trials to be 69.6° F (20.9° C) and peak growth to occur at 55.8°F (13.2° C). Goetz (1994) reports juvenile bull trout in the Cascade Mountains were not found in water temperatures above 53.6° F (12° C).

Substrate composition

Bull trout are more strongly oriented to the stream bottom and substrate than most other salmonids (Pratt 1992). Substrate composition has been repeatedly correlated with bull trout occurrence and abundance (Rieman and McIntyre 1993; Watson and Hillman 1997; Earle and McKenzie 2001) as well as selection of spawning sites (Graham et al. 1981; Boag and Hvenegaard 1997). Bull trout are more often found in areas with boulder and cobble substrate rather than areas of finer bed material (Watson and Hillman 1997).

Preferred spawning habitat includes low gradient reaches of mountain valley streams with loose, clean gravel and cobble substrate (Fraley and Shepard 1989; Reiser et al. 1997; MBTSG 1998; USDI 2002b). Fine sediments fill spaces between the gravel needed by incubating eggs and fry, lowering incubation survival and emergence success (Everest et al. 1987, USDI 2002a). If fine sediment is deposited into interstitial spaces during incubation, it can impede the movement of water through the gravel, lowering the levels of dissolved oxygen as well as inhibiting the removal of metabolic waste (MBTSG 1998). Because bull trout eggs incubate about seven months (e.g., mid-September to mid-April) in the gravel, they are especially vulnerable to fine sediment accumulation and water quality degradation (Fraley and Shepard 1989). Some

embryos can incubate and develop successfully but emerging fry can be trapped by fine sediment and entombed (MBTSG 1998).

Juveniles are similarly affected, as they also live on or within the streambed cobble (Pratt 1984). The accumulation of sediment leads to a reduction in pool depth and interstitial spaces, as well as causing channel braiding or dewatering (Shepard et al. 1984; Everest et al. 1987). Substrate interstices also provide important over-wintering cover (Goetz 1994; Jakober 1995). Sub adults and adults tend to occupy deep pools with boulder-rubble substrate and abundant cover (MBTSG 1998).

Migratory corridors

Migratory bull trout ensure regular interchange of genetic material between local populations within core areas (USDI 2002a), and may facilitate genetic interchange among core areas on an evolutionary time scale (Whitesel et al. 2004), thereby promoting genetic variability. Intact migratory corridors also allow for the potential re-establishment of extirpated local populations (USDI 2002b). Many populations of migratory bull trout have been restricted or eliminated due to stream habitat alterations, including seasonal or permanent obstructions, detrimental changes in water quality, increased temperatures, and the alteration of natural stream flow patterns. Migratory corridors tie seasonal foraging, migrating and overwintering habitat (USDI 2002a, 2002b) to spawning and rearing habitat (USDI 2002a, 2002b) for anadromous, adfluvial, and fluvial forms. Such corridors could potentially allow for dispersal of resident forms for re-colonization of recovering habitats (Rieman and McIntyre 1993), though evidence indicates that resident fish are naturally less likely to disperse (Nelson et al. 2002). Dam and reservoir construction and operation have altered major portions of migratory bull trout habitat throughout the Columbia River Basin (USDI 2002a, 2002b, 2002c, 2002d, 2005a). Dams without fish passage create barriers to fluvial and adfluvial bull trout which isolates populations. Dams and reservoirs alter the natural hydrograph, thereby affecting forage, water temperature, and water quality (USDI 1999). In addition, reservoirs sometimes do not contain suitable bull trout habitat during portions of the year when temperature or other factors may be limiting (USDI 2002b, 2002c, 2005a).

Channel stability and stream flow

Bull trout are exceptionally sensitive to activities that directly or indirectly affect stream channel integrity. Juvenile and adult bull trout frequently inhabit areas of reduced water velocity, such as side channels, stream margins, and pools. These areas can be eliminated or degraded by management activities (Rieman and McIntyre 1993). Bull trout also are sensitive to activities that alter stream flow. Incubation to emergence may take up to 200 days during winter and early spring. The fall spawning period and strong association of juvenile fish with stream channel substrates make bull trout vulnerable to flow pattern changes and associated channel instability (Fraley and Shepard 1989; Pratt 1992; Pratt and Huston 1993; Rieman and McIntyre 1993).

Patterns of stream flow and the frequency of extreme flow events that influence substrate are important factors in population dynamics (Rieman and McIntyre 1993). Due to the embryos and juveniles close association with the substrate, bull trout may be particularly vulnerable to flooding and channel scour associated with rain-on-snow events common in some parts of the range (Rieman and McIntyre 1993). Channel dewatering and bed aggradation also can block access for spawning fish.

Cover

All life history stages of bull trout are associated with complex forms of cover related to large woody debris, undercut banks, boulders and pools (Fraley and Shepard 1989; Goetz 1989; USDI 2002a). Young-of-the-year bull trout tend to use areas of low velocity such as side channels, staying close to substrate and submerged debris (Rieman and McIntyre 1993). Juveniles live close to undercut banks, coarse rock substrate and woody debris in the channel (Pratt 1984; Goetz 1991; Pratt 1992). Adult fish use deep pools with boulder-rubble substrate, undercut banks and areas with large woody debris (Pratt 1984, 1985; MBTSG 1998; USDI 2002a and 2002b). Cover also plays an important role to spawning bull trout by protecting the adults from disturbance or predation as well as providing security (MBTSG 1998). Large migratory bull trout typically spawn in small streams during low flow periods, the combination making them exceptionally vulnerable to humans and other predators. Jakober et al. (1998) observed bull trout over-wintering in deep beaver ponds and pools containing large woody debris in the Bitterroot River drainage, and suggested that suitable winter habitat may be more restrictive than summer habitat.

Population Dynamics

Population size

Bull trout have declined in overall range and numbers of fish. Though still widespread, there have been numerous local extirpations reported throughout the Columbia River basin (Thomas 1992; Goetz 1994; USDI 2002b). The FWS recognized 121 bull trout core areas; with consolidation of four core areas, this number is now 118 within the coterminous US range (USDI 2002b). Due to the high concentration of isolated populations in headwaters lakes, a significant portion of those core areas (35) are located in a single sub-basin in western Montana and northern Idaho. The ensuing baseline and effects analysis uses the core area and its component local populations as the unit of biological organization (USDI 2002b) to demonstrate the influences of conservation practice activities on population persistence at several scales.

