Endangered Species Act - Section 7 Consultation

DRAFT

BIOLOGICAL OPINION
for
Bull Trout
Flower Creek Dam Replacement Project

2013

Action Agency:	USDA Rural Development
Consultation Conducted by:	U.S. Fish and Wildlife Service Montana Field Office Helena, Montana
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I. Introduction

A. Consultation summary

This biological opinion (BO) describes potential direct and indirect effects to bull trout (*Salvelinus confluentus*) and its habitat that may occur as a result of removal of the old Flower Creek Dam, construction of the new Flower Creek Dam, repair of the lower water diversion dam structure, and the operations and maintenance of the new dam of which the entire project is located within the Flower Creek watershed. The City of Libby owns and operates the Flower Creek Dam and associated municipal water works facilities that supplies drinking water to the water distribution system for the residents of the City of Libby. The City of Libby intends to replace the Flower Creek Dam as part of the Water Supply Improvements Project and intends to apply for a Federal grant or loan from the USDA Rural Development for funding of the project and thus the action of providing Federal funding for project requires USDA Rural Development (USDA) to consult with the U.S. Fish and Wildlife Service (Service) regarding potential impacts to threatened and endangered species that may be impacted by the proposed action.

The U.S. Fish and Wildlife Service (Service) has prepared this document in response to USDA's request for initiation of formal consultation received via email on September 18, 2013, accompanied with an updated threatened and endangered species assessment dated September 5, 2013. Discussions have occurred between the Service, USDA staff, U.S. Army Corps of Engineers staff, Forest Service staff, and the City of Libby's consultant, Morrison and Maierle, Inc. during the consultation period. Note that personnel from Morrison and Maierle, Inc prepared the species assessment for USDA which for consultation purposes serves as the biological assessment (BA) for potential impacts to federally listed species that may be affected by the proposed action. Some data and information presented in this BO has been validated and then excerpted directly from the BA related documents.

Section 7(b)(3)(A) of the Endangered Species Act (Act) requires that the Secretary of the Interior issue biological opinions on federal agency actions that may affect listed species or critical habitat. Biological opinions determine if the action proposed by the action agency is likely to jeopardize the continued existence of listed species or destroy or adversely modify critical habitat. Section 7(b)(3)(A) of the Act also requires the Secretary to suggest reasonable and prudent alternatives to any action that is found likely to jeopardize the continued existence of listed species or result in an adverse modification of critical habitat, if any has been designated. This BO only assesses impacts to the federally threatened bull trout and does not address designated critical habitat for bull trout because critical habitat does not occur in the Flower Creek watershed.

USDA conducted an analysis in their BA on two other listed species that may occur in the action area of the project and determined the project "may affect, but is not likely to adversely affect" the federally listed grizzly bear (*Ursus arctos horribilis*) and Canada lynx (*Lynx canadensis*). The Service reviewed the analyses and effects determinations for these two species and concurs with these determinations; therefore, no further consultation is needed on these species.

The Service has determined in this BO that the proposed action will not jeopardize bull trout or destroy or adversely modify bull trout critical habitat. Existing habitat conditions will be maintained or improved over the long-term with this project, and while some adverse impacts to bull trout may occur during implementation, minimization measures will reduce the effects of those impacts. Nevertheless, this proposed action will cause harm (incidental take) to bull trout and this BO provides USDA with reasonable and prudent measures and terms and conditions that will minimize the impact of incidental take. USDA must comply with the terms and conditions in order to be exempt from section 9 prohibitions in the Act.

This BO addresses only the impacts to the federally listed bull trout within the action area and does not address the overall environmental acceptability of the proposed action.

B. Consultation history

The coterminous United States population of the bull trout was listed as threatened on November 1, 1999 (64 FR 58910). On October 18, 2010, the Service published the final rule revising designated critical habitat for bull trout for the Klamath River, Columbia River, Jarbridge River, Coastal-Puget Sound, and Saint Mary-Belly River populations of bull trout (USDI Fish and Wildlife Service 2010). Federal agencies are required to conference on any action which is likely to jeopardize the continued existence of any species proposed for listing or result in the destruction or adverse modification of proposed critical habitat pursuant to section 7(a)(4) of the Act of 1973, as amended (16 U.S.C. 1531 et seq.; 50 CFR 402.10(a)).

The Service was first contacted by Morrison and Maierle, Inc about this project via email in February 2012. At that time the Service responded by email stating that the threatened grizzly bear and bull trout occur in the proximity to the project area, but indicated that "the nature of the project and the semi-urban setting location for the proposed work will prevent the project from resulting any significant adverse effects to threatened or endangered species, or other fish, wildlife, and habitat resources under purview of the U.S. Fish and Wildlife Service." However, in February 2013 (one year later) the Service learned that our 2012 email response should have provided guidance that a biological assessment (BA) was needed in order to determine if there would be the potential for effects to threatened and endangered species. The Service provided a letter to Morrison and Maierle, Inc dated February 27, 2013, retracting the earlier email response. Also, the Service indicated that a small scale fish survey completed in 2012 collected two bull trout hybrids, one above Flower Creek Dam and one below the lower diversion dam, thus verifying the presence of bull trout in Flower Creek and the likely presence of bull trout in the area of the project.

Informal consultation for this project was initiated in April 2013 and a meeting with Morrison and Maierle, USDA, the Army Corps of Engineers, and the Service to discuss the consultation process occurred on June 27, 2013. The Service and Morrison and Maierle staff met onsite at the project on May 14, 2013 to view the facilities and to discuss technical aspects of the proposed project. Morrison and Maierle prepared the first draft of the BA dated June 12, 2013. The Service provided comments on the draft to assist the consultant in conducting further analyses and in preparation of a final draft BA. The Service received a second draft of the BA dated August 6, 2013 and provided input on this document informally by phone. The BA was

subsequently finalized by Morrison and Maierle and submitted to USDA for their approval on August 28, 2013. The Service received the final BA and request for formal consultation from USDA on September 18, 2013.

Throughout the informal and formal consultation period there were phone calls, meetings, and electronic correspondences were exchanged. A complete administrative record of this consultation is on file at the Montana Ecological Services office, Helena, Montana.

C. Bull trout consultation and recovery

For purposes of consultation and recovery for bull trout the Service considers biological effects and project related impacts of proposed actions at several nested spatial levels (i.e., hierarchal relationships), that include the local population, core areas, management units, and interim recovery units (USDI Fish and Wildlife Service 2002b). In the Draft Bull Trout Recovery Plan (USDI Fish and Wildlife Service 2002b), twenty-seven major watersheds were referred to as recovery units; terminology that has since been revised and they are now referred to as management units. The following definitions are from the Draft Bull Trout Recovery Plan:

- Local population: A group of bull trout that spawn within a particular stream or portion of a stream system. Multiple local populations may exist within a core area. A local population is considered to be the smallest group of fish that is known to represent an interacting reproductive unit. In most areas a local population is represented by a single headwater tributary or complex of headwater tributaries where spawning occurs. Gene flow may occur between local populations (e.g., those within a core population), but is assumed to be infrequent compared with that among individuals within a local population.

- Core area: The combination of core habitat (i.e., habitat that could supply all elements for the long-term security of bull trout) and a core population (a group of one or more local bull trout populations that exist within core habitat) constitutes the basic unit on which to gauge recovery. Core areas require both habitat and bull trout to function, and the number (replication) and characteristics of local populations inhabiting a core area provide a relative indication of the core area's likelihood to persist. A core area represents the closest approximation of a biologically functioning unit for bull trout. Local populations within a core area have the potential to interact because of connected aquatic habitat.

- Recovery unit / management unit: Management units are the major units for managing recovery efforts; management units were described (as recovery units) in separate chapters in the draft recovery plan (USDI Fish and Wildlife Service 2002b). Most management units, as proposed, consisted of one or more major river basins. Several factors were considered in our identifying management units, for example, biological and genetic factors, political boundaries, and ongoing conservation efforts. In some instances, management unit boundaries were modified to maximize efficiency of established watershed groups, encompass areas of common threats, or accommodate other logistic concerns. Some proposed management units included portions of mainstem

rivers (e.g., Columbia and Snake rivers) when biological evidence warranted such inclusion.

Within each recovery/management unit, there are one or more core areas, which are intended to reflect the metapopulation structure of bull trout. By definition, a core area contains all of the necessary constituent elements for the long-term security of bull trout. Each core area represents the closest approximation of a biologically functioning unit for bull trout and is the geographic scale at which the Service is gauging the status of bull trout. The Draft Bull Trout Recovery Plan recognizes core areas as the population units that are necessary to provide for bull trout biological needs in relation to genetic and phenotypic diversity, and spreading the risk of extinction caused by stochastic events. Peer review of the Draft Bull Trout Recovery Plan supported this approach. Furthermore, in the October 18, 2010, Final Rule Designating Revised Critical Habitat for Bull Trout (USDI Fish and Wildlife Service 2010), additional guidance was given on the appropriate use of terminology to promote consistency in carrying out Service consultation responsibilities with respect to bull trout.

In this BO, we describe the biological effects and project impacts at each of the following scales: local population, core area, management unit, and interim recovery unit.

D. Analytical Framework for the Jeopardy Determination

Jeopardy determinations for bull trout are made at the scale of the listed entity, which is the coterminous United States population (64 FR 58910). This follows the April 20, 2006, analytical framework guidance described in the Service's memorandum to Ecological Services Project Leaders in Idaho, Oregon and Washington from the Assistant Regional Director – Ecological Services, Region 1. The guidance indicates that a biological opinion should concisely discuss all the effects and take into account how those effects are likely to influence the survival and recovery functions of the affected interim recovery unit(s), which should be the basis for determining if the proposed action is "likely to appreciably reduce both survival and recovery of the coterminous United States population of bull trout in the wild."

In accordance with policy and regulation, the jeopardy analysis in this BO relies on four components: (1) the *Status of the Species*, which evaluates the bull trout's range-wide condition, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the bull trout in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the bull trout; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the bull trout; and (4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the bull trout.

The jeopardy analysis for the bull trout in this BO uses the above approach and considers the relationship of the action area and core area (discussed below under the *Status of the Species* section) to the recovery unit and the relationship of the recovery unit to both the survival and recovery of the bull trout as a whole as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making

the jeopardy determination.

The analysis in this BO places an emphasis on using the intended range-wide recovery function of bull trout critical habitat, especially in terms of maintaining and/or restoring viable core areas, and the role of the action area relative to that intended function as the context for evaluating the significance of the effects of the proposed federal action, taken together with cumulative effects, for purposes of making the adverse modification determination.

This analytical framework relies heavily on the importance of core area bull trout populations to survival and recovery of the species. Core areas form the building blocks that provide for conserving bull trout evolutionary legacy as represented by the major evolutionary groups (Coastal, Snake River, and Upper Columbia River). Should the adverse effects of a proposed action not rise to the level where it appreciably reduces both survival and recovery of the species at a lower scale, such as the local or the core population, by deduction the proposed action would not jeopardize bull trout at the higher scale of the interim recovery unit (Columbia River) or the coterminous United States (i.e., range wide). Therefore, the determination would result in a no-jeopardy finding. However, should a proposed action produce adverse effects that are determined to appreciably reduce both survival and recovery of the species at a lower scale of analysis, then further analysis is warranted at the next higher scale. "Generally, if a proposed federal action is incompatible with the viability of the affected core area population(s), inclusive of associated habitat conditions, a jeopardy finding is considered to be warranted because of the relationship of each core area population to the survival and recovery of the species has a whole (70 CFR 56258)."

Survival is defined as the condition in which a species continues to exist into the future while retaining the potential for recovery. This condition is characterized by a species with a sufficient population, represented by all necessary age classes, genetic heterogeneity, and number of sexually mature individuals producing viable offspring, which exists in an environment providing all requirements for completion of the species' entire life cycle, including reproduction, sustenance, and shelter. Recovery is defined as improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set out in section 4(a)(1) of the Act. [50 CFR §402.02]. For the purposes of bull trout recovery, an emphasis is placed on the adult (migratory) life history forms. Benefits of migratory bull trout include greater fecundity resulting in increased reproductive potential, and dispersing the population across space and time so that spawning streams may be recolonized should local populations suffer a catastrophic loss (Rieman and McIntyre 1993, MBTSG 1998, Frissell 1999). In the absence of the migratory bull trout life form, isolated populations cannot be replenished when disturbance makes local habitats temporarily unsuitable, the range of the species is diminished, and the potential for enhanced reproductive capabilities are lost (Rieman and McIntyre 1993).

As indicated above the approach to the jeopardy analysis for the proposed action addressed by this BO follows a hierarchal relationship between units of analysis (i.e., geographical subdivisions) that characterize effects at the lowest level or smallest scale (local population) aggregated to the highest level or largest scale (Columbia River Interim Recovery Unit) of analysis. Table 1 shows the hierarchal relationship between units of analysis that was used to determine whether the proposed action is likely to jeopardize the survival and recovery of bull

trout. If the adverse effects of the proposed action do not rise to the level where it appreciably reduces both survival and recovery of the species at a lower scale, such as the local or core population, the proposed action could not jeopardize bull trout in the coterminous United States (i.e., range-wide). Therefore, the determination would result in a no-jeopardy finding. However, if the proposed action causes adverse effects that are determined to appreciably reduce both survival and recovery of the species at a lower scale of analysis, then further analysis is warranted at the next higher scale.

Table 1. Hierarchy of units of analysis for bull trout jeopardy analysis for the Flower Creek Dam Replacement Project.