A core area incorporates "bull trout populations with the demographic characteristics needed to ensure their persistence and with the habitat needed to sustain those characteristics" (Rieman and McIntyre 1993). The concept of establishing core area for the purposes of bull trout conservation is reflected in the scientific literature (e.g., Rieman and McIntyre 1993; MBTSG 1998; Morita and Yamamoto 2002; Frissel et al. 1993). Further, considerable specific information on bull trout presence, population status, migratory behavior, spawning behavior, and habitat relationships has been developed since the 1998 listing action (USDI 2002b, Whitesel et al. 2004, USDI 2005a). This scientific literature suggests that core areas do not contribute equally to regional persistence of bull trout due to broad differences between local populations that result from variable habitat quality and population characteristics in individual watersheds within a core area. Core areas that have large, stable bull trout populations and high quality habitat are the primary sources for re-colonization if other areas fail, and are the mainstay to ensure a high probability of persistence despite deterministic and stochastic threats. In terms of management, it is these "stronghold" core areas where conservation should be emphasized (Rieman and McIntyre 1993). In other core areas, the likelihood of persistence is not as strong and the probability of persistence is less than desired. The latter may require more intensive management and monitoring to ensure that desirable demographic and habitat characteristics are protected, enhanced, or restored (Rieman and McIntyre 1993). The Lower Clark Fork Core Area

falls into this latter category of needing intensive management to reach recovery goals as evidenced by the major threat to connectivity caused by three dams and the extensive efforts to provide artificial fish passage at all three (Thompson Falls, Noxon Rapids, and Cabinet Gorge).

As a result of the availability of new information, as well as a reconsideration of the scientific literature, the Draft Bull Trout Recovery Plan (USDI 2002b) defined core areas and their local populations as the population units most appropriate for the purposes of assessing the current status of bull trout and tracking progress towards recovery.

To evaluate the current status of bull trout distribution and abundance for the five-year review, the FWS analyzed the most recent information on bull trout relative to core areas and local populations (USDI 2005a).

Some core areas are considered at inherently higher risk of extirpation from naturally occurring or human-caused events, especially where the core areas are:

1. Unlikely to be re-established by individuals from another core area (i.e., functionally or geographically isolated from other core areas);

2. Limited to a single spawning area (i.e., spatially restricted); and either

3. Characterized by low individual or spawning numbers; or

4. Primarily of a single life-history form.

For example, a core area that is isolated in a small watershed upstream of an impassable waterfall (e.g., several in Glacier National Park) would be considered at elevated risk of extirpation from naturally occurring events, especially if the core area had low numbers of fish with little available spawning habitat. In such cases, an event such as a fire or flood affecting the spawning area could eliminate bull trout from the core area, and the impassable waterfall would prevent re-establishment from fish downstream. However, a core area residing downstream of the waterfall might not be considered at the same level of risk of extirpation from naturally occurring events because there would be potential for immigration of fish from adjacent core areas either upstream or downstream.

In the process of reviewing information relative to the bull trout listing process, the status of core areas (previously called subpopulations in the listing process) was based on modified criteria of Rieman et al. (1997), including the abundance, trends in abundance, and the presence of multiple life history forms. In the listing, the FWS considered a “core area” (i.e., subpopulation) “strong” if 5,000 individuals or 500 spawn adults likely occurred in the subpopulation, abundance appeared stable or increasing, and multiple life-history forms were likely to persist. The FWS considered a subpopulation “depressed” if less than 5,000 individuals or 500 spawn adults likely occurred in the subpopulation, abundance appeared to be declining, or a life-history form historically present had been lost. The complete review of this evaluation is found in a status summary compiled by the FWS (USDI 1998c).

Based on abundance, trends in abundance, and the presence of life-history forms, bull trout were considered strong in 13% of the occupied range in the interior Columbia River basin (Quigley

and Arbelbide 1997). Using various estimates of bull trout range, Rieman et al. (1997) estimated that bull trout populations were strong in 6% of the sub-watersheds in the Columbia River basin. Bull trout declines have been attributed to the effects of land and water management activities, including forest management and road building, mining, agricultural practices, livestock grazing (Meehan 1991; Frissell 1993), isolation and habitat fragmentation from dams and agricultural diversions (Rode 1990; Jakober 1995), fisheries management practices, poaching and the introduction of non-native species (Rode 1990; Bond 1992; Donald and Alger 1993; Leary et al. 1993; Pratt and Huston 1993; Rieman and McIntyre 1993; MBTSG 1998; USDI 2002b and 2002c; Fredenberg 2002a).

Population variability

Distribution of existing bull trout populations is often patchy even where numbers are still strong and habitat is in good condition (Rieman and McIntyre 1993, 1995). It is unlikely bull trout occupied all of the accessible streams within the range at any one time. The number of bull trout within a population can vary dramatically both spatially and temporally. Redd (a gravel nest constructed by adult spawning bull trout where eggs are deposited) counts are commonly used to assess population trends. Existing long-term redd count data indicate a high degree of variability within and between populations (Rieman and McIntyre 1996, USDI 2002b, USDI 2005a). Habitat preferences or selection is likely important (Rieman and McIntyre 1995; Dambacher and Jones 1997; Baxter and Hauer 2000), but more stochastic extirpation and colonization processes may influence distribution even within suitable habitats (Rieman and McIntyre 1995).

Population stability

The best available information indicates that bull trout are in widespread decline across their historic range (USDI 1998b) and are characterized by numerous, often reproductively isolated core areas in the Columbia River basin with evidence of recent local extirpations (Rieman et al. 1997; USDI 2002b). The largest contiguous areas supporting bull trout are in central Idaho and western Montana. Many bull trout core areas are characterized by declining trends, but a few are increasing and in most the status is unknown (USDI 2005a).

The viability of functioning core areas for bull trout depend on the habitat quality and population characteristics of the multiple local populations that comprise the core area. Rieman and McIntyre (1993) reported that the extinction rate of small local populations was high when testing hypothetical populations during a 30-year timeframe and increased fivefold when migrating bull trout were restricted to low numbers. It appeared the more isolated and independent the local population, the higher the risk of extinction. In contrast, even with moderate amounts of immigration (i.e., connectivity) to local population, the risk of extinction was one-fourth as high in these connected environments. Some populations will be stable and more robust, and may act as “sources” while other less stable and less robust populations may act as “sinks.” Further, these roles may reverse at different times (Rieman and McIntyre 1993).

Some local populations will persist in habitat conditions that are less than optimal. In these cases, Rieman and McIntyre (1993) propose that managers create core areas so that any seriously degraded local population could be re-colonized from other core areas (i.e., opportunities should exist within larger river basins that allow some natural connection whenever possible). The Lower Clark Fork core area is such a case, where re-colonization is possible from a healthy bull

trout population in the Lake Pend Oreille core area downstream; a result of re-establishing connectivity by artificial fish passage at the three dams on the lower Clark Fork River.

What is evident is that the stability of a range-wide population of bull trout depends on protecting those habitats in the best condition with the strongest populations. Fragmentation and disruption of bull trout habitat will increasingly isolate local populations and life history forms, thus reducing survival, growth, and resilience of individual local populations. As long as there are multiple, robust local populations to support several widely distributed healthy functioning core areas within the range of bull trout, the higher the likelihood bull trout will be able to survive catastrophic events, normal environmental variation, and the effects of human activities (Rieman and McIntyre 1993), including local fragmentation and disruption.

Population structure

Whitesel et al. (2004) noted that although there are multiple resources that contribute to the subject, Spruell et al. (2003) best summarized genetic information on bull trout population structure. Spruell et al. (2003) analyzed 1,847 bull trout from 65 sampling locations; four located in three coastal drainages (Klamath, Queets, and Skagit Rivers), one in the Saskatchewan River drainage (Belly River), and 60 scattered throughout the Columbia River Basin. They concluded that there is a consistent pattern among genetic studies of bull trout, regardless of whether examining allozymes, mitochondrial DNA, or microsatellite loci. Typically, the genetic pattern shows relatively little genetic variation within populations, but substantial divergence between populations. Microsatellite loci analysis supports the existence of at least three major genetically differentiated groups (or lineages) of bull trout (Spruell et al. 2003).

They were characterized as:

1. "Coastal", including the Deschutes River and all of the Columbia River drainage downstream, as well as most coastal streams in Washington, Oregon, and British Columbia. A compelling case also exists that the Klamath Basin represents a unique evolutionary lineage within the coastal group.

2. "Snake River", which also included the John Day, Umatilla, and Walla Walla Rivers. Despite close proximity of the John Day and Deschutes Rivers, a striking level of divergence between bull trout in these two systems was observed.

3. "Upper Columbia River" which includes the entire basin in Montana and northern Idaho. A tentative assignment was made by Spruell et al. (2003) of the Saskatchewan River drainage populations (east of the continental divide), grouping them with the upper Columbia River group.

Spruell et al. (2003) noted that within the major assemblages, populations were further subdivided, primarily at the level of major river basins. Taylor et al. (1999) surveyed bull trout populations, primarily from Canada, and found a major divergence between inland and coastal populations. Costello et al. (2003) suggested the patterns reflected the existence of two glacial refugia, consistent with the conclusions of Spruell and the biogeographic analysis of Haas and McPhail (2001). Both Taylor et al. (1999) and Spruell et al. (2003) concluded that the Deschutes River represented the most upstream limit of the coastal lineage in the Columbia River Basin.

Status and Distribution

Historic and current distribution

The historic range of bull trout was restricted to North America (Cavender 1978; Haas and McPhail 1991). Bull trout were historically recorded from the McCloud River in northern California, the Klamath River basin in Oregon and throughout the Columbia River basin in much of interior Oregon, Washington, Idaho, northern Nevada, and western Montana. They also occurred in coastal and interior Canada in much of British Columbia, with populations extending along the east slopes of the Rockies in Alberta and including a small area in northern Montana (Rieman et al. 1997).

Bull trout distribution has probably contracted and expanded periodically with natural climate variation (Williams et al. 1997). Genetic variation (presence of unique alleles) suggests an extended and evolutionarily important isolation between populations in the Klamath basin and those in the Columbia River basin (Leary et. al. 1993). Populations within the Columbia River basin are more closely allied, and are thought to have expanded from, at least two common glacial refugia in recent geologic time (Williams et al. 1997; Haas and McPhail 2001; Whitesel et al. 2004).

Despite current bull trout presence across a major portion of the historically potential range, many areas presently support only remnant populations. Bull trout were reported present in 36% and unknown or unclassified in 28% of the sub-watersheds within the potential historic range. Strong populations were estimated to occur in only 6% of the potential historic range (Rieman et al. 1997). Bull trout are now extirpated in California and only remnant populations are found in portions of Oregon (Ratliff and Howell 1992). A small population still exists in the headwaters of the Jarbidge River, Nevada, which represents the present southern limit of the species' range.

Though bull trout may move throughout entire river basins seasonally, spawning and juvenile rearing are restricted to the coldest streams or stream reaches. The downstream limits of habitat used by bull trout are strongly associated with gradients in elevation, longitude, and latitude (Dunham and Rieman 1999), which likely approximate a gradient in climate across the basin (Goetz 1994). The patterns indicate that spatial and temporal variation in climate may strongly influence habitat occupancy by bull trout. While temperatures are probably suitable throughout much of the northern and mountainous portions of the range, predicted spawning and rearing habitat are restricted to increasingly isolated high elevation or headwater "islands" toward the south (Goetz 1994; Rieman and McIntyre 1995).

Status of bull trout in the Columbia River Basin

Range-wide, local populations of bull trout within their respective core areas are often isolated and remnant. Migratory life histories have been lost or limited throughout major portions of the range (Ratliff and Howell 1992; Pratt and Huston 1993; Rieman and McIntyre 1993, 1995; Goetz 1994; Jakober 1995; MBTSG 1998; USDI 2002b; USDI 2005a) and fluvial bull trout populations in portions of the upper Columbia River basin appear to be nearly extirpated (USDI 2002b, 2005a). While bull trout remain widely distributed throughout the Columbia River basin, declines in abundance and local extinctions continue, as well as fragmentation, and isolation of (unoccupied) high-quality habitats (Lee et al. 1997; Rieman et al. 1997); strong or protected populations are less common (Rieman et al. 1997). This isolation places the remaining

populations at increased risk of extinction (Rieman and McIntyre 1993; Lee et al. 1997). Continued loss of habitat associated with detrimental land use practices further threatens remaining bull trout populations (Rieman et al. 1997). In addition, close association with cold stream temperatures increases the likelihood of continued habitat loss and population fragmentation due to climate change, leading to local extinctions (Rieman et al. 2007).

In Montana, while bull trout remain widely distributed throughout their historic range, abundance and distribution have continually declined over the past century (Everman 1892; Thomas 1992; MBTSG 1995a-e; MBTSG 1996a-f; Peters 1990; Weaver 1997). A summary of the status and trend for bull trout core areas that occur primarily on non-federal lands is provided in Appendix A.

Threats

Factors contributing to declines of bull trout populations include habitat degradation and loss due to land and water management practices; isolation and fragmentation of populations by both structural (e.g., dams) and environmental (e.g., thermal or pollution) barriers; introduction of non-native fishes resulting in competition, predation and hybridization threats; historical eradication efforts; poisoning to remove non-game species; historical overharvest; and ongoing poaching and accidental harvest due to misidentification (Fraley and Shepard 1989; Meehan and Bjornn 1991; Bond 1992; Ratliff 1992; Leary et al. 1993; MBTSG 1995a-e; Long 1997; Riehle et al. 1997; Donald and Stelfox 1997; Schmetterling and Long 1999). Historically, bull trout were often viewed as a nuisance species due to their predaceous habits, including being targeted for eradication with bounties, and were fished commercially with nets on Flathead Lake in the early 1900's (Brown 1971; Leary et al. 1993). Concerns over their decline, along with accompanying efforts at protection, began to be raised in the 1950's (Brown 1971; Fraley 1994). Bull trout are now viewed as an important indicator species for environmental disturbance, due to their specific requirements for spawning and rearing habitat and general sensitivity of each life history stage (Fraley and Shepard 1989).