Name	Hierarchical Relationship
Coterminous United States	Range of the species within the coterminous United States (i.e., the listed ESA entity)
Columbia River Interim Recovery Unit	One of 5 interim recovery units in the coterminous United States
Kootenai River Basin Management Unit	One of 23 management units in the Columbia River Interim Recovery Unit
Kootenai River Core Area	One of 4 core areas in the Kootenai River Basin Management Unit
Local populations	There are six local populations in the action area. *Flower Creek*, a tributary to the Kootenai River, is not identified as a local bull trout population

Based on the information that is analyzed and described in this BO, this project will not jeopardize the survival and recovery of bull trout at the scale of the listed entity (i.e., coterminous United States range wide distribution). More detailed rationale and discussion for this conclusion is provided below.

E. Designated critical habitat

Critical habitat designations identify habitat areas that provide essential life cycle needs of the species, to the extent known using the best scientific and commercial data available (USDI Fish and Wildlife Service 2010). No critical habitat is designated within the action area. The closest critical habitat unit to the action area of Flower Creek Dam Replacement Project is the Kootenai River, which is approximately 5 miles downstream to the confluence. Therefore, critical habitat will not be affected and there will not be adverse modification of designated critical habitat at broader geographic scales (e.g., Kootenai River Subunit or Kootenai River Basin Unit scale or Columbia River basin scale). Therefore, this BO will not further analyze or address critical habitat.

II. Description of the proposed action

A. Action area

For purposes of consultation under section 7 of the Act, the "action area" is defined by 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action."

Flower Creek flows approximately 12.3 miles to its confluence with the Kootenai River. Headwater tributaries begin in a series of lakes in the Kootenai National Forest within the Cabinet Mountain Wilderness. The two dams present in the watershed are owned by the City of Libby and located on City property which is surrounded by the Kootenai National Forest and a small amount of state land. The Flower Creek Dam impounds the Upper Flower Creek Reservoir and a smaller diversion dam is located in the lower half of Flower Creek at the City of Libby's water outtake facility. The project site is accessed by Forest Service Road 128. Land use adjacent to the project corridor is primarily rural/undeveloped forest land. The legal description of the project location is Section 21, Township 30 North, Range 31 West, Lincoln County, Montana. See Figures 1 and 2 below.

Flower Creek Dam and Upper Flower Creek Reservoir are located 5 miles upstream from the confluence with the Kootenai River, and therefore the action area for this BO is confined to the Flower Creek watershed (i.e., HUC 17010101). Flower Creek flows about 12.3 miles to its confluence with the Kootenai River. The action area is within the Kootenai River Core Area, within the Kootenai River Basin Management Unit, and within the Columbia River Interim Recovery Unit (USDI Fish and Wildlife Service 2002b). The Flower Creek bull trout population is not a primary local population that supports this core area. However, bull trout appear to persist in the upper watershed, but likely in very low numbers (USDA Forest Service 2000). Lower reaches of Flower Creek below the lower diversion dam remain seasonally connected to the mainstem Kootenai River and could on occasion be occupied by the fluvial form of bull trout which could enter the stream reach by moving upstream from the Kootenai River or by moving downstream from the Action Area. On a seasonal basis, the lower reaches of Flower Creek could also be used by upstream migrating bull trout from the Kootenai River seeking spawning habitat.

Figure 1. Vicinity map of the Flower Creek Replacement Project in northwest Montana (taken from Morrison and Maierle, Inc, Hydropower Feasibility Study for Flower Creek, technical memorandum, May 2011).

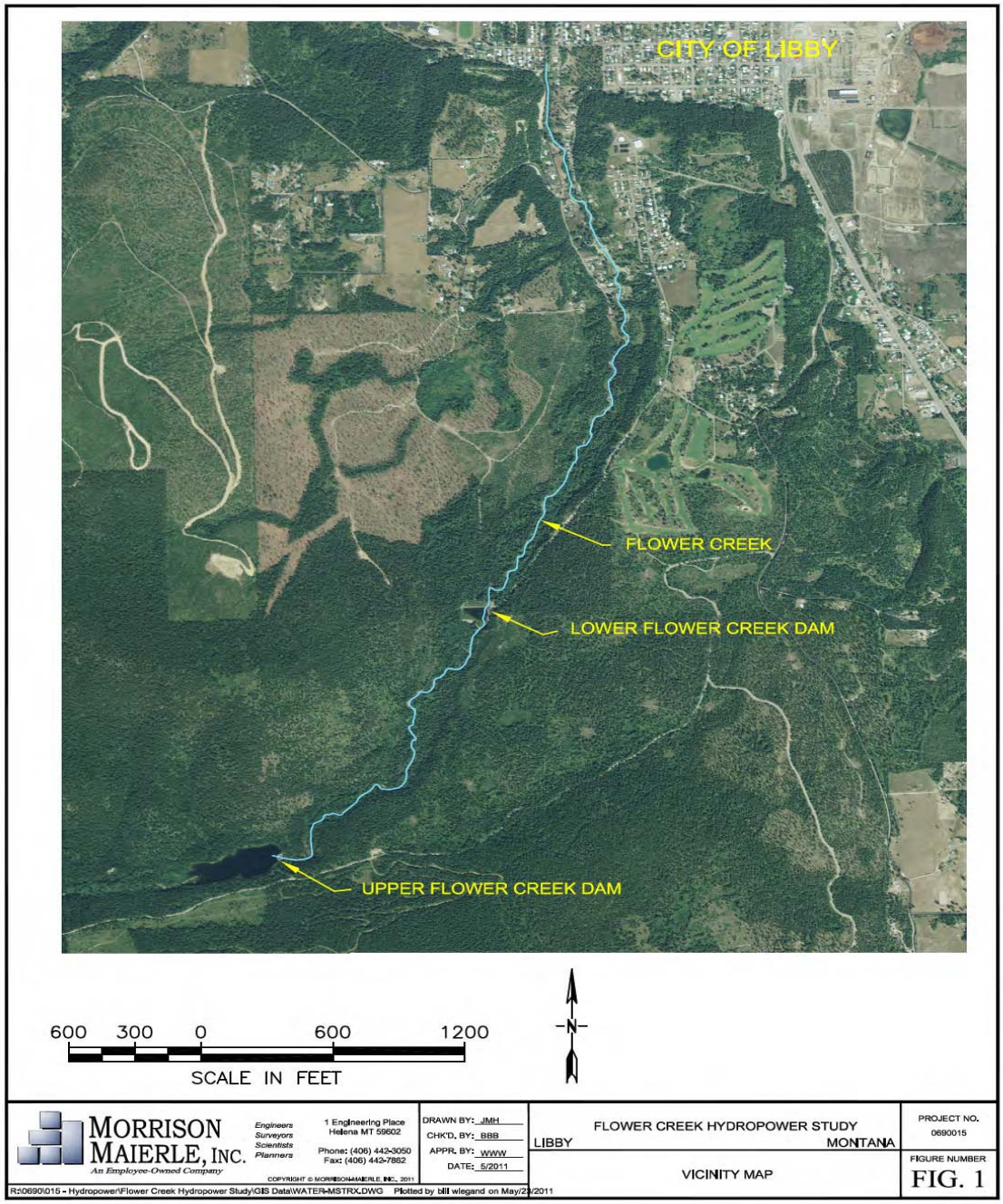
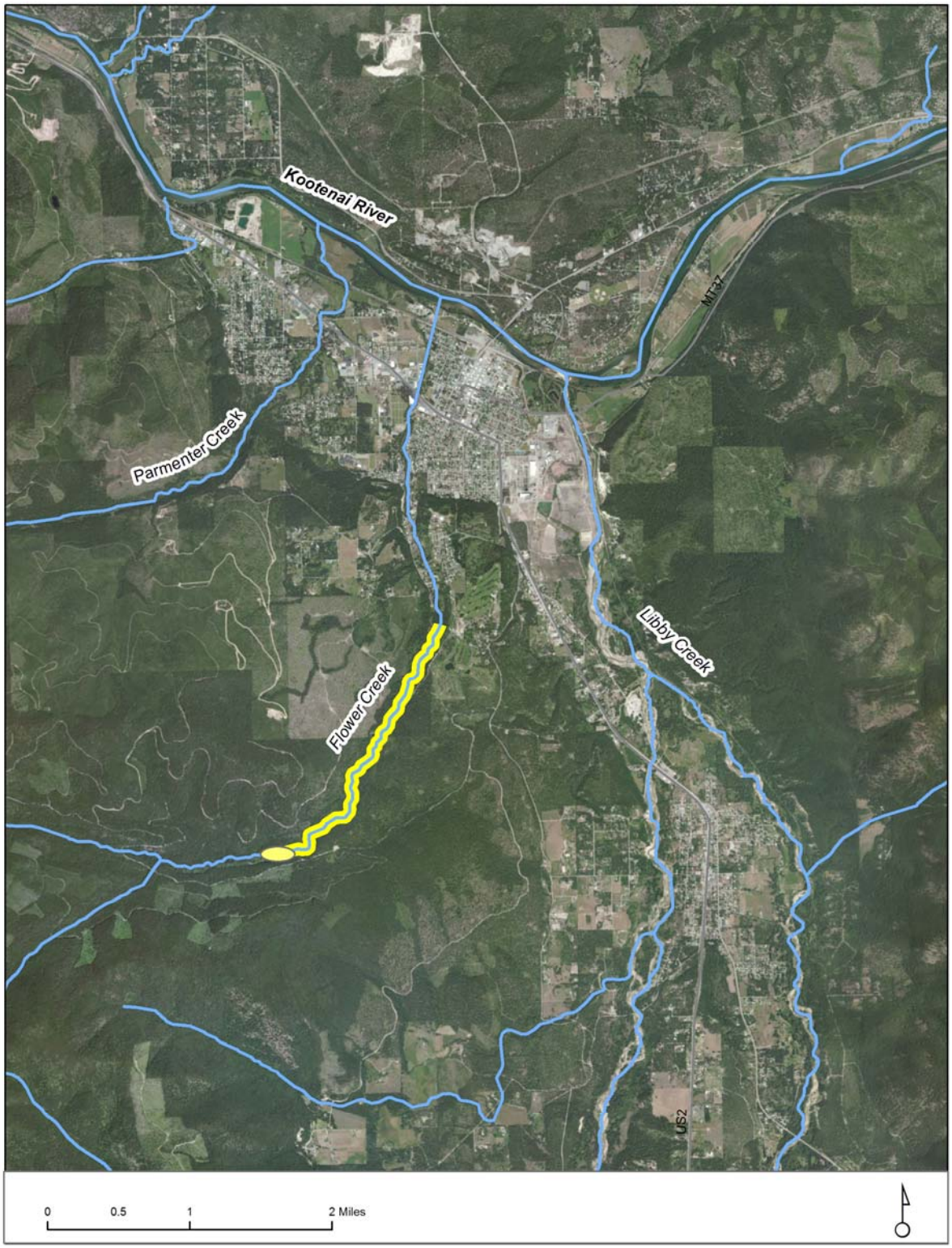


Figure 2. Map of vicinity streams and the Kootenai River relative to the action area.



B. Proposed action

The proposed action includes the following: 1) the removal of the outdated Flower Creek Dam, 2) construction of the new Flower Creek Dam, 3) operations and maintenance of the new Flower Creek Dam, and 4) rehabilitation and repairs of the lower diversion dam located about one mile downstream of Flower Creek Dam.

Removal of the old Flower Creek Dam

The existing Flower Creek Dam consists of a concrete arch dam with two overflow spillways, and a low-level outlet works. It was constructed in 1946 and impounds Upper Flower Creek Reservoir. The existing dam is a variable radius concrete arch dam with a maximum height of 55 feet and a crest length of approximately 180 feet. The two spillways looking downstream of the dam are located on the right and left abutments. The low-level outlet works consist of a primary 3-foot square sluice gate located at the base of the dam, and a 10-inch and 12-inch diameter conduits and control valves that are used as secondary outlets.

To remove the old dam, the 220 acre-foot reservoir storage impoundment will be lowered to about 40 acre-feet of storage pool (USDA RD BA 2013). The lowering will occur over approximately fourteen days beginning about March 2014 during which base flows in Flower Creek would increase by 6.5 cubic feet per second (cfs). For reference, the long-term maximum average monthly flow is 88 cfs, and the long-term average monthly minimum flow is 9.1 cfs. The reservoir will be lowered to allow the existing dam to be partially dismantled. The contractor will remove approximately 25 feet concrete material from the top of the existing dam using articulating buckets or other similar means to pick up and remove the cut pieces. These materials will be removed from the project site. Approximately 25 feet (height above streambed) of the existing dam will remain in place. This portion of the dam will not be removed, but will permanently remain in place and will be inundated by the proposed new dam.

Construction of the new Flower Creek Dam

Prior to construction of the proposed new dam, the stream flows will be diverted through the construction site with a bypass pipe. The bypass pipe will be connected to the low-level outlet of the existing dam and will outlet below a temporary cofferdam. The pipe is designed to carry between 132 and 161 cfs and will be between 42 and 54 inches in diameter, depending on the final bypass configuration. This will allow the contractor to keep the site free of excess water, and will allow continued in-stream flows during all stages of the project. The pipe will be approximately 235 feet long with 85 feet of welded steel that will remain permanently in place and 150 feet of high density polyethylene pipe that will be removed following construction.

A low embankment-type, earth-fill cofferdam will be constructed at the downstream boundary of the construction site. The temporary cofferdam will be approximately 30 feet wide (transverse to the stream) at the base, 53 feet wide at the crest, and 35 feet long (longitudinal to the stream) at the base and 5 feet long at the crest. This will keep tail water from entering the site, and will also allow the site to be disturbed without introducing soils and foreign materials into the stream; the flows will pass through the diversion pipe through the project area, without contacting

construction materials or disturbed materials. The cofferdam will be removed when the dam is completed and operational, or may be removed when construction on the proposed new dam no longer necessitates protecting the downstream toe of the dam from backwater.

The new Flower Creek Dam will be a mass-concrete gravity dam situated approximately 85 feet downstream of the existing structure. The estimated volume of concrete to be used is approximately 5,600 cubic yards. The concrete, steel, pipe, and other materials will be trucked to the site and will be placed by a crane erected adjacent to the right embankment. The new dam will be higher and raise the existing full pool elevation by approximately 2 feet and increase water storage capacity to 230.1 acre-feet (from 220 acre-feet). The full pool elevation will increase from 2,676 feet to 2,678 feet. The reservoir level will be controlled by a low-level spillway. The design of the proposed dam, like the current structure, contains a low-level outlet to allow for the release of colder waters associated with fishery enhancements.

Operations and Maintenance of the new Flower Creek Dam

The proposed dam will also have a low-level outlet which is designed to allow for greater control of deep, cold-water flow releases and stream temperature. According to the proposed action (USDA RD BA 2013), operation of the new dam low-level outlet would allow flows to increase from the historic low-level outlet flows of 2.5 cfs (approximated) to a rate approaching the historic seasonal low-flow conditions of approximately 9 cfs. For municipal water supply operations, the maximum release of water through the low-level outlet at base stream flows would be constrained only by the average low daily flow (9 cfs historically) or by the actual flow into the reservoir.

Following the construction and completion of the proposed dam, the City of Libby will conduct flow metering to determine and adjust flows through the proposed low-level outlet. This will allow the City of Libby to calibrate and verify the operational capability of the outlet works, and develop a plan to maintain minimum flows downstream of the dam by maximizing cold-water releases from the low-level outlet structure while minimizing flows over the spillway. The City of Libby will also measure the stream temperature flows to establish a post-construction baseline for comparison of stream temperatures measurements with the pre-construction baseline conditions. In all cases, the City of Libby will operate the proposed dam to maintain full-pool conditions by preserving at least some minimal flow over the lower spillway crest. In turn, this would allow cold water releases to be maintained year-round through the low-level outlet.

The proposed operations of the new dam are intended to emulate the current operations in that flows will be released through the low-level outlet and over the spillway crest. However, the design and operations of the new dam will allow the amount of low-level outlet flows to increase significantly over the current and historic low-level outlet flows and likely improve stream temperature conditions in the downstream reaches of Flower Creek.

Rehabilitation and Repair of the Lower Diversion Dam

The lower Diversion Dam rehabilitation and repair addresses the water-loss and soil stability associated with this structure. A depression or sinkhole that has developed just upstream of the

diversion allows water to pass underneath the diversion structure and surface in the streambed below the structure. This is due to the fine material in the soil has been washed from the soil formation creating voids that are now allowing water to pass under the structure through an unintended soil conduit. The entrance appears to be just upstream of the weir on the right side as observed from the reservoir. The exit is localized below the left side of the concrete apron below the weir and downstream face. Dye tests have shown that only minimal flows (estimated at much less than 1 cfs) are passing through the diversion dam.

The proposal includes drilling or excavating into the voids and pressure-grouting a Portland cement grout to seal this conduit. The primary purpose of sealing these flows is to stabilize the soil structure under the concrete apron. The secondary purpose is to allow the adjustable weir to control all flows through the reservoir.

Water temperatures taken in the area above and below the lower diversion indicate the minimal flows through the soil structure likely do not have a significant influence on stream water temperatures. Water temperature measurements taken on July 30 and July 31, 2013, indicate that stream temperatures increase by approximately 1 degree Celsius for having passed through the reservoir and over the concrete apron.

III. Status of the species and critical habitat

A. Status of the Species

A.1 Listing status

The coterminous United States population of the bull trout (*Salvelinus confluentus*) 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 and in the Jarbidge River in Nevada, north to various coastal rivers of Washington to the Puget Sound and east throughout major rivers within the Columbia River Basin to the St. Mary-Belly River, east of the Continental Divide in northwestern Montana (Cavender 1978, Bond 1992, Brewin and Brewin 1997, Leary and Allendorf 1997).

Throughout its range, the bull trout is threatened by the combined effects of habitat degradation, fragmentation and alterations associated with: 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 (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels; and introduced non-native species (64 FR 58910).

The bull trout was initially listed as three separate Distinct Population Units (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 ESA 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.

Please note that consideration of the above recovery units for purposes of the jeopardy analysis is done within the context of making the jeopardy determination at the scale of the entire listed species in accordance with Service policy (USDI Fish and Wildlife Service 2006).

A.2 Current status and conservation needs

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

A summary of the current status and conservation needs of the bull trout within these units is provided in the November 1999 Final listing Rule. A comprehensive discussion of these topics is found in the Service's draft recovery plan for the bull trout (USDI Fish and Wildlife Service 2002b, 2004a, b).

Generally, the conservation needs of the bull trout are often generally expressed as the need to provide the four "C's": cold, clean, complex, and connected habitat. 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 coterminus to local populations. The recovery planning process for the bull trout (USDI Fish and Wildlife Service 2002b, 2004a, b) 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) maintaining 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.

Central to the survival and recovery of the bull trout is the maintenance of viable core areas (USDI Fish and Wildlife Service 2002b, 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 interim recovery units listed above consists of one or more core areas. About 114 core

areas are recognized across the United States range of the bull trout (USDI Fish and Wildlife Service 2002b, 2004a,b).

Columbia River

This interim recovery unit is the unit relevant to the analysis in this BO and currently contains about 90 core areas and 500 local populations. About 62 percent of these core areas and local populations occur in central 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 draft bull trout recovery plan (USDI Fish and Wildlife Service 2002b) identifies the following conservation needs for this unit: 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.

A.3 Life history

Bull trout exhibit both resident and migratory life history strategies. Both resident and migratory forms may be found together, and either form may produce offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. The resident form tends to be smaller than the migratory form at maturity and also produces fewer eggs (Fraley and Shepard 1989, Goetz 1989). Migratory bull trout spawn in tributary streams where juvenile fish rear 1 to 4 years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and Shepard 1989, Goetz 1989), or saltwater (anadromous) to rear as subadults or to live as adults (Cavender 1978, McPhail and Baxter 1996, WDFW et al. 1997). Bull trout normally reach sexual maturity in 4 to 7 years and may live longer than 12 years. They 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).

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.

Growth varies depending upon life-history strategy. Resident adults range from 6 to 12 inches total length, and migratory adults commonly reach 24 inches or more (Pratt 1985, Goetz 1989).

The largest verified bull trout is a 32-pound specimen caught in Lake Pend Oreille, Idaho, in 1949 (Simpson and Wallace 1982).

A.4 Habitat characteristics

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993). Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrate, and migratory corridors (Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Howell and Buchanan 1992; Pratt 1992; Rieman and McIntyre 1993, 1995; Rich 1996; Watson and Hillman 1997). Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993), fish should not be expected to simultaneously occupy all available habitats (Rieman et al. 1997).

Migratory corridors link seasonal habitats for all bull trout life histories. The ability to migrate is important to the persistence of bull trout (Rieman and McIntyre 1993; Gilpin 1997; Rieman et al. 1997). Migrations facilitate gene flow among local populations when individuals from different local populations interbreed, or stray, to non-natal streams. Local populations that are extirpated by catastrophic events may also become reestablished by bull trout migrants. However, it is important to note that the genetic structuring of bull trout indicates that there is limited gene flow among bull trout populations, which may encourage local adaptation within individual populations, and that reestablishment of extirpated populations may take a very long time (Spruell et al. 1999, Rieman and McIntyre 1993).

Cold water temperatures play an important role in determining bull trout habitat, as these fish are primarily found in colder streams (below 59 degrees Fahrenheit), and spawning habitats are generally characterized by temperatures that drop below 48 degrees Fahrenheit in the fall (Fraley and Shepard 1989, Pratt 1992, Rieman and McIntyre 1993).

Thermal requirements for bull trout appear to differ at different life stages. 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, Baxter and McPhail 1997, Rieman et al. 1997). Optimum incubation temperatures for bull trout eggs range from 35 to 39 degrees Fahrenheit whereas optimum water temperatures for rearing range from about 46 to 50 degrees Fahrenheit (McPhail and Murray 1979, Goetz 1989, Buchanan and Gregory 1997). In Granite Creek, Idaho, Bonneau and Scarnecchia (1996) observed that juvenile bull trout selected the coldest water available in a plunge pool, 46 to 48 degrees Fahrenheit, within a temperature gradient of 46 to 60 degrees Fahrenheit. In a landscape study relating bull trout distribution to maximum water temperatures, Dunham et al. (2003) found that the probability of juvenile bull trout occurrence does not become high (i.e., greater than 0.75) until maximum temperatures decline to 52 to 54 degrees Fahrenheit.

Although bull trout are found primarily in cold streams, occasionally these fish are found in

larger, warmer river systems throughout the Columbia River basin (Fraley and Shepard 1989; Rieman and McIntyre 1993, 1995; Buchanan and Gregory 1997; Rieman et al. 1997). Factors that can influence bull trout ability to survive in warmer rivers include availability and proximity of cold water patches and food productivity (Myrick et al. 2002). In Nevada, adult bull trout have been collected at 63 degrees Fahrenheit in the West Fork of the Jarbidge River (S. Werdon, Service, pers. comm. 1998) and have been observed in Dave Creek where maximum daily water temperatures were 62.8 to 63.6 degrees Fahrenheit. In the Little Lost River, Idaho, bull trout have been collected in water having temperatures up to 68 degrees Fahrenheit; however, bull trout made up less than 50 percent of all salmonids when maximum summer water temperature exceeded 59 degrees Fahrenheit and less than 10 percent of all salmonids when temperature exceeded 63 degrees Fahrenheit (Gamett 1999). In the Little Lost River study, most sites that had high densities of bull trout were in an area where primary productivity increased in the streams following a fire (B. Gamett, U. S. Forest Service, pers. comm. 2002).

All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (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). Maintaining bull trout habitat requires stability of stream channels and maintenance of natural flow patterns (Rieman and McIntyre 1993). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997). These areas are sensitive to activities that directly or indirectly affect stream channel stability[†] and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period, and channel instability may decrease survival of eggs and young juveniles in the gravel from winter through spring (Fraley and Shepard 1989, Pratt 1992, Pratt and Huston 1993). Pratt (1992) indicated that increases in fine sediment reduce egg survival and emergence.

Bull trout typically spawn from August to November during periods of decreasing water temperatures. Preferred spawning habitat consists of low-gradient stream reaches with loose, clean gravel (Fraley and Shepard 1989). Redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989, Pratt 1992, Rieman and McIntyre 1996). 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 of fry may surpass 200 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Pratt 1992, Ratliff and Howell 1992).

Migratory forms of the bull trout appear to develop when habitat conditions allow movement between spawning and rearing streams and larger rivers or lakes where foraging opportunities may be enhanced (Frissell 1993). For example, multiple life history forms (e.g., resident and fluvial) and multiple migration patterns have been noted in the Grande Ronde River (Baxter 2002). Parts of this river system have retained habitat conditions that allow free movement between spawning and rearing areas and the mainstem Snake River. Such multiple life history strategies help to maintain the stability and persistence of bull trout populations to environmental changes. Benefits to migratory bull trout include greater growth in the more productive waters of larger streams and lakes, greater fecundity resulting in increased reproductive potential, and dispersing the population across space and time so that spawning streams may be recolonized

should local populations suffer a catastrophic loss (Rieman and McIntyre 1993, MBTSG 1998, Frissell 1993). In the absence of the migratory bull trout life form, isolated populations cannot be replenished when disturbance makes local habitats temporarily unsuitable, the range of the species is diminished, and the potential for enhanced reproductive capabilities are lost (Rieman and McIntyre 1993).

A.5 Diet

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987, Goetz 1989, Donald and Alger 1993). Adult migratory bull trout feed on various fish species (Leathe and Graham 1982, Fraley and Shepard 1989, Brown 1994, Donald and Alger 1993). In coastal areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasi*), Pacific sand lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*) in the ocean (WDFW et al. 1997).

Bull trout migration and life history strategies are closely related to their feeding and foraging strategies. Optimal foraging theory can be used to describe strategies fish use to choose between alternative sources of food by weighing the benefits and costs of capturing one choice of food over another. For example, prey often occurs in concentrated patches of abundance ("patch model"; Gerking 1994). As the predator feeds the prey population is reduced, and it becomes more profitable for the predator to seek a new patch rather than continue feeding on the original one. This can be explained in terms of balancing energy acquired versus energy expended. In the Skagit River system, anadromous bull trout make migrations as long as 121 miles between marine foraging areas in Puget Sound and headwater spawning grounds, foraging on salmon eggs and juvenile salmon along their migratory route (WDFW et al. 1997). Anadromous bull trout also use marine waters as migratory corridors to reach seasonal habitats in non-natal watersheds to forage and possibly overwinter (Brenkman and Corbett 2005; Goetz 1994).

A single optimal foraging strategy is not necessarily a consistent feature in the life of a fish, but this foraging strategy can change from one life stage to another. Fish growth depends on the quantity and quality of food that is eaten (Gerking 1994) and as fish grow their foraging strategy changes as their food changes in quantity, size, or other characteristics. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, mysids and small fish (Shepard et al. 1984, Boag 1987, Goetz 1989, Donald and Alger 1993). Bull trout that are 4.3 inches long or longer commonly have fish in their diet (Shepard et al. 1984), and bull trout of all sizes have been found to eat fish half their length (Beauchamp and Van Tassell 2001).

Migratory bull trout begin growing rapidly once they move to waters with abundant forage that includes fish (Shepard et al. 1984, Carl 1985). As these fish mature they become larger bodied predators and are able to travel greater distances (with greater energy expended) in search of prey species of larger size and in greater abundance (with greater energy acquired). In Lake Billy Chinook as bull trout became increasingly piscivorous with increasing size, the prey species changed from mainly smaller bull trout and rainbow trout for bull trout less than 17.7 inches in length to mainly kokanee for bull trout greater in size (Beauchamp and Van Tassell 2001).