Loss of the migratory life history, especially where bull trout populations have become isolated in headwater lakes or stream reaches, further threatens the species' recovery. Small, isolated populations face increased extirpation risks as a result of direct impacts of habitat alteration, random demographic and environmental variation, and genetic isolation (Goetz 1989; Rieman and McIntyre 1993).

Common predators and competitors of juvenile bull trout are larger bull trout and introduced fish species of the same genus, namely lake trout (Fredenberg 2002a) and brook trout (Pratt and Huston 1993; Rieman and McIntyre 1993). Other piscivorous species such as brown trout, northern pike, and walleye are also considered potential threats in some core areas (USDI 2002a, 2002b, 2002c and 2005a). Disease is not believed to be a major factor in the long-term health and survival of bull trout populations (USDI 1999), although whirling disease has been detected in wild bull trout (USDI 2005a) and may have unpredictable effects on fish communities.

Hybridization with brook trout poses a threat to the persistence of isolated or remnant populations. These hybrids are likely to be sterile and may experience developmental problems, but could play a role in eliminating local populations of bull trout (Leary et al. 1993; Rieman and

McIntyre 1993; USDI 2005a). The degree of hybridization, other interactions, and distribution of the two species is likely influenced by habitat condition (Rieman and McIntyre 1993). Bull trout are rare, if present at all, in many streams supporting large numbers of brook trout (Buckman et al. 1992; Ziller 1992; Rich 1996). Rich (1996) found brook trout occupied more degraded stream reaches than bull trout. Leary et al. (1993) documented a shift in community dominance from bull trout to brook trout in Lolo Creek, Montana, and expected the trend to continue until bull trout are displaced from the stream. Habitat degradation appears to give brook trout a competitive advantage over bull trout in streams where water temperature and/or sediment levels increase.

Management

Several studies report genetic divergence between local bull trout populations at the geographic scale of adjacent tributaries (Leary et al. 1993; Kanda et al. 1997; Spruell et al. 1999; Taylor et al. 1999). Based on similar patterns of population genetic structure in steelhead, Parkinson (1984) suggested that populations in geographically adjacent streams be managed as separate stocks.

Because of their opportunistic feeding habits and late maturity, bull trout are vulnerable to overharvest, poaching or accidental harvest, especially during migrations in tributaries (Leathe and Enk 1985; Long 1997; Schmetterling and Long 1999; Carnefix 2002). Some Montana bull trout populations (e.g., Swan, South Fork Flathead, Kootenai, Flathead and Blackfoot) have responded well to more restrictive angling regulations or closures, and initial conservation efforts in Montana focused on such measures. The first minimum length limit was imposed in 1951 (Long 1997). By 1981, eight of 33 major North and Middle Fork Flathead River spawning tributaries were closed to fishing, and an 18-inch minimum size limit established in the rivers and Flathead Lake to reduce harvest of sub-adult fish (Fraley et al. 1981). Regulations closing all state waters except Swan Lake and Hungry Horse Reservoir to intentionally fishing for and/or harvesting bull trout became effective in 1993. Harvest is currently permitted only in Swan Lake, Hungry Horse Reservoir, and Lake Koocanusa (the latter under Section 10 (a) experimental permit). Some level of poaching (Swanberg 1996; Long 1997) and accidental harvest due to misidentification (Schmetterling and Long 1999) probably continues to impact bull trout populations, but is difficult to detect, quantify, prosecute or prevent. Recent efforts to reduce misidentification include a Bull Trout Identification and Education webpage at the Montana Fish Wildlife and Parks (FWP) website.

The state of Montana began development of a bull trout restoration plan in 1993. The final plan, published in June 2000, identifies 115 bull trout core areas and connecting "nodal habitat" within 12 Restoration or Conservation Areas (RCA); sets goals, objectives and criteria for restoration; outlines actions to meet those criteria; and establishes a structure to monitor implementation and evaluate effectiveness of the plan. The stated goal of the plan is "to ensure the long-term persistence of complex (i.e., all life histories represented), interacting groups of bull trout distributed across the species' range and manage for sufficient abundance within restored RCA to allow for recreational utilization" (MBTRT 2000).

With "threatened" status under ESA (USDI 1999), FWS was charged with developing a Federal recovery plan and designation of critical habitat. A draft Recovery Plan was built upon the

foundation of state restoration plans (USDI 2002b-d; http://www.fws.gov/pacific/bulltrout), and critical habitat has been designated (USDI 2005c; http://www.fws.gov/pacific/bulltrout). The draft Recovery Plan covers the Klamath basin, Columbia River and St. Mary-Belly River "distinct population segments" (DPS). The draft Recovery Plan and designated critical habitat are organized hierarchically by "local populations" within "core areas" within "recovery subunits" within 24 "recovery units" within three (of five) designated DPSs. Ten local populations within four core areas have been identified within the Kootenai River Recovery Unit in Montana. About 119 local populations distributed among 36 core areas within three Recovery Subunits (Flathead, Upper and Lower Clark Fork) are identified within Montana in the Clark Fork Recovery Unit. Nine local populations within six core areas are identified within Montana in the St. Mary-Belly River Recovery Unit. Critical habitat designation is completed only for the Klamath and Columbia River, and St. Mary-Belly DPSs. Critical habitat is limited to the bankfull stream channel width within designated stream segments, and excludes habitat within existing approved Habitat Conservation Plans (HCP) with bull trout "incidental take" permits. In Montana, 1,703 stream km (1,058 mi) and 12,916 lake/reservoir ha (31,916 ac) are designated as critical habitat, most of which occurs on private lands.

The FWS proposed a voluntary remand of the 2005 final rule designating bull trout critical habitat, which was subsequently directed by court order on July 1, 2009. United States District Court Judge Robert E. Jones ruled (Oregon US District Court Case Number 3:04-cv-01813-JO):

1. Defendants' Motion for Voluntary Remand is Granted on the terms set forth herein and the final critical habitat designation challenged in this litigation is remanded to defendants for further consideration and evaluation;
2. On or before December 31, 2009, defendants shall submit a proposed revised critical habitat designation to the Federal Register for publication;
3. On or before September 30, 2010, defendants shall submit a final decision concerning the proposal referenced in paragraph (2) to the Federal Register for publication;
4. ***The existing critical habitat designation shall remain in full force and effect*** pending the issuance of the final decision referenced in paragraph (3);
5. Defendants shall file a status report on August 31, 2009, and every 60 days thereafter, advising the court as to defendants' progress toward completing the final critical habitat rule (paragraph's 6 and 7 not germane, and therefore omitted).