Migration allows bull trout to access optimal foraging areas and exploit a wider variety of prey resources. Bull trout likely move to or with a food source. For example, some bull trout in the Wenatchee basin were found to consume large numbers of earthworms during spring runoff in May at the mouth of the Little Wenatchee River where it enters Lake Wenatchee (USDI Fish and Wildlife Service 2003, in prep.). In the Wenatchee River, radio-tagged bull trout moved downstream after spawning to the locations of spawning chinook and sockeye salmon and held for a few days to a few weeks, possibly to prey on dislodged eggs, before establishing an overwintering area downstream or in Lake Wenatchee (USDI Fish and Wildlife Service 2003, in prep.).

B. Status of Bull Trout Critical Habitat

B.1 Legal status

The Service published a final revised critical habitat designation for the coterminous United States population of the bull trout on October 18, 2010 (USDI Fish and Wildlife Service 2010); the rule becomes effective on November 17, 2010. This final rule updates and replaces the previous bull trout critical habitat designation (USDI Fish and Wildlife Service 2005c). The scope of the new designation includes approximately 18,975 miles of streams and 488,252 acres of lakes and reservoirs in Idaho, Oregon, Washington, Montana and Nevada (Table 2). In Washington, 754 miles of marine shoreline are also being designated. In addition, the final rule identifies 32 critical habitat units clustered into six recovery units where recovery efforts will be focused. Recovery units include: Mid-Columbia recovery unit; Saint Mary recovery unit; Columbia Headwaters recovery unit; Coastal recovery unit; Klamath recovery unit; and Upper Snake recovery unit. Conserving each RU is essential to conserving the listed entity as a whole.

Table 2. Stream/shoreline distance and acres of reservoir or lakes designated as bull trout critical habitat by state.

State	Stream/shoreline Miles	Acres of lakes or reservoirs
Idaho	8,772	170,218
Montana	3,056	221,471
Oregon	2,836	30,256
Nevada	72	
Washington	3,793	66,308
Washington (marine)	754	

B.2 Conservation role and description of critical habitat

The conservation role of bull trout critical habitat is to support viable core area populations (70 FR 56212). Core areas reflect the metapopulation structure of the coterminous United States population of the bull trout and are the closest approximation of a biologically functioning unit for the purposes of recovery planning and risk analyses. Critical habitat units generally

encompass one or more core areas and may include foraging, migration, and overwintering areas, outside of core areas, that are important to the survival and recovery (i.e., conservation) of the bull trout.

The primary function of individual critical habitat units is to maintain and support core areas which (1) contain bull trout populations with the demographic characteristics needed to ensure their persistence and contain the habitat needed to sustain those characteristics (Rieman and McIntyre 1993); (2) provide for persistence of strong local populations, in part, by providing habitat conditions that encourage movement of migratory fish (Rieman and McIntyre 1993; MBTSG 1998); (3) are large enough to incorporate genetic and phenotypic diversity, but small enough to ensure connectivity between populations (Rieman and McIntyre 1993; Hard 1995; Healey and Prince 1995; MBTSG 1998); and (4) are distributed throughout the historic range of the species to preserve both genetic and phenotypic adaptations (Rieman and McIntyre 1993; Hard 1995; MBTSG 1998; Rieman and Allendorf 2001).

Within designated critical habitat areas, the PCEs for bull trout are those habitat components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering. The PCEs of bull trout critical habitat are as follows:

> (1) Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.
>
> (2) Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.
>
> (3) An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.
>
> (4) Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.
>
> (5) Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.
>
> (6) In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions. The size and amounts of fine sediment suitable to bull trout will likely vary from system to system.

(7) A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.

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

(9) Sufficiently low levels of occurrence of nonnnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.

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

In freshwater areas, critical habitat includes the stream channels within the designated stream reaches and a lateral extent as defined by the bankfull elevation on one bank to the bankfull elevation on the opposite bank. If bankfull elevation is not evident on either bank, the ordinary high-water line determines the lateral extent of critical habitat. The lateral extent of critical habitat in lakes may initially be defined by the perimeter of the waterbody as mapped on standard 1:24,000 scale topographic maps.

Critical habitat for bull trout applies only to waterways. However, the rule recognizes that associated flood plains, shorelines, riparian zones and upland habitat are important to critical habitat areas and that activities in these areas may affect bull trout critical habitat. About 63.7 percent of designated critical habitat stream and shoreline water bodies occur adjacent to federal land, 33.2 percent occurs adjacent to private land, 1.8 percent occurs adjacent to state land and 0.7 percent is adjacent to tribal land. Less than one percent is adjacent to land that includes a mix of ownerships.

B.3 Current range-wide condition of bull trout critical habitat

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

There is widespread agreement in the scientific literature that many factors related to human activities have impacted bull trout and their habitat, and continue to do so. Among the many factors that contribute to degraded PCEs, those which appear to be particularly significant and have resulted in a legacy of degraded habitat conditions are as follows: (1) fragmentation and isolation of local populations due to the proliferation of dams and water diversions that have eliminated habitat, altered water flow and temperature regimes, and impeded migratory movements (Rieman and McIntyre 1993; Dunham and Rieman 1999); (2) degradation of

spawning and rearing habitat and upper watershed areas, particularly alterations in sedimentation rates and water temperature, resulting from forest and rangeland practices and intensive development of roads (Fraley and Shepard 1989; MBTSG 1998); (3) the introduction and spread of nonnative species as a result of fish stocking and facilitated by degraded habitat conditions, particularly for brook trout and lake trout, which compete with bull trout for limited resources and, in the case of brook trout, hybridize with bull trout (Leary et al. 1993; Rieman et al. 2006); (4) in the Coastal-Puget Sound region where amphidromous bull trout occur, degradation of mainstem river FMO habitat, and the degradation and loss of marine near shore foraging and migration habitat due to urban and residential development; and (5) degradation of foraging, migration, and overwintering habitat resulting from reduced prey base, roads, agriculture, development and dams.

C. Status and distribution

C.1 Current and historic distribution

Bull trout are found throughout the northwestern United States and in British Columbia and Alberta in western Canada (Rieman and McIntyre 1993; USDI Fish and Wildlife Service 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. 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 Fish and Wildlife Service 2002a). In Montana, bull trout occur in the headwaters of the Columbia River basin in the Clark Fork and the Kootenai subbasins.

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 change (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 bull trout occurring widely across a major portion of the historic potential range, many areas support only remnant populations of bull trout. Bull trout were reported present in 36% and unknown or unclassified in 28% of the subwatersheds 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 appear to be 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, 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).

C.2 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 et al. 1998; MBTSG 1998; USDI Fish and Wildlife Service 2002b, 2005a,b) and fluvial bull trout populations in portions of the upper Columbia River basin appear to be nearly extirpated (USDI Fish and Wildlife Service 2002b, 2005a).

At this time, the Service recognizes 118 bull trout core areas range-wide in Idaho, Montana, Oregon, Nevada and Washington (USDI Fish and Wildlife Service 2002b). This represents a partial consolidation of some of the 188 local populations originally described in the various bull trout listing documents (USDI Fish and Wildlife Service 1999), and is based on the use of more consistent and updated terminology as well as specific information regarding connectivity and consolidation between some populations previously considered autonomous. For example, radio telemetry information from some recent studies has been particularly useful in further describing the movements of bull trout. Core areas were previously defined as approximating interacting biological units for bull trout. Hence, as more information is obtained and recovery proceeds, we would anticipate the number of core areas and the boundaries that describe them will continue to be somewhat fluid.

Within the Columbia River basin, a total of 95 core areas are described (USDI Fish and Wildlife Service 2002b). Generally, where status is known and population data exists, bull trout populations throughout the Columbia River basin are at best stable and more often declining (Thomas 1992; Schill 1992; Pratt and Huston 1993; USDI Fish and Wildlife Service 2005a,b). Bull trout in the Columbia basin have been estimated to occupy about 45 percent of their historic range (Quigley and Arbelbide 1997). Many of the bull trout core areas occur as isolated watersheds in headwater tributaries, or in tributaries where the migratory corridors have been lost or restricted. Few bull trout core areas are considered strong in terms of relative abundance and core area stability (USDI Fish and Wildlife Service 1998b, 2005a,b). Strong core areas are generally associated with large areas of contiguous habitat.

Within the Clark Fork subbasin of western Montana and northern Idaho, the Draft Bull Trout Recovery Plan 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 (USDI Fish and Wildlife Service 2002b). Within the Kootenai River Basin Management/Recovery Unit, four core areas and ten local populations are described.

C.3 Status of bull trout in the Kootenai River Core Area

Bull trout densities in the Kootenai River Core Area may have historically been somewhat higher than they are today, but have experienced nowhere near the reductions observed in other western Montana Core Areas. Impacts to bull trout populations in the KR began in the late 19th century with extensive habitat destruction due to gold mining in Libby Creek, agricultural land conversion , and the development of riparian railroads; however, more significant changes in bull trout populations likely occurred in the middle part of the century when development pressures in the form of timber harvest and road construction began to occur over relatively large areas of spawning and rearing habitat, including the upper Fisher River.

A major event affecting populations in the Core Area occurred with the construction of Libby Dam in 1974. This dam effectively severed much of the upper watershed, including productive habitat in Grave Creek, the Wigwam River and other river systems in Canada. Movement patterns of fluvial bull trout in the Kootenai River Core Area are therefore significantly restricted from historical patterns. Kootenai Falls also bisects this core area, which (because of the falls) was originally considered to be two separate core areas, but radio telemetry has demonstrated that at least partial upstream passage occurs over the falls. Fluvial populations in the truncated system are, however, geographically distributed throughout the core area, which increases the potential for recovery.

The proportion of fluvial to resident forms as it compares to historic proportions is uncertain. The only known resident bull trout populations is found in Libby Creek above an impassable waterfall. There has been some loss of smaller populations in Parmenter and Flower creeks. The primary cause of loss in Parmenter was due to irrigation withdrawals and irregular flows over the last 75 years. The Flower Creek population became isolated with the development of the Libby municipal water supply and associated dams which isolated the once migratory population. The Kootenai River provides abundant deep water Foraging, Migrating, and Overwintering (FMO) habitat and there does appear to be a relatively strong fluvial component remaining in index spawning reaches. However, the strength of the population is somewhat misleading, as recent genetic testing has indicated that the population appears to be heavily supported by entrainment (one-way, downstream movement) of Lake Koocanusa bull trout through Libby Dam.

Gas bubble disease may be a key factor affecting bull trout in the Kootenai River Core area. Reduced nutrient flow past the dam (due to the reservoir acting as a sink) and reduced phosphate spill in the Canadian portion of the Kootenai River may also be significant. These three issues appear to be key contributors to mainstem rearing capacity limitations. Conversely the dam provides a tremendous food source for bull trout directly downstream. Kokanee salmon entrained by the dam are discharged at the base of the dam. Opportunistic species such as bull trout have

benefitted from this condition and bull trout in excess of 20 pounds are occasionally observed in this Core Area as a result of the enhanced food supply. More recently there has been extensive *Didymosphenia geminata* growth below Libby Dam and extending beyond the Idaho-Montana Border. The effects of this nuisance algae growth on bull trout rearing in the mainstem Kootenai River is undetermined.

Forest Service Biologists estimate that as many as 300 to 400 fluvial redds may have been present in the Kootenai River Core Area historically. As with most bull trout populations, overall numbers were likely highly variable from year to year, based on natural climatic and disturbance patterns.

Bull trout populations in the Kootenai River Core Area were first exposed to significant human-caused impacts in the late 1800's. As the population in the area grew and agricultural production increased there was a need for a steady water supply to local farms. For example, the Glen Lake Irrigation District (GLID) was formed around the turn of the century. The GLID built a log dam and diversion on Grave Creek in 1917. Grave Creek was the primary bull trout stream in this Core Area south of the Canadian border prior to Libby Dam. The GLID dam was not a total barrier but did significantly limit connectivity with the bulk of the available bull trout spawning habitat for fish rearing in the upper reaches of the Kootenai River or what is now Lake Koocanusa (and the Lake Koocanusa Core Area). Timber harvest and road construction impacted most spawning tributaries and cumulatively impacted rearing habitats in the mainstem Kootenai River. The construction of Libby Dam in 1974 was the single-most significant impact to bull trout in this core area during the current era.

Numerous smaller scale impacts to bull trout gradually occurred throughout the Kootenai River valley in the middle part of the 20th century. These included grazing, subdivision, and agricultural development along many of the important low gradient streams, road and energy corridor Numerous smaller scale impacts to bull trout gradually occurred throughout the Kootenai River valley in the middle part of the 20th century. These included grazing, subdivision, and agricultural development along many of the important low gradient streams, road and energy corridor development in riparian areas, and logging and road development in tributary streams. These all had impacts to bull trout and their habitats; however, they were not of the same magnitude as Libby Dam.

Changes in fish species composition within the Kootenai River system, brought about by Montana Fish, Wildlife and Parks stocking programs and some illegal introductions, have created an additional impact to the system. Brook trout are the main non-native species threat; they exist in numerous tributary streams that contain bull trout and are of particular concern in the O'Brien Creek drainage. Lake trout have been captured in the Kootenai River downstream of Libby Dam and potential establishment and proliferation of a lake trout population downstream in Kootenay Lake could be a major concern. Brown trout also occur, and are increasing downstream of Kootenai Falls in the mainstem and in Lake Creek.

The 1950's-80's saw a rapid expansion of road construction and logging, especially on the upper watersheds of this core area. Further downstream, the climate is more maritime and dominated by rain on snow events. Steep slopes in the middle and upper portions of many Cabinet

Mountain drainages produce high bedload levels as a result of their flashy nature. In some cases, this bedload has been exacerbated by road construction and logging. These loads have exceeded the transport capacity of some streams resulting in cobble and boulder dominated systems.

This period of management and heavy road construction also resulted in fragmentation of bull trout populations at undersized culvert crossings in some areas. Most of these barriers have been addressed in recent years and connectivity, aside from Libby Dam, is not a significant issue.

Some past impacts, such as culvert barriers, have been reduced or eliminated, and therefore some stressors on the population no longer play as large of a role as they did historically. Logging and road construction have decreased considerably and hundreds of road miles have been removed from the landscape in key bull trout watersheds such as Quartz, Pipe, Callahan, O'Brien Creeks. Fishing regulation changes do not allow people to keep, or intentionally fish for bull trout in most areas (with the exception of Lake Koocanusa, which primarily affects the Lake Koocanusa Core Area). Bull trout poaching was an issue in this core area after angling was closed in 1994 and likely remains.

Overall, current bull trout numbers in the Kootenai River Core Area appear to be relatively stable. Bull trout distribution is relatively good and fluvial components exist in all local populations. The mainstem Fisher River has potential to support more bull trout but would require major habitat restoration efforts to restore function and thermal conditions suitable to bull trout. There is some uncertainty as to whether temperature issues could be completely resolved for all life stages.

Biologically, if nonnative brook trout and the potentially emerging lake trout and brown trout threats can be controlled, and headwater spawning and rearing habitat can be improved and connectivity maintained, there is potential for this core area to rebound. However, the apparent population strength is misleading as a significant proportion of the large bull trout routinely encountered downstream of Libby Dam appear (genetic testing has verified) to have originated from upstream of Libby Dam. Also of concern is the prevalence of *Didymosphenia geminate* in the reaches below Libby Dam.

C.4 Five-year bull trout status review

In 2005, the Service assessed the conservation status of bull trout and the vulnerability for each of 121 bull trout core areas (now 118 core areas; USDI Fish and Wildlife Service 2005b). We reviewed the Bull Trout Core Area Conservation Assessment and concluded that that the original threats to bull trout still existed for the most part in all core areas, but no substantial new and widespread threats were discovered during this review or in the review of previous biological opinions on bull trout. This finding indicates the baseline conditions overall range-wide had not changed substantially in the last five years and that the trend and magnitude of the range-wide population had not worsened nor did it improve measurably.

The risk assessment or ranking portion of the status review was modeled to assess the relative status of each of the 121 core areas. The model used to rank the relative risk to bull trout was based on the Natural Heritage Programs' NatureServe Conservation Status Assessment Criteria,

which had been applied in previous assessments of fish status, including bull trout (Master et al. 2003). The model integrated four factors: population abundance, distribution, population trend, and threats. For a complete understanding of the ranking process, a more thorough review of the report which describes the model and the output is required (USDI Fish and Wildlife Service 2005b).

Results of the status assessment indicate that two of the four core areas in the Kootenai River Basin Management Unit, including the Kootenai River and Bull Lake core areas, are considered to be at "at risk" because of very limited and/or declining numbers, range, and/or habitat, making the bull trout in this core area vulnerable to extirpation. The Lake Koocanusa Core Area is considered to be at "low risk" because bull trout are common or uncommon, but not rare, and usually widespread through the core area. The Sophie Lake core area is considered to be at "high risk" because of extremely limited and/or rapidly declining numbers, range, and/or habitat, making the bull trout in this core area highly vulnerable to extirpation.

C.5 Analysis of species/critical habitat likely to be affected

The proposed action is confined to the Flower Creek watershed. Kootenai White Sturgeon is the only other federally listed fish species that occur in this bull trout core area, but will not be affected by the proposed action because it does not occur in or near the action area. Bull trout critical habitat is designated within the core area, but not in Flower Creek. Therefore, as previously mentioned no additional analysis of bull trout critical habitat in the action area is included in this BO. No other federally listed fish species are expected to be adversely affected by the proposed action. Therefore, this BO analyzes the potential effect the proposed action could have on bull trout in the Flower Creek watershed and the Kootenai River Core Area.

C.6 Summary of determinations from past bull trout consultations

The Service is in the process of analyzing all of the bull trout biological opinions, range-wide from federal listing (June 1998) until present. Thus far the analysis shows that the Service has consulted on a wide array of actions, which had varying levels of effect and varying timeframes for implementation. None of the consultation actions were found to appreciably reduce the likelihood of survival and recovery of the bull trout in any core area or result in the loss of any subpopulations (USDI Fish and Wildlife Service 2003). Based on preliminary information, 16 biological opinions have been issued for the Kootenai River Basin Management Unit, with only two issued within the Bull Lake Core Area. All of the opinions have included mandatory terms and conditions, which are binding on the action agency, in order to reduce the potential impacts of anticipated incidental take to bull trout.

All bull trout biological opinions that have been issued are considered in the most recent technical and status information and used to update environmental baseline conditions for bull trout. Updating baselines based on previously proposed actions and associated incidental take is a requirement in preparing biological opinions (USDI Fish and Wildlife Service 1998c) and is routinely done when a federal agency is preparing a biological assessment, in the form of the Framework impact assessment (USDI Fish and Wildlife Service 1998a).

D. Climate Change

Over the last 50 years, average spring snowpack (April 1 snow water equivalent) has declined and average snowmelt runoff is occurring earlier in the spring. These trends are observed for northwestern Montana, the entire Pacific Northwest, and much of the western U.S. Since the available data is limited to the last 50 years, it is not clear whether these trends are persistent long-term trends or reflect short-term decade-to-decade variability that may reverse in coming years. Several recent studies of the same trends across the entire western U.S. have concluded that natural variability explains some, but not all, of the west-wide trend in decreasing spring snowpack and earlier snowmelt runoff.

Potential changes in streamflow and rising stream temperatures are likely to increase risks to maintaining existing populations of native cold-water aquatic species. Over the last century, most native fish and amphibians have declined in abundance and distribution throughout the western U.S., including northwest Montana. It is unknown whether, or to what degree, these changes are attributable to climate trends. Potential climate-induced trends of altered streamflow timing, lower summer flows, and increased water temperature will likely reduce the amount, quality, and distribution of habitat suitable for native trout, and contribute to fragmentation of existing populations. Climate related impacts are likely to add cumulatively to other stressors on native fish and amphibian species. Non-native trout and other aquatic species better adapted to warm water temperatures may increase in abundance and expand their existing ranges.

These climatic and hydrologic trends, combined with climate-related trends in wildfires and forest mortality from insects and diseases, can significantly affect aquatic ecosystems and species (Dunham et al. 2003b, Casola et al. 2005, Dunham et al. 2007, Isaak et al. 2010). A growing body of literature has linked these hydrologic trends with impacts to aquatic ecosystems and species in western North America, often as a result of climate-related factors affecting stream temperatures and the distribution of thermally suitable habitat (Petersen and Kitchell 2001, Morrison et al. 2002, Bartholow 2005, Kaushal et al. 2010, Isaak et al. 2010). Lower summer streamflows and higher air temperatures, as observed over recent decades in northwestern Montana, are generally expected to result in increased stream temperatures. However, stream temperatures are controlled by a complex set of site-specific variables; including shading from riparian vegetation, wind velocity, relative humidity, geomorphic factors, groundwater inflow, and hyporheic flow (Caissie 2006).

Potential impacts to fish include:

- Egg incubation and fry emergence may be adversely affected due to flood flows, dewatering, and/or water temperatures. Shifts in the timing and magnitude of natural runoff will likely introduce new selection pressures that may cause changes in the most productive timing or areas for spawning.
- Spring/summer rearing may be adversely affected due to reduction in stream flow and higher water temperatures.
- Overwinter survival may be positively affected by higher winter water temperatures enabling fish to feed more actively, potentially increasing growth rates if sufficient food is available. If food is limited, the elevated metabolic demands could reduce winter growth and survival.

D.1 Effects of Climate Change on Bull Trout and Critical Habitat

Based on modeling, Rieman et al. (2007) indicated that the effects of climate change on bull trout populations in the United States are more pronounced in some regions than in others because bull trout are distributed across a broad range of environments and landforms of varied relief. Future loss of bull trout habitat due to climate warming within the interior Columbia River basin was predicted to be 18 to 92 percent of habitat areas that are currently thermally suitable and 27 to 99 percent of large (> 10,000 ha) habitat patches (Rieman et al. 2007). If that were to occur, bull trout would remain in only a few high-elevation strongholds, becoming functionally extinct because the populations would be too small and isolated to guarantee ample genetic flow (Rieman et al. 2007). Because loss and fragmentation of habitats with warming has important implications for bull trout conservation, the loss of isolated patches of habitat could affect bull trout populations at a disproportionately greater level than that predicted based only on the overall loss of habitat area (Rieman et al. 2007). The model also predicted that of the three major bull trout basins in Montana, the Clark Fork River basin is at greatest risk from climate change, followed by the Flathead and Kootenai River basins.

Bull trout is the native trout species most vulnerable to potential increases in stream temperatures because it has the coldest range of thermally suitable habitat among native salmonids in the Northern Rockies. For this species, increasing stream temperatures may cause a net loss of habitat because areas are not available further upstream to replace those that become unsuitably warm. Warmer stream temperatures may also lead to nonnative fish and other aquatic species moving into previously unsuitable upstream areas where they will compete with native species (Rieman et al. 2007, Haak et al. 2010)

Projected increases in air temperatures, along with projected decreases in summer stream flows, will likely lead to warmer stream temperatures in the Columbia River basin, particularly during summer low flow periods. Recent scientific publications suggest that projected air temperature changes are likely to reduce the distribution of thermally suitable natal habitat for bull trout, fragment existing populations, and increase risk of local extirpation (Rieman et al. 2007, Isaak et al. 2010). However, the risk of climate-induced extirpation in subbasins of northwestern Montana may be less than other, relatively drier and warmer, subbasins in the Columbia River basin (Rieman et al. 2007).

Effects of climate change on bull trout described above, largely describes the anticipated effects on bull trout habitat. Therefore, these same trends are expected to affect critical habitat. One objective of the 2010 final rule designating bull trout critical habitat was to identify and protect those habitats that provide resiliency for bull trout use in the face of climate change. Over a period of decades, climate change may directly threaten the integrity of the essential physical or biological features essential for bull trout critical habitat. Protecting bull trout strongholds and cold water refugia from disturbance and ensuring connectivity among populations were important considerations in addressing this potential impact. Additionally, climate change may exacerbate habitat degradation impacts both physically (e.g., decreased base flows, increased water temperatures) and biologically (e.g., increased competition with non-native fishes).

IV. Environmental baseline

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area which have already undergone section 7 consultations and the impacts of State and private actions which are contemporaneous with the consultations in progress.

A. Status of the species within the action area

The Flower Creek dam, reservoir, and diversion is a typical system within the range of bull trout in the Intermountain West that has resulted in isolated populations of bull trout above a storage reservoir. Some bull trout populations have been eliminated but several persist including systems where limited spawning areas occur in headwater stream reaches upstream of the reservoir (e.g., East Fork Rock Creek Reservoir; MacDonald Reservoir, Tabor Reservoir, Painted Rocks Reservoir, Nevada Creek Reservoir). Some evidence (indicated below) shows that bull trout persist in the Flower Creek watershed. The U.S. Forest Service 2000 Middle Kootenai section 7 watershed baseline assessment stated that Flower Creek was a stream that supports bull trout and that bull trout were collected in Flower Creek in 1960, 1961, and 1962 and were estimated to comprise 5.5% of the fish population (by number) according to Huston (1961, 1963) (USDA Forest Service 2000).

The historic and current understanding of bull trout life history in Flower Creek is not well understood or documented. It appears the construction of the Flower Creek dam and the lower diversion dam in 1946 eliminated the connection of Flower Creek above river mile 5 to the Kootenai River and isolated any bull trout to areas above these dams. Bull trout that may persist are likely rare in abundance and isolated above these dams. However, bull trout may out-migrate through these dam outlets, but upstream passage is not possible because upstream fish passage facilities were not built as part of the original construction, nor are they designed or planned for the proposed new Flower Creek Dam Replacement project**.**

<u>Population Status</u>: The action area includes the area of the Flower Creek Dam storage reservoir, the Flower Creek damsite, the entire downstream stream segment of Flower Creek below the damsite to the lower diversion dam structure (about one mile), and 1 mile of Flower Creek below the lower diversion dam structure. The entire action area falls within the Kootenai River Core Area.

Although it is assumed that bull trout inhabited Flower Creek before the municipal water works facilities were constructed in 1946, evidence collected several years after showed that bull trout could still be found in Flower Creek. Data from the 1959 Montana Fish and Game Department inventory of Flower Creek showed that a 400 foot electro-fished section produced 11 bull trout (called Dolly Varden at that time) in the 4 to 14 inch size range (Montana Fish and Game 1959-1960. In the early 1960's the Montana Fish and Game Department conducted population

surveys and found 24 bull trout above the dam in one electro-fished section (Montana Fish and Game 1960-1961). Bull trout were not found during sampling in 1994 however (Huston as reported in MBTSG 1996). In 1996 it was reported that a resident population of bull trout existed in upper Flower Creek (MBTSG 1996) and according to the current MFISH database bull trout are considered rare or unknown in the lower reaches of Flower Creek. The MBTSG (1996) identified as a data need that more information about the status of the bull trout population in Flower Creek was needed.

In 2009 electro-fishing surveys, the U.S. Forest Service did not observe bull trout in upper Flower Creek drainage (MFISH database) and more recently reported that no bull trout have been collected from Flower Creek in the past 10 years (BT CS strategy 2013 pg 545). However, in 2012, two bull trout x brook trout hybrids (likely F1 generation) were sampled in electro-fishing surveys (USDA RD BA 2013; MMC technical memorandum, unpublished data, 2012). One hybrid was sampled above Flower Creek Dam and one below the lower diversion dam. This most recent data indicate that bull trout continue to persist in Flower Creek and it is probable that a small resident, disjunct population exists in upper Flower Creek drainage above Flower Creek reservoir and dam (USDA Forest Service 2000).