Given Judge Jones' ruling that the "existing critical habitat designation shall remain in full force and effect", and statement of the 2002 Draft Critical Habitat proposal "being an excellent starting point", the following effects determination will adhere to the existing principle critical elements (PCE). Pending completion of the critical habitat review and decisions forthcoming from that process, some modifications to the principle critical elements are also anticipated. It is most likely that the spatial extent of designated critical habitat in the upcoming final rule will more closely reflect that in the 2002 proposed rule (USDI 2002a). Regardless, the spatial extent of critical habitat designated will not influence the effects determination, and the basic structure of PCEs is not expected to change appreciably, except in response to new biological information that causes refinement within an individual PCE. Therefore, little is expected change for the following effects determination by the remand.

3.2 ENVIRONMENTAL BASELINE

The environmental baseline for bull trout was completed using the matrix of diagnostics, pathways and indicators in the USDI (1998a) **A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale**.

There are two primary pathways that human activities may threaten bull trout including the subpopulation (generally equates to a 5th level Hydrologic Unit Code [HUC]) and the habitat upon which the fish depend (assessed at the 6th HUC within which a project is proposed). Specific indicators under each pathway are described in USDI (1998a; and see *bulltrout_matrix_pathway_indicators_100109.xls*); an integrated species-habitat pathway is also described that incorporates those indicators deemed to have a synergistic influence most critical to persistence of a bull trout subpopulation within a watershed.

The matrix of diagnostic indicators was completed for each practice group described below in Direct and Indirect Effects Analysis, for 6th HUC sub-watersheds with predominantly private lands (i.e., >50% non-federal). Completing the matrix will not be necessary for implementing practices with a *Not Likely to Adversely Affect determination* (NLAA). An underlying assumption is that implementing NRCS conservation practices (i.e., NLAA) will improve the respective indicator, or in the least remain neutral, to the existing baseline condition. Where unavoidable adverse impacts may occur to bull trout or adverse modification of designated critical habitat, for a particular conservation practice, this is accomplished by requiring adherence to conservation measures described in Appendix D. A modification required for NRCS use of the matrix included changing “Riparian Conservation Area” to “Riparian Area Condition”. This was necessary given that NRCS is not a land management agency, and cannot dedicate a land use allocation on private lands. In addition, four columns were added to the matrix to document the overall effect for a practice group (i.e., restore, maintain, or degrade) on an indicator, as well as whether implementation of the practices comply with an NRCS aquatic conservation strategy (see below).

An NRCS version of the environmental baseline was completed with several modifications to the original version developed by Region 1 US Forest Service, and used to document affects analysis for each conservation practice. An attribute was added to incorporate lands classified as row crop agriculture. The agricultural land classification is assumed to have similar potential adverse affects as for Equivalent Clear-cut Acres. In addition, the original single attribute for Active or Abandoned Mines was expanded to three attributes; those are counts of Number of Abandoned Mines, Number of Surface Mines, and Number of Underground Mines.

The environmental baseline will be used at the project level for the 6th HUC within which the project is located (see sample narratives in Appendix F) when any one practice is determined *May Affect, Likely to Adversely Affect* (LAA) bull trout or designated critical habitat. A summary narrative for the effects analysis and effects determination will be included in the project file as documentation for those practices identified as *Likely to Adversely Affect*.

3.3 DIRECT AND INDIRECT EFFECTS ANALYSIS

Conservation Practices

The impacts of 87 NRCS conservation practices on bull trout are summarized in Appendix C. Table C-1 lists the conservation practices applied primarily on private farm and ranch lands, and non-industrial private timber lands within the range of bull trout in Montana. These practices have been determined to have either a No Effect; a May Affect, Not Likely to Adversely Affect; or a May Affect, Likely to Adversely Affect on bull trout. A complete list and description of Montana's conservation practices can be found in Section IV, Conservation Practices, of the electronic Field Office Technical Guide (eFOTG) at http://efotg.nrcs.usda.gov/treemenuFS.aspx. A brief summary of each practice is provided in the accompanying document Conservation Practice Summary (see *cp_summary_090909.doc*).

For the purposes of this analysis, conservation practices were grouped by similarity of effects into one of five impact categories to bull trout or bull trout critical habitat: I – No Disturbance/habitat modification; II – Disturbance; III – Disturbance/habitat modification; IV – Disturbance/habitat modification/long-term beneficial; and V – Disturbance/habitat modification/detrimental.

Impact Category I – *No Disturbance/habitat modification*
This impact category includes one group of conservation practices deemed "No Effect" and includes:

Group – No Effect
Anaerobic Digester, Controlled Temperature (366)
Forage Harvest Management (511)
Irrigation Water Management (449)
Pest Management (595)
Restoration and Management of Rare and Declining Habitats (643)
Shallow Water Development and Management (646)
Stream Habitat Improvement and Management (395)
Upland Wildlife Habitat and Management (645)
Wetland Wildlife Habitat Management (644)

These practices have No Effect on bull trout or critical habitat because the practices are not implemented in or adjacent to bull trout habitat and are used strictly for planning, design, risk assessment, or habitat evaluation (i.e., no on-the-ground activity). Implementing these conservation practices will not conflict with the aquatic-riparian conservation strategy (see p. 21). Practice 366 addresses planning and design only, requires Montana DEQ permit as described in MT ARM 17.30.1330 regardless of where a digester is located in the watershed; Waste Storage Facility (313) is the facilitating practice. Practices 511 and 449 are entirely assessment and planning practices, and address changing from the current agricultural system to a new Resource Management System with the intent of improving or increasing efficiency of forage production or water use, respectively. Practices 395, 595, 643, 644, 645, and 646 are "umbrella" practices, or those that may incorporate numerous "facilitating" practices analyzed in the following four impact categories.

Impact Category II – *Disturbance*
This impact category includes practices with potential affects to bull trout during implementation by disturbance associated with implementation. These practices may cause a short-term disturbance to, or avoidance of a stream segment, by bull trout in the stream. Nineteen practices in this impact category were grouped by similarity as Access Control, Erosion Control, Riparian, or Upland and Wildlife Habitat.

Generally these practices are intended to stabilize or minimize the amount and extent of bare soil that could result in sediment delivery to stream courses, and restore or improve upland and riparian vegetation. Reducing potential sediment sources and improving vegetation conditions would result in long-term beneficial effects to habitat indicators summarized in Table C-1. Implementation of these practices is not anticipated to be of the scope or magnitude that could result in short-term increase of sedimentation, temperature and or major degradation to any of the habitat indicators. In all cases, only a short-term pulse of sediment delivery to stream channels is anticipated during implementation, and would be expected to be less than that which is already occurring from the site (i.e., a proposed action is result of the site being identified as a sediment source).