Habitat Status:

Flower Creek is a spring fed creek with peak flows corresponding to snowmelt water runoff. A USGS stream flow station (12303100) located about 1 mile above Flower Creek Reservoir is not currently operated; however, data from this station for a period of record from 1961-1992 show a long-term maximum average monthly flow of 88 cfs and a long-term average monthly minimum flow of 9.1 cfs. Peak flows within Flower Creek typically occur in the months of May and June and low flows typically occurring from August through the winter months to March. Total watershed area above the gauge station is approximately 11.1 square miles.

Although no data exists to confirm the presence of bull trout occupying Flower Creek reservoir, it likely serves as rearing habitat seasonally for resident bull trout that moved downstream from the upper watershed. The quality of the habitat conditions for rearing bull trout are also unknown; however, in general bull trout appear to use benthic areas of lakes but use predominantly shallow zones (less than 130 feet deep) provided water temperatures are less than 59ºF (MBTSG 1998). In summer, bull trout appear to occupy primarily the upper hypolimnion of deep lakes but will forage opportunistically in warmer, shallower waters. In winter, conditions can be a significant stress factor, especially without sufficient reservoir pool depths. However, because Flower Creek reservoir pool remains full during winter, reservoir pool level should not be a stress factor for over-wintering bull trout.

A recent assessment of bull trout population and habitat parameters in the Flower Creek drainage was prepared by the Kootenai National Forest (USDA Forest Service 2013). In part, the assessment was based on 19 habitat parameters described in the Service's Matrix (USDI Fish and Wildlife Service 1998a) used to assist agencies in making endangered species act determinations of project effects at the core area level. Information was available for only 9 of the Matrix parameters and the assessment was primarily based on aerial imagery rather than on site observations. However, this information constitutes the most recent information for the habitat

conditions in the Flower Creek drainage. The Forest concluded that nearly all habitat parameters (8 of 9 parameters), that had enough information available for ranking, were rated as "Functioning at Risk" which means the current baseline condition of Matrix parameter provide for persistence of bull trout but in more isolated populations and the current conditions may not promote recovery of the species or its habitat without active or passive restoration efforts. One parameter ("man-made physical barriers") was rated as "Functioning at Unacceptable Risk" which means the current baseline condition of this Matrix paramenter contribute to the absence of bull trout from historical habitat, or bull trout are rare or being maintained at a low population level; although the habitat may maintain the species at this low persistence level, active restoration is needed to begin recovery of the species. This condition is directly related to the presence of the dams on Flower Creek.

The Kootenai National Forest assessment (USDA Forest Service 2013) describes the upper half of the Flower Creek drainage, basically the portion upstream of Flower Creek Reservoir, as having a low road density, a heavy forest canopy, and a well-vegetated riparian zone. The headwaters of Flower Creek lie in the undeveloped drainage of the Cabinet Mountains Wilderness Area. This contrasts with the lower half of the drainage, downstream of the Action Area, which is described as having a high road density (and urban setting through the City of Libby) which may be impactive to disturbances of the stream channel and riparian vegetation, channel braiding, and other habitat parameters as the stream flows into the Kootenai River.

B. Factors affecting species environment within the action area

The major factors currently affecting bull trout in the Flower Creek drainage are: 1) lack of connectivity due to the presence of two dams; 2) stream temperature effects due to reservoir impoundment and water withdrawal; 3) habitat loss due to water withdrawal and associated decreased instream flow and chronic dewatering in the lower reaches; and 4) presence of non-native fish, particularly brook trout. Other contributing factors may include the legacy effects of past logging and road construction; however, this activity has been limited to the lower stream reaches in this drainage because of the protection afforded to a municipal watershed.

Connectivity

Construction of the original Flower Creek Dam in 1946, and the downstream water diversion structure, created an upstream fish passage barrier for migratory fishes, including bull trout that may have ascended the stream from the Kootenai River. These barriers have separated the upper reaches of the stream, which are typically favored by migratory bull trout for spawning and rearing purposes, from bull trout populations residing in the Kootenai River. The documentation of the presence of resident (non-migratory) bull trout upstream of Flower Creek Dam indicates a population of bull trout persisted despite loss of connectivity to the Kootenai River. Downstream movement of bull trout is still possible with the dams in place; however, this type of one-way movement can be detrimental to the upstream fish population because downstream moving fish are lost to the population.

Stream Temperature

Operation of Flower Creek Dam results in a warming of water temperatures in Flower Creek downstream from the dam during the warm summer months (mid-July into October). This condition occurs because warm surface water in the reservoir flows over the dam spillway and enters the stream reach immediately below the dam. The water temperatures in Flower Creek downstream of the reservoir are warmer by about 4° to 5° C downstream of the dam. This makes water temperatures in Flower Creek downstream of the dam exceed bull trout tolerances for "preferred" water temperatures for most life stages (see bull trout temperature preference discussion in Section A.4).

Intermittency

Withdrawal of water from the Flower Creek drainage for the City of Libby's municipal water supply contributes to length of time and severity of dewatering of the stream channel downstream of the water supply pipeline diversion dam. This condition is known as intermittency and it affects the length of time that fish can freely move up or downstream within a system. Intermittency can seasonally reduce the amount of fish habitat available in a stream and it can contribute to raising stream water temperatures.

Non-native Fish

Non-native brook trout are found throughout the Flower Creek drainage from the stream entering Flower Creek Reservoir to the confluence with the Kootenai River. Brook trout are genetically similar enough to bull trout to permit hybridization. Offspring of the bull trout/brook trout cross are likely to be infertile, but the loss of a spawning opportunity by creating infertile hybrids reduces the reproductive output of bull trout. While it has the same effect of brook trout, brook trout have a higher fecundity rate and lower age at first reproduction, so when they co-occur, brook trout can become numerically dominant which may eliminate local bull trout populations. With the discovery of two bull/brook trout hybrids in Flower Creek in 2012 (USDA RD BA 2013), this process may be currently underway in Flower Creek.

V. Effects of the Action

"Effects of the action" refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action that will be added to the environmental baseline. Direct effects are considered immediate effects of the project on the species or its habitat. Indirect effects are those caused by the proposed action and are later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend upon the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consultation.

A. Effects of the Proposed Action to Bull Trout

The effects of the Flower Creek Dam Replacement Project proposed action on baseline conditions are described in the USDA RD BA (2013). Some of that information is summarized or directly excerpted below; other analyses are included where the Service concluded further

explanation of effects was needed to clarify effects to bull trout populations or to bull trout habitat. Several components of the proposed action have the potential to adversely affect bull trout in the action area. The primary adverse effect to bull trout associated with the project are fish entrainment and stranding through the reservoir during the extended reservoir drawdown period. Following completion of the dam chronic entrainment of fish during the operational life of the reservoir will also adversely affect bull trout. Blockage of upstream moving fish by the diversion dam and Flower Creek Dam currently occurs; since no fish passage facilities are proposed for the project, this adverse effect to bull trout will be perpetuated through the life of the project. Temporary elevation of sediment loads in Flower Creek (caused by the reservoir drawdown and construction activities) downstream of the cofferdam will also adversely affect bull trout and their habitats. The temporary loss of bull trout habitat in the reservoir and in the cofferdam bypass reach of Flower Creek, and the permanent loss of bull trout habitat at the new dam site will also adversely affect bull trout. Bull trout could benefit from the change in stream temperature due to the operations of the new Flower Creek Dam.

A.1 Entrainment and Stranding

The water level in Flower Creek Reservoir will gradually be lowered approximately 25 feet over a two week period during construction of the new dam (USDA RD BA 2013). This gradual lowering of the reservoir is intended to minimize the potential for stranding fish in isolated pools in the reservoir area and to minimize entraining fish through the dam. It is not known if pools of water will be isolated in topographic depressions or in the old stream channels of Flower Creek previously inundated by the reservoir. If isolated pools of water do occur, then fish could be trapped, including bull trout, and those fish will likely perish during the 41 week construction period (drying up of the pools, predation, freezing are probable causes of fish losses).

The reservoir water volume will be reduced by about 82% during the drawdown period; 220 acre-feet of storage will be reduced to 40 acre-feet of storage (USDA RD BA 2013). As waters in the reservoir recede during the reservoir drawdown, fish residing in the reservoir will be crowded into a fraction of the space that was available at reservoir full pool conditions. Fish may remain in the reduced reservoir area, move upstream into Flower Creek, or move downstream through the dam (entrainment). Fish in close proximity to the dam during the two week drawdown will be susceptible to entrainment through the dam as base flows through the dam increase about 70% over historic baseflow conditions (minimum flows = 9.1 cfs, an additional 6.5 cfs of flow will result from dewatering the reservoir). During the remaining 41 week construction period, fish present in the reduced reservoir area will be susceptible to entrainment whenever they move into the near vicinity of the dam. Fish that are entrained through the dam will most likely not be able to return upstream through the bypass pipeline to the reservoir or to upstream reaches of Flower Creek. These fish and their future reproductive potential will be lost to the upstream populations.

A.2 Fish Passage

Construction of the original Flower Creek Dam in 1946 (and construction of the downstream water diversion structure) have created upstream fish passage barriers for upstream moving fishes (including bull trout) which may have ascended the stream from the Kootenai River.

These barriers have separated the upper reaches of the stream, which are typically favored by migratory bull trout for spawning and rearing purposes, from bull trout populations residing in the Kootenai River. Loss of the migratory component of bull trout from the Kootenai River contributed to the "functioning at unacceptable risk" rating of Flower Creek recently arrived at by the Kootenai National Forest (USDA Forest Service 2013). Additionally, the documentation of the presence of resident (non-migratory) bull trout upstream of Flower Creek Dam indicates a population of bull trout persisted despite loss of connectivity to the Kootenai River. Downstream movement of bull trout is still possible with the dams in place; however, this type of one-way movement can be detrimental to the upstream fish population because downstream moving fish and their reproductive potential are lost to the upstream population.

Development of fish passage facilities at Flower Creek Dam and the downstream water diversion dam are not proposed as part of this project. Without fish passage facilities, the adverse effects to migratory and resident populations of bull trout will be perpetuated for the life of the project.

A.3 Sediment

The proposed staged drawdown of the Flower Creek Reservoir is intended to manage the rate at which the existing volume of mobilized sediment (often expressed as total suspended solids or TSS) is entrained by the water leaving the reservoir. The staged drawdown allows for the controlled release of reservoir sediment at smaller volumes of release over time. The drawdown will begin with gradual water release and continue for a two week period. The gradual drawdown will allow improved management and a slower rate of sediment entrainment by reducing the rate of reservoir drawdown.

Suspended sediment can have both acute and sublethal effects on salmonids (Sigler et al. 1984). Potential effects on fish resulting from elevated sediment concentrations can vary from paralethal and lethal effects at considerably higher concentrations (Newcombe and Jensen 1996). In general, short-term concentrations of suspended sediment have to be very high to cause acute lethal effects. As such, sublethal and paralethal effects are much more likely to result from most activities that produce moderate amounts of suspended sediment for limited periods of time. Behavioral effects could include an alarm reaction, abandonment of cover and possible avoidance response. Sublethal effects include short-term to long-term reduction in feeding rate and success, increased rate of coughing and respiration, impaired homing, poor condition, and moderate habitat degradation. Paralethal effects include reduced growth rate, delayed hatching, reduced fish density, and moderate habitat degradation (Newcombe and Jensen 1996). The severity of effects on fish will increase as a function of the product of concentration and the duration of exposure (Newcombe and Jensen 1996).

The Service anticipates that the movement of an unknown amount of volume of activity-created sediment from the reservoir drawdown, and possibly from the dismantling of the old Flower Creek Dam could result in adverse impacts to bull trout and bull trout habitat in the short and intermediate term of the project. Immediately or soon-after the initiation of the drawdown, it is likely that a fraction of sediment will be mobilized and suspended into the remaining water body of the reservoir. As the water drains from the reservoir area, the suspended sediment will settle out of the water column and be deposited over the existing

substrate of Flower Creek downstream from Flower Creek Dam and may eventually reach the impoundment of the lower diversion dam.

In the reach below the Flower Creek dam-site the sediment that is deposited, at least in the short-term, could reduce pool volumes, quality of spawning habitat, and quantity and quality of habitat for rearing bull trout. Deposition may also occur over portions of the creek bottom where macroinvertebrates are an important food resource for juvenile bull trout and where negative impacts could occur to this food resource. These impacts are anticipated to gradually diminish as the amount of sediment deposition (particularly coarse materials) moves downstream following the drawdown. During the first spring run-off period flushing flows are likely to mobilize any residual sediment that is remaining and distribute this material downstream. By the second year of operation and completion of the new Flower Creek Dam, sediment levels are expected to return to near background pre-project levels. Most of the fine sediments will have been transported downstream to the lower dam impoundment and likely passed through downstream to the Kootenai River.