These activities are primarily a concern when they occur adjacent to spawning and rearing habitats. In order to avoid the potential for disturbance related effects to bull trout these practices will only occur adjacent to spawning and rearing habitats from May 1 to August 31 (Conservation Measure 1 [CM-1]). The riparian group of practices will require CM-7 (on-site biologist review) to ensure compliance for a not likely to adversely affect determination; mechanical disturbance within the bankfull channel, including placement of structures or riprap will result in a likely to adversely affect determination. No adverse modification of critical habitat is anticipated; reducing erosion and restoring vegetation is expected to result in long-term beneficial effects. Fence construction must adhere to CM-6 to avoid potential ground or surface water contamination.

Group – Access Control
Access Control (472)
Fence (382)
Heavy Use Area Protection (561)

Group – Erosion Control
Conservation Cover (327)
Critical Area Planting (342)
Diversion (362; upland or non-riparian sites, not associated with streams or surface water sources)
Filter Strip (393)
Grade Stabilization Structure (410)
Grassed Waterway (412)
Runoff Management System (570)*
Water and Sediment Control Basin (638)

*See Appendix H

Group – Riparian
Channel Bank Vegetation (322)
Riparian Forest Buffer (391)
Riparian Herbaceous Cover (390)
Stream bank and Shoreline Protection (580)

Group – Upland and Wildlife Habitat
Tree/Shrub Establishment (612)
Tree/Shrub Site Preparation (490)
Windbreak/Shelterbelt Establishment (380)

These practices if installed according to NRCS practice standards and guidelines were determined to have a May Affect, Not Likely to Adversely Affect on bull trout or designated critical habitat. In general, these practices do not occur in bull trout habitat but may occur in riparian areas or uplands within 300 ft of occupied or unoccupied stream zones (see Appendix B, Definitions and Assumptions). Where these practices have the potential to adversely impact bull trout will require modifications during practice implementation (e.g., CM 3; see Table C-1). Implementing these conservation practices, with the identified conservation measures, is not anticipated to be of the scope or magnitude to result in short-term disturbance of bull trout or increase of sediment delivery, temperature and or major degradation to any of the habitat indicators, and will not conflict with the aquatic-riparian conservation strategy. Specific to the group of riparian practices, any use of chemical or mechanical ground disturbance <35 ft from occupied or unoccupied stream zones will require a biologists review (CM-9).

Impact Category III – *Disturbance/habitat modification*
This impact category includes 35 conservation practices grouped by similarity into seven practice groups. These practices have potential to affect bull trout during implementation or by ground disturbance and vegetation alteration associated with implementation. Some practices may cause a short-term disturbance to, or avoidance of a stream segment, by bull trout in the stream (e.g., Forestry and Fire, Ground Disturbance, Waste Treatment). Other practices may affect physical habitat (e.g., Agriculture, Forestry and Fire, Grazing and Rangeland, Ground Disturbance, Water Application, Waste Treatment), or water quality (e.g., Chemical and Organic Applications, Waste Treatment).

Generally these practices are not restorative, and support either agricultural, livestock, or forestry production. For most practices, reducing potential sediment sources and maintaining or improving vegetation conditions would neutralize affects to habitat indicators summarized in Table C-1. In some cases (e.g., 512*, 797*, 338, or 550) long-term benefits to habitat indicators related to temperature, sediment, or riparian vegetation could result when implemented with appropriate conservation measures. Implementing these practices is not anticipated to be of the scope or magnitude to result in short-term increase of sediment delivery, temperature, nor degradation to any of the remaining habitat indicators. Only in the case where spatial extent of row crop agriculture exceeds 50% of a sub-watershed (CEAP 2008), or where conventional tillage occurs <35 ft of streams (INFISH 1995), are major degradation of habitat indicators expected (e.g., water quality, habitat elements, channel condition and dynamics).

*See Appendix H

These activities are primarily a concern when they occur adjacent to spawning and rearing habitats. In order to avoid the potential for disturbance-related effects or direct effects to spawning and rearing habitat, these practices will not occur within stream and riparian management zones (CM-3 and CM-4). One exception is Prescribed Grazing (528) which can result in livestock grazing adjacent to streams. No CM's are necessary with active grazing in riparian pastures adjacent to foraging migrating, or over wintering habitat. The fall timing stipulation in CM-1 will apply to grazing adjacent to spawning and rearing habitat to minimize potential for redd trampling by livestock. Practice 528 is also required when applying 548 and 550, although neither practice is applied in riparian areas. Also, when practice 528 includes riparian pastures, NRCS riparian grazing specifications require 3-5 inch minimum stubble height or not more than 50% utilization, and can include additional riparian objectives when warranted (e.g., stream bank stability objectives); compliance checks are scheduled a minimum of first year, mid-contract, and final year.

In general, concerns for this impact category relate to potential for increases in sediment delivery to streams, increased stream water temperature, chemical contamination or nutrient enrichment, or habitat degradation. Applying CM-3 and CM-4 minimizes potential for sediment delivery, temperature, nutrient, or large woody debris-related affects. While CM-2 meets the requirements of the Montana streamside management zone law (77-5-301 through 307 MCA), it is considered inadequate for this programmatic assessment to meet the insignificant or discountable criteria for a not likely to adversely affect determination for NRCS forestry practices. Requiring CM-7 with no direct wastewater return to streams or blow-off from chemigation with practice 450* minimizes potential for chemical contamination. Potential watershed related-affects from the ground disturbance practices are minimized by applying CM-3, CM-4, as well as CM-5 for practice 560.

Group – Agriculture
Conservation Crop Rotation (328)
Cover Crop (340)
Pasture and Hay Planting (512)*
Range Planting (550)
Residue and Tillage Management, Mulch Till (345)
Residue and Tillage Management, No-Till/Strip Till/Direct Seed (329)
Residue Management, Seasonal (344)

Group – Chemical or Organic Applications
Anionic Polyacrylamide (PAM) Erosion Control (450)*
Herbaceous Weed Control and Management (797)*
Nutrient Management (590)
Waste Utilization (633)

Group – Forestry and Fire
Brush Management (314)
Forest Slash Treatment (384)*
Forest Trails and Landings (655)
Forest Stand Improvement (666)

*See Appendix H

Firebreak (394)
Fuel Break (383)
Prescribed Burning (338)

Group – Grazing and Rangeland
Grazing Land Mechanical Treatment (548)
Prescribed Grazing (528)
Watering Facility (614)

Group – Ground Disturbance
Access Road (560)
Animal Trails and Walkways (575)
Irrigation Land Leveling (464)
Land Smoothing (466)
Obstruction Removal (500)
Spoil Spreading (572)*
Well Decommissioning (351)*

Group – Water Application
Above Ground, Multi-Outlet Pipe (Gated Pipe) (431)*
Irrigation Field Ditch (388)
Irrigation System, Microirrigation (441)
Irrigation System, Sprinkler (442)

Group – Waste Treatment
Vegetated Treatment Area (635)
Waste Storage Facility (313)
Waste Transfer (634)

This impact category includes practices that have the potential to adversely affect bull trout or designated critical habitat, and require modifications to the practice. These practices may disturb individual bull trout or they may result in long-term modifications to bull trout habitat during or following implementation. Therefore, Conservation Measures (Table C -1) must be implemented in order to reach a May Affect, Not Likely to Adversely Affect determination. Implementing these conservation practices, with the identified conservation measures, is not anticipated to be of the scope or magnitude to result in short-term disturbance of bull trout or increase of sedimentation, temperature and or major degradation to any of the habitat indicators, and will not conflict with the aquatic-riparian conservation strategy.