A.4 Habitat

Reservoir

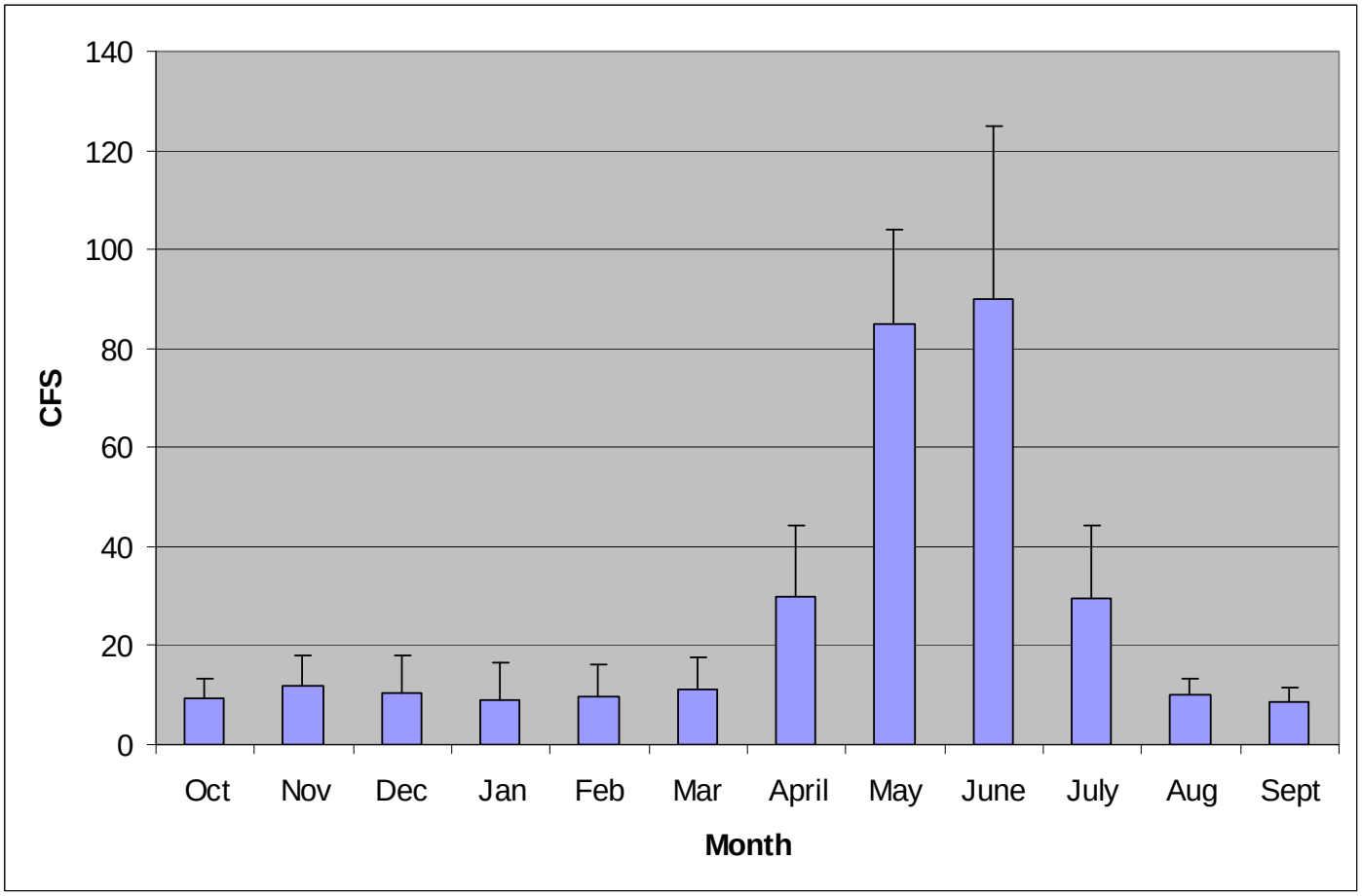
Bull trout habitat directly affected by the proposed action includes: over-wintering and rearing habitat in Flower Creek Reservoir and stream habitats affected by water withdrawals. Bull trout residing in Flower Creek Reservoir may be using that habitat as rearing habitat, over-wintering habitat, or general foraging habitat. Temporarily (about one year), this reservoir habitat will be greatly reduced. The reservoir water volume will be reduced by about 82% during the drawdown period; 220 acre-feet of storage will be reduced to 40 acre-feet of storage (USDA RD BA 2013). This temporary habitat loss will be followed by a slight permanent increase in the available habitat as the reservoir level will be increased two feet in elevation resulting in an increase in reservoir volume from 220 acre-feet to 230 acre-feet of water (an increase of about 4 %). The temporary loss of reservoir habitat may adversely affect bull trout by crowding fish into a smaller volume of water; this may increase predation on small bull trout by larger fish (bull trout or brook trout), and it may increase predation opportunities for larger bull trout on smaller fishes.

Stream

The standing crop of fish that a particular stream supports can vary over time. For Montana's streams, standing crops are typically lowest following winter and highest in the fall after the summer growing season. The magnitude of these annual lows and highs can vary substantially from year to year. A factor often considered a major, if not the overriding, cause of this variability within a particular stream is the year-to-year variation in streamflows. Simply stated, more water translates into more space for fish, and the population increases to fill this void. Conversely, lower flows provide less space and lead to a reduction in fish standing crops. This has led to the belief that the period of lowest streamflows is the single factor having the greatest impact on a stream's carrying capacity (standing crops of fish that can be maintained indefinitely by the aquatic environment) (Everhart and Youngs 1981).

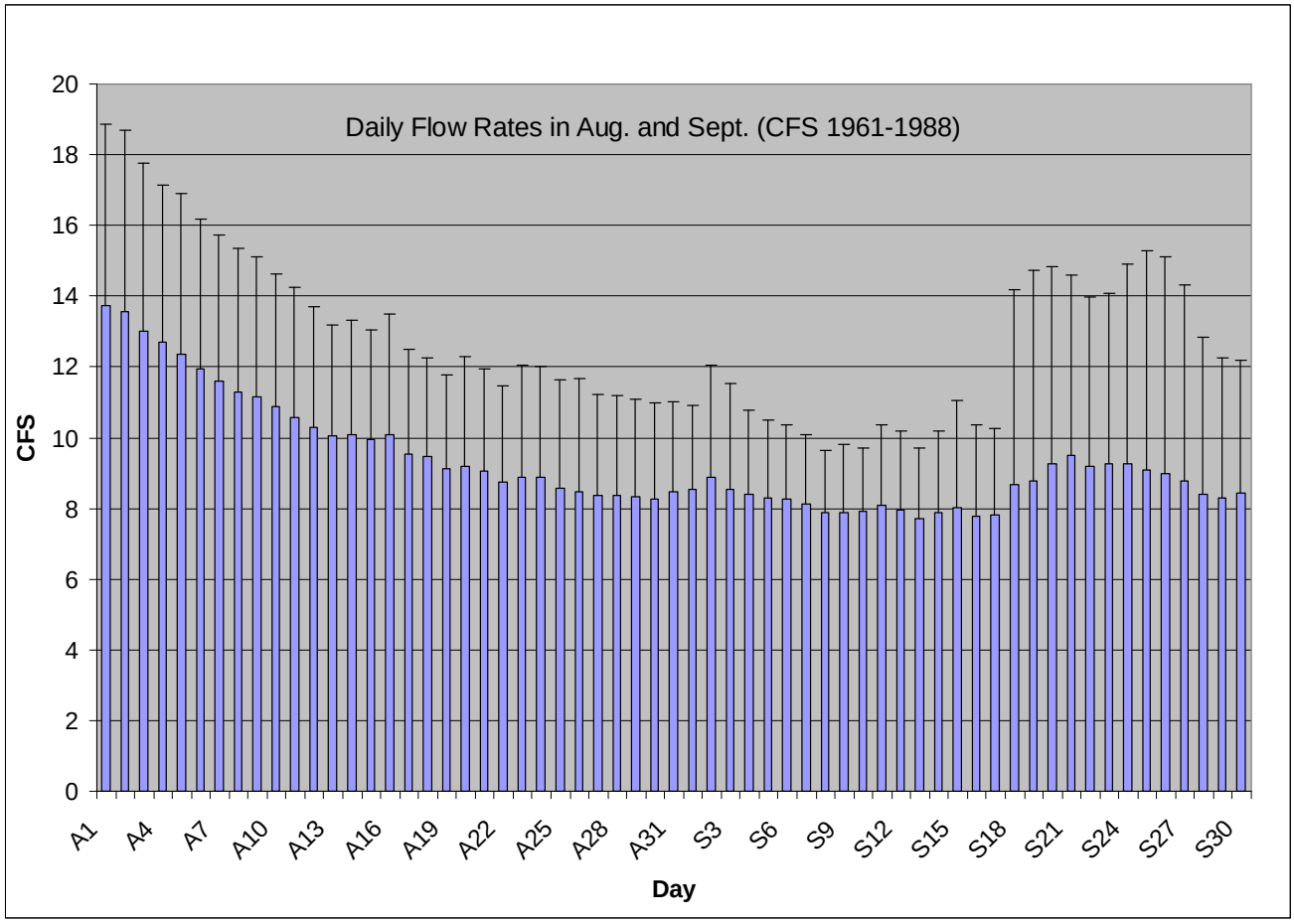
The natural hydrograph of Flower Creek (Figure 2 and Figure 3) has been altered due to the construction and operation of the two dams and the associated water withdrawal for municipal water supply. This condition will be perpetuated for the life of the project.

Figure 3. Average monthly flow at USGS gaging station # 12303100 on Flower Creek (1961-1988).



http://pubs.usgs.gov/wri/wri934076/stations/12303100.html

Figure 4. Average daily flow for August and September at USGS gaging station # 12303100 on Flower Creek (1961-1988)\



http://pubs.usgs.gov/wri/wri934076/stations/12303100.html

A.5 Stream Water Temperature

As previously noted, operation of the existing Flower Creek Dam during the summer/early fall months (mid-July into October) results in warming of water temperatures in Flower Creek downstream of the dam. This condition occurs because warm surface water in the reservoir flows over the dam spillway and enters the stream (mixing with some cold water flows discharged at the bottom of the dam). The water temperatures in Flower Creek upstream of the reservoir are warmed about 4° to 5° C. as they emerge into Flower Creek downstream of the dam. This makes water temperatures in Flower Creek downstream of the dam exceed bull trout tolerances for preferred water temperatures for most life stages (see bull trout temperature preference discussion in Section A.4). The proposed action for the Flower Creek Dam Replacement Project identified the potential to utilize a low-level water release system in order to cool downstream water temperatures. If the Operation Plan for the Dam and Reservoir calls for implementing such an operation, then benefits to bull trout could occur as stream temperatures during the warm summer months would be cooled and would likely approximate

the water temperatures of Libby Creek upstream of the reservoir which is suitable for bull trout habitation.

B. Species Response to the Proposed Action

Bull trout response to the proposed action would vary depending on a number of factors. The severity and extent of the effects of particular activities associated with the proposed action, described above, depend on existing site specific conditions such as: 1) current level of sediment embeddedness in Flower Creek substrates downstream of the dam; 2) future hydrologic conditions (rain-on-snow events, timing of snow melt and spring runoff); 3) unknown topographic details (presence and extent of surface land depressions inundated by the reservoir that could become isolated pools during drawdown); and 4) other physical and environmental elements. Bull trout response to the effects of the proposed activities also depend on biological factors such as: 1) size and distribution of the Flower Creek bull trout local population; 2) extent of brook trout hybridization with bull trout; 3) bull trout movement behavior to reservoir drawdown; 4) extent of seasonal bull trout migrations upstream in Flower Creek from the Kootenai River; 5) locations and extent of bull trout spawning and rearing habitat in the drainage, and 6) other factors that produce a biological response either directly or indirectly. For these reasons the response of bull trout to the individual and to the overall effects of the proposed action are unquantifiable and not easily predicted with certainty.

B.1 Entrainment and Stranding

The response of bull trout would be the same for the effects of both entrainment through the dam and stranding in the reservoir pool during the two week drawdown period and throughout the construction period (about one year). Both effects would result in the loss of bull trout to the local population. Bull trout that reside in the reservoir will be susceptible to entrainment through the dam via the bypass pipeline. As these fish exit the bypass pipeline they will enter Flower Creek downstream of the coffer dam. Those bull trout that are entrained will not be able to return upstream to the reservoir or Flower Creek upstream of the reservoir because of the water velocity barrier in the pipeline and the extent of the bypass pipeline (235 feet in length). These fish will be lost to the bull trout population upstream of Flower Creek Dam. Likewise, any bull trout trapped in isolated pools in the dewatered reservoir area will be lost to the bull trout population through mortality due to desiccation, predation, or freezing.

Although little information is available on bull trout abundance and distribution in the Flower Creek drainage, bull trout occurrence has been described as “rare” (USDA RD BA 2013). Loss of any individuals from a small population of bull trout represents a significant loss of reproductive potential. Such a loss, if it occurs, would likely result in a response of population decline and increase in risk to persistence of the local bull trout population.

B.2 Fish Passage

The response of bull trout to the effects of maintaining upstream fish passage barriers in the Flower Creek drainage (two dams) will vary depending on the particular life form affected (migratory or resident forms). Migratory bull trout from the Kootenai River undoubtedly

ascended Flower Creek for spawning purposes prior to construction of the dams. Preservation of the migratory form of bull trout is a key element in achieving recovery of bull trout (USDI Fish and Wildlife Service 2002b). Migratory bull trout may enter Flower Creek during seasonal high water conditions and migrate upstream to the diversion dam seeking spawning habitat. The diversion dam is a fish passage barrier and bull trout seeking spawning habitat will be restricted to the stream reach downstream of the dam. The proposed action provides for the capability to greatly lower stream water temperatures in Flower Creek downstream of the new Flower Creek Dam and downstream of the water diversion dam (USDA RD BA 2013). If an Operations Plan for the new dam and reservoir is fully developed and provides for implementation measures to lower stream water temperatures, as proposed, then improved conditions for bull trout spawning and rearing will likely occur in Flower Creek downstream of the diversion dam. The extent and condition of potential bull trout spawning and rearing habitat in Flower Creek downstream of the diversion dam is not known. The response of migratory bull trout to the fish passage barrier at the water diversion dam would be to restrict their upstream movement and reproductive potential to the reach of Flower Creek downstream of the dam. This stream reach may or may not be suitable for bull trout reproduction, but if so, the fish passage barrier limits the amount of reproduction that could potentially occur and thus limits the size of the migratory population that could exist in this reach of Flower Creek.