Impact Category IV – *Disturbance/habitat modification/long-term beneficial*
This impact category includes restorative practices that may cause short-term disturbance or habitat modification during implementation, followed by a long-term benefit to bull trout and designated critical habitat. Benefits would include one or more of the following: improved habitat by decreasing water temperatures, increasing complexity, improved water quality, restoration of habitat connectivity, or increased availability of food and water resources. These

*See Appendix H

eight practices are grouped as either In-channel Disturbance or Wetlands. The practice Fish Screen (700) was adopted in 2010 specifically to address fish entrainment at water diversions.

Group – In-channel disturbance
Channel Stabilization (584)*
Fish Passage (396)
Fish Screen (700)
Open Channel (582)
Stream Crossing (578)

Group – Wetlands
Wetland Creation (658)*
Wetland Enhancement (659)
Wetland Restoration (657)

Implementing these conservation practices, with the identified conservation measures, may have short-term adverse affects on bull trout or designated critical habitat, but have no long-term conflicts with the aquatic-riparian conservation strategy. Given the aquatic restoration emphasis of these practices, principle critical elements of designated critical habitat are expected to be functioning appropriately within one bull trout generation. These practices if installed according to NRCS practice standards and guidelines are considered to have a May Affect, Likely to Adversely Affect on bull trout or designated critical habitat, and will require formal consultation. However, the effects determination for the wetland group of practices would be May Affect, Not Likely to Adversely Affect where documentation is provided that the wetland in question has no connectivity to the channel in occupied or unoccupied stream zones; there would be no water withdrawal from occupied or unoccupied streams; and, a natural water source (specific to 657 or 659) or a confined subsurface water source is utilized (specific to 658*).

Impact Category V – *Disturbance/habitat modification/detrimental*
The fifth impact category includes practices that are expected to have long-term adverse affects on bull trout or designated critical habitat. The detrimental effects result from injury or loss of bull trout from the population in water conveyance systems, loss or alteration of habitat from in-stream structures for water developments (i.e., little or no progress toward recovering habitat with replacement of an existing structure), and or the potential to fragment habitat by creating barriers to fish passage. These 17 practices are grouped as Water Conveyance or Water Development.

Group – Water Conveyance
Irrigation Canal or Lateral (320)
Irrigation Water Conveyance, Ditch and Canal Lining, Flexible Membrane (428B)
Irrigation Water Conveyance, Pipeline, Aluminum Tubing (430AA)*
Irrigation Water Conveyance, Pipeline, High Pressure, Underground, Plastic (430DD)*
Irrigation Water Conveyance, Pipeline, Low Pressure, Underground, Plastic (430EE)*
Irrigation Water Conveyance, Pipeline, Steel (430FF)*
Lined Waterway or Outlet (468)*
Pipeline (516)

*See Appendix H

Group – Water Development
Dam, Diversion (348)
Dike (356)
Irrigation Storage Reservoir (436)*
Pond (378)
Pond Sealing or Lining, Flexible Membrane (521A)
Pumping Plant (533)
Spring Development (574)
Structure for Water Control (587)
Water Well (642)

Implementing these conservation practices may have long-term adverse affects on bull trout or designated critical habitat, and may conflict with the NRCS aquatic-riparian conservation strategy. These practices if installed according to NRCS practice standards and guidelines are considered to have a May Affect, Likely to Adversely Affect on bull trout or designated critical habitat, and will require formal consultation. However, it should be noted that in cases where irrigation-related practices (includes practice groups described herein as water development, water conveyance, and under Impact Category III - water application) are planned through an EQIP application, the project must provide for a net increase in water use efficiency of ≥10% or more, where the saved water must remain in the water source (NRCS Manual MT515.81(A)). In such cases, a benefit may result where ≥10% of flow previously diverted is retained in-stream, and would lead to an incremental discharge-related restoration, where multiple projects occur within a watershed.

Two documents elaborate on the water savings requirement for funding under EQIP. Montana NRCS Bulletin MT300-9-10 (updated annually) reaffirms the ≥10% water savings requirement under EQIP in order to qualify for funding. This water savings requirement is further detailed in the Montana Addenda MT-LTP-4, to the EQIP contract required for all irrigation system improvements. This means that for the NRCS-designated lifespan of the practice (e.g., 15-20 years depending on specific practice, or 3-4 bull trout generations) the participant can only withdraw the allotted irrigation volume *minus* the amount saved by the EQIP irrigation improvements, and that the saved water cannot be used elsewhere on land controlled by the participant. In addition, the participant agrees not to use any associated water savings from the EQIP contract to bring new land under irrigation production. "New land" is defined as "land that does not meet the current irrigation history requirement of being irrigated two (2) years out of the previous five (5) years as of the date of the application or land that is not owned or controlled by the participant as of the date of the application." In western Montana, >95% of irrigation system related projects are funded by EQIP (Mark Zuber, NRCS Senior Civil Engineer, personal communication), with the remainder being Conservation Technical Assistance with no federal nexus.

Cumulative Effects Analysis

Cumulative effects 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 assessment. The

*See Appendix H

action area, as defined by the Endangered Species Act what's this (ESA), includes all areas to be affected directly or indirectly by the Federal action and is not limited merely to the immediate area involved in the action [50 CFR 402.02]. This is of particular concern for bull trout given the nature of linear and connected stream habitat. These concerns warranted the definition of occupied versus unoccupied stream zones (see Appendix C – Definitions and Assumptions), and determining connectivity of unoccupied streams and habitat to downstream occupied streams and habitat. Where the latter exists, impacts may not be limited to the immediate area involved in the proposed action, and therefore similar concern for connected but unoccupied streams and habitat. Future federal actions that are unrelated to the proposed action are not considered in cumulative effects analysis because they require separate consultation pursuant to Section 7 of ESA. This latter point is the primary difference from cumulative effects analysis conducted for National Environmental Policy Act (NEPA) environmental analyses (Table 1). Cumulative effects will be evaluated and documented on the consultation summary sheet during the initial planning stages of any NRCS-funded projects.

Non-federal activities on private farm and ranch lands, and non-industrial private timber lands that are reasonably certain to occur, such as crop and hay production, livestock grazing, timber harvest, road building, recreation, or residential development, will continue to contribute to habitat fragmentation, degradation or loss, which may affect bull trout or designated critical habitat. Tourism and recreational angling in Montana have increased dramatically in recent years. Incidental harvest of bull trout, whether intentional or not has become an increasing source of mortality. Also, the illegal release and establishment of non-native fishes, along with expansion of established populations of brook trout and brown trout, possibly related to a

Table 1. Summarizes differences in direct, indirect, and cumulative effects analyses conducted for Section 7 consultation (ESA) versus an environmental effects analysis (NEPA).

ESA (50 CFR 402.02)	NEPA (40 CFR 1508.7)
Direct Effects Caused by the action and occur at the same time and place (i.e., during implementation of the action)	
Indirect Effects	
Those effects caused by the proposed action and are later in time, but are still reasonably certain to occur.	Those effects caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.
Cumulative Effects	
• The effects of future State or private activities, not involving federal activities, that are reasonably certain to occur, within the action area of the Federal Action subject to consultation.future only • non-Federal	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.

ESA (50 CFR 402.02)	NEPA (40 CFR 1508.7)
• "reasonably certain"	• past, present and future • Federal and non-Federal • "reasonably foreseeable"

changing climate, will continue to affect bull trout populations. The development of private lands and resulting ground disturbance, sediment delivery, and vegetation conversion is expected to continue as secondary development creates a demand for new public services and facilities. Human development on valley bottoms and along occupied and unoccupied stream zones has, and will continue to have, a cumulative impact on bull trout through degradation of in-stream habitat or the conversion and loss of riparian habitat, and therefore, the principle constituent elements of critical habitat. Availability and access to the types of information listed above may be limited or non-existent as privacy issues and final decisions are ultimately up to the individual landowners.

Aquatic-Riparian Conservation Strategy

An outcome of this informal consultation is the description of an NRCS aquatic-riparian conservation strategy (ACS) for bull trout in Montana. Given that the NRCS is not a land management agency, and works primarily on private lands by providing technical support and/or funding implementation of conservation practices, this ACS is limited to being conceptual in nature. While it is not the intent of the NRCS to commit a land use allocation on any private lands to an ACS, Section 7(a)(1) of the ESA does require that the NRCS "utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species". Thus, the ACS is written as a set of goal statements similar to the "Riparian Goals" in Appendix B of **A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale** (USDI 1998a). These goals reassert the NRCS commitment, through implementation of programs under the 2008 Farm Bill that will maintain and restore characteristics of stream habitat complexity, functioning watersheds, resilient riparian areas, and associated fish habitats to benefit bull trout.

The NRCS Aquatic-Riparian Conservation Strategy addresses the basic habitat requirements (i.e., the Four "C's") of bull trout in Montana. Bull trout need streams and lakes with cold water, clean streambed gravel, complex stream habitat and connected habitats for migration across the landscape (MBTSG 1998). Therefore, the ACS is to maintain or restore:

1. Water temperatures to support all life-history stages of bull trout;

2. Water quality within a range that maintains the biological, physical, and chemical integrity necessary for bull trout;

3. In-stream flows to support healthy riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to withstand flood discharges;

4. Natural timing and variability of the water table elevation in riparian areas and wetlands;

5. Stream channel integrity, channel processes, and the sediment regime (including the elements of timing, volume, and character of sediment input and transport) that support complex aquatic habitats;

6. Diversity and productivity of native and desired non-native riparian plant communities;

7. Riparian vegetation necessary to (a) provide amount and distribution of large woody debris characteristic of natural aquatic-riparian systems; (b) provide adequate summer and winter thermal regulation within the riparian area and stream; and (c) help achieve rates of surface erosion, bank erosion, and channel migration characteristic of that under which the communities developed;

8. Riparian and aquatic habitats necessary to foster the unique genetic traits that evolved within the specific geo-climatic region;

9. Habitat to support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian-dependent communities; and

10. Foster an understanding of the biological, physical, and ecological requirements for the recovery of bull trout by Montana's farming and ranching communities and interests.

A comparison between ACS goals, the diagnostics/pathways and indicators used in the effects matrix, and the primary constituent elements of bull trout critical habitat are provided in Appendix F (Table F-1).

Determination of Effects

Appendix C Table C-1 summarizes the effects analysis and effects determinations for conservation practices analyzed in this programmatic BA, and indicates when adverse impacts of practices are unavoidable on bull trout and designated critical habitat. Implementing many of the practices within occupied stream zones or unoccupied stream zones (see definitions Appendix C – Definitions and Assumptions) result in a <u>May Affect, Likely to Adversely Affect</u> determination. Avoiding or mitigating those practice effects to reach a <u>May Affect, Not Likely to Adversely Affect</u> determination will require implementation of the CM(s) indicated in Table C-1 for the specific practice.

Use of the bull trout habitat determination screen as proposed for Impact Category II – *disturbance* and Impact Category III – *disturbance/habitat modification*, would result in NRCS conservation practices that <u>May Affect, Not Likely to Adversely Affect</u> bull trout. The impact associated with the proposed action is expected to be discountable or insignificant for the specific practice, and where necessary with implementation of CM(s) indicated in Table C-1 would properly be included in the programmatic concurrence from the FWS. No NRCS conservation practices were identified that were considered wholly beneficial to bull trout, although in numerous cases long-term beneficial effects are likely.

Use of the bull trout habitat determination screens as proposed for Impact Category II – *disturbance* and Impact Category III – *disturbance/habitat modification*, would result in NRCS

conservation practices that May Affect, Not Likely to Adversely Affect designated critical habitat for bull trout. The impact associated with the proposed action is expected to be discountable or insignificant for the specific practice, and where necessary with implementation of CM(s) indicated in Table C-1 would properly be included in the programmatic concurrence from the FWS. No NRCS conservation practices were identified that were considered wholly beneficial to designated critical habitat, although in numerous cases long-term beneficial effects are likely.

Use of the bull trout habitat determination screens as proposed for Impact Category IV – *disturbance/habitat modification/long-term beneficial* and Impact Category V – *disturbance/habitat modification/detrimental* would result in NRCS conservation practices that May Affect, Likely to Adversely Affect bull trout or designated bull trout critical habitat. The adverse impact associated with the proposed action, whether in the short-term or long-term, cannot be included in this programmatic biological assessment. Those practices which cannot be mitigated (e.g., Impact Category IV – *disturbance/habitat modification/long-term beneficial*) will require affects analysis in a formal consultation with the FWS.

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