Approximately one mile of Flower Creek flows from Flower Creek Dam downstream to the water pipeline diversion dam. If the previously mentioned water temperature improvements are implemented by operation of Flower Creek Dam and Reservoir, then this reach of Flower Creek has a high potential to be utilized by migratory bull trout if fish passage were facilitated at the water diversion dam. It should be noted that the extent and condition of potential bull trout spawning and rearing habitat in Flower Creek downstream of Flower Creek Dam is not known. The response of bull trout to the fish passage barrier caused by the diversion dam is limitation to occupy and utilize the reproductive potential of a substantial reach of bull trout habitat. The population response of migratory bull trout would be limitation of population size. The same limitations to migratory bull trout population size (by prevention of utilization of Flower Creek upstream of Flower Creek Dam) could be extrapolated to the fish passage barrier created by Flower Creek Dam. However, the dam height and downstream topography make fish passage at that dam infeasible, therefore, that bull trout response will not be considered further.

The resident bull trout response to the upstream fish barriers created by both Flower Creek Dam and the water diversion dam is similar to that described, above, for bull trout response to entrainment effects. That is, the dams created fish passage barrier to upstream fish movement resulting in loss of fish to the local bull trout population upstream of Flower Creek Dam. Loss of any individuals from a small population of resident bull trout represents a significant loss of reproductive potential. Such a loss, if it occurs, would likely result in a response of population decline and increase in risk to persistence of the local bull trout population.

B.3 Sediment

As note above, the Service anticipates that the movement of an unknown amount of volume of activity-created sediment from the reservoir drawdown, and possibly from the dismantling of the old Flower Creek Dam could result in adverse impacts to bull trout and bull trout habitat in the

short and intermediate term of the project. Immediately or soon-after the initiation of the drawdown, it is likely that a fraction of sediment will be mobilized and suspended into the remaining water body of the reservoir. As the water drains from the reservoir area, the suspended sediment will settle out of the water column and be deposited over the existing substrate of Flower Creek downstream from Flower Creek Dam and may eventually reach the impoundment of the lower diversion dam. Likewise, sediment is anticipated to enter Flower Creek and affect bull trout and bull trout habitat as a result of cofferdam construction, general construction activities, and repair of diversion dam leakage.

The expected response of bull trout to elevated sediment levels or to sediment plumes in Flower Creek resulting from the proposed actions would vary, depending on the life stage involved, from direct mortality to minor avoidance and behavioral reactions. It is anticipated that some negative physiological reactions would occur that would lower the fitness and survivability of individuals for a short time frame. A population level response is not anticipated for the area of influence downstream of Flower Creek Dam.

Bull trout habitat, as noted above, is also expected to be impacted by sediment in the short-term (1 - 2 years) and possibly last for another few years (2 - 3 years) as the system recovers through natural processes. If bull trout reproduction were occurring in the area of influence by elevated sediment level, then a negative response to egg, fry, and juvenile survival would be expected. This in turn would cause a response of reduced population size and fitness.

B.4 Habitat

Reservoir

As noted above, bull trout habitat directly affected by the proposed action includes: over-wintering and rearing habitat in Flower Creek Reservoir. Bull trout residing in Flower Creek Reservoir may be using that habitat as rearing habitat, over-wintering habitat, or general foraging habitat. Temporarily (about one year), this reservoir habitat will be greatly reduced. The reservoir water volume will be reduced by about 82% during the drawdown period; 220 acre-feet of storage will be reduced to 40 acre-feet of storage (USDA RD BA 2013). This temporary habitat loss will be followed by a slight permanent increase in the available habitat as the reservoir level will be increased two feet in elevation resulting in an increase in reservoir volume from 220 acre-feet to 230 acre-feet of water (an increase of about 4 %). The temporary loss of reservoir habitat may adversely affect bull trout by crowding fish into a smaller volume of water; this may increase predation on small bull trout by larger fish (bull trout or brook trout), and it may increase predation opportunities for larger bull trout on smaller fishes.

The expected response of bull trout to these effects of the proposed action would be a reduced population size as an unknown number of individuals are lost to the population residing upstream of Flower Creek Dam. No measureable response is expected from the minor increase in reservoir habitat resulting from expanding the size of the reservoir elevation by 2 feet.

Stream

Historically, the natural hydrograph of Flower Creek has been altered due to the construction and operation of the two dams and the associated water withdrawal for municipal water supply. The proposed action will perpetuate this condition for the life of the project. The negative effects of reduced stream flow, previously described, are expected to limit the existing bull trout population in Flower Creek downstream of Flower Creek Dam to levels that currently exist (proposed potential improvements in water temperature may cause a positive response of bull trout in the area of reduced habitat availability caused by the water withdrawals).

B. 5 Stream Water Temperatures

The proposed action for the Flower Creek Dam Replacement Project identified the potential to utilize a low-level water release system in order to cool downstream water temperatures. The Service assumes that the Operation Plan for the Dam and Reservoir calls for implementing such an operation, then benefits to bull trout could likely occur as stream temperatures during the warm summer months would be cooled and would likely approximate the water temperatures of Flower Creek upstream of the reservoir which is suitable for bull trout habitation. If such conditions are duplicated downsteam of Flower Creek Dam, then the expected response of bull trout would likely be positive. With improved water temperature conditions, the approximately one mile reach of Flower Creek between the two dams may become suitable habitat for bull trout spawning and rearing. It is possible that bull trout moving downstream out of Flower Creek Reservoir could occupy this stream reach. It is also possible that development of a fish passage facility at the water diversion dam could provide upstream passage for migratory bull trout from the Kootenai River. If this occurred, then migratory bull trout spawning could occur in this reach and migratory juvenile bull trout could rear in the stream reach until they migrated downstream to the Kootenai River. Both of these situations (resident or migratory occupancy of the one mile stream reach between the dams) could occur with improvement to the water temperature conditions in Flower Creek. Either or both of these situations would result in a positive response from bull trout with additional fish being added to the local population.

VI. Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The greatest issues facing bull trout in the Kootenai River Core Area include mining operations that encompass small mining claims and large commercial private mining operations, non-native fish species (e.g., brook trout, lake trout brown trout), and habitat isolation (USDI Fish and Wildlife Service 2002b). Potential threats specific to the Flower Creek watershed include fish passage/dewatering issues, introduced species (e.g., brook trout), angling and harvest (legal or illegal), forest management practices and forest roads, and residential development and urbanization along the lower reaches of the creek in or near the City of Libby (USDI Fish and Wildlife Service 2009).

The biological assessment (USDA RD BA 2013) indicates that ongoing and reasonably

foreseeable actions on private lands within the watershed include residential development, riparian disturbance, streambank armoring, and water withdrawals. Effects to fish habitat resulting from these practices include reduced channel stability, decreased habitat complexity, increased nutrient inputs, increased sedimentation, increased stream temperature, and reduced base flows. It is unlikely however, that any of these activities would occur to any great degree if at all. The amount and intensity of development on private land would not change the scope or magnitude of effects anticipated from this proposal.

In summary, cumulative watershed effects within the action area are not likely to increase over the project duration because the action area is a narrow stream corridor surrounded mainly by federal and state lands. Development of private lands appears to be limited to the lower Flower Creek reach in and near the City of Libby and most of these residential and commercial private appear to be fully developed.

VII. Conclusion

A. Jeopardy analysis

Jeopardy determinations for bull trout are made at the scale of the listed entity, which is the coterminous United States population (64 FR 58910). As described above, the jeopardy analysis in this BO follows a hierarchal relationship between units of analysis that characterize effects at the lowest level or smallest scale aggregated to the highest level or largest scale of analysis.

The data and information provided in the biological assessment (USDA BA 2013) and provided to the Service to date suggests that construction activities related to the dismantling of the old Flower Creek Dam, lowering of Flower Creek Reservoir for an extended period, construction of the new Flower Creek Dam and repairs of the lower diversion dam will significantly alter existing habitat conditions for bull trout and may displace or entrain individual bull trout. The short-term will result in adverse effects to stream temperature, sediment levels, and habitat quantity and quality which in turn would adversely affect individual bull trout and their habitats within the vicinity of the proposed action.

The population of bull trout in Flower Creek is not a primary local population that provides principal support for the Kootenai River core area population. Furthermore, the potential impacts would be confined to only local individual bull trout inhabiting the action area and associated habitat potentially occupied by these individuals within the action area of the Flower Creek watershed.

As a result, the Service concludes that implementation of this project is not likely to jeopardize the continued existence of bull trout at the scale of the Kootenai River Core Area, and by extension not likely to jeopardize at the Kootenai River Management Unit and the larger scale of the Columbia River Interim Recovery Unit. Therefore, the Service concludes that this project will not appreciably reduce both the survival and recovery of the coterminous United States population of the bull trout in the wild (64 FR 58910; April 20, 2006. memorandum to Ecological Services Project Leaders from Assistant Regional Director – Region 1, subject line, Jeopardy Determinations under Section 7 of the Endangered Species Act for the Bull Trout).

This conclusion is further supported by the following:

- The probability of persistence of bull trout in the Kootenai River Management Unit would not be significantly reduced even if individual bull trout in the action area of the Flower Creek watershed are affected due to the anticipated low number of individual bull trout likely present in the action area and the non-vital function of the Flower Creek population in support of the Kootenai River Core Area population.

- The Kootenai River watershed is only 1 of at least 20 major watersheds forming the Columbia River basin (USDI Fish and Wildlife Service 2002b). This demonstrates the very small fraction of bull trout abundance, reproduction, and distribution of the Columbia River basin bull trout represented by the Flower Creek bull trout population within the Kootenai River Core Area.

After reviewing the current status of bull trout, the environmental baseline for the action area, the effects of the Flower Creek Dam Replacement Project, and the cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of bull trout. This conclusion is based on the magnitude of the project effects (to reproduction, distribution, and abundance) in relation to the listed population. Implementing regulations for section 7 (50 CFR 402) defines "jeopardize the continued existence of " as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species."

VIII. Incidental Take Statement

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are not discretionary, and must be undertaken by USDA so that they become binding conditions of any contract or permit issued to any party, as appropriate, for the exemption in section 7(o)(2) to apply. USDA has a continuing duty to regulate the activity covered by this incidental take statement. If USDA: (1) fails to assume and implement the terms

and conditions or (2) fails to require any party to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, USDA must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(I)(3)].

The BA (USDA BA 2013) describes activities anticipated to occur during implementation of the proposed action that may have some potential to adversely affect bull trout to such an extent that incidental take occurs. Construction activities related to lowering the reservoir water level, dismantling of the old Flower Creek Dam, construction of the new Flower Creek Dam, repairs of the lower diversion dam, and operations and maintenance of the new dam will potentially result in adverse effects to bull trout and their habitat in the affected reaches within the action area.

A. Amount or extent of take anticipated

The Service anticipates that there will be direct take to bull trout through entrainment and stranding during the two week reservoir drawdown period. Any bull trout trapped in isolated pools within the reservoir drawdown zone will likely be lost to the population through mortality caused by desiccation, predation, or freezing. Additionally, the Service anticipates that bull trout will be entrained through the dam during the one year construction period due to the 82% reduction in reservoir volume resulting in less living space for bull trout and increasing the likelihood of bull trout being in the near vicinity of the dam and susceptible to entrainment. As bull trout are entrained, those fish and their reproductive potential will be lost from the bull trout population upstream of the dam.

The Service anticipates that there will be direct take of bull trout through continued blockage of fish passage as fish attempting upstream migrations from the Kootenai River will encounter an upstream movement barrier created and maintained at the water diversion dam. Spawning movements will be altered, spawning may be delayed or abandoned, or spawning will take place in an area not conducive to successful reproduction (current warm water situation downstream of the diversion dam likely has an adverse effect on spawning and rearing success).

The Service anticipates that there will be direct take (i.e., non-lethal and lethal) of juvenile or sub-adult or adult bull trout from the proposed action. Lowering Flower Creek reservoir, construction activities associated with dismantling the old dam, construction of the new dam, and repairs of the lower diversion dam are anticipated to introduce higher levels of sediment into Flower Creek that are significantly above current baseline levels and to the degree that individual bull trout will be harmed, harassed, and potentially killed over the projected one year construction period of the project and most likely beyond the one year until such time that sediment levels stabilize and return to pre-project baseline levels. Increased levels of sediment can result in sublethal and behavioral effects such as increased activity, stress, and emigration rates; loss or reduction of foraging capability; reduced growth and resistance to disease; physical abrasion; clogging of gills; and interference with orientation in homing and migration (McLeay et al. 1987; Newcombe and MacDonald 1991; Barrett, Grossman, and Rosenfeld 1992; Lake and Hinch 1999; Bash et al. 2001; Watts et al. 2003; Vondracek et al. 2003; Berry et al. 2003). The effects of increased suspended sediments can cause changes in the abundance and/or type of food organisms, alterations in fish habitat, and long-term impacts to fish populations (Anderson et al. 1996; Reid and

Anderson 1999). No threshold has been determined in which fine-sediment addition to a stream is harmless (Suttle et al. 2004). Even at low concentrations, fine-sediment deposition can decrease growth and survival of juvenile salmonids.

It has been noted in the USDA RD BA (2013) (and previously stated in this BO) that the existing warm stream water temperatures in Flower Creek downstream of Flower Creek Dam are adversely affecting several life stages of bull trout during the warm summer months. This existing condition constitutes "take" of bull trout. The proposed action for the Flower Creek Dam Replacement Project has identified the potential to utilize a low-level water release system in order to cool downstream water temperatures. Assuming the Operation Plan for the Dam and Reservoir which, as proposed, calls for implementing such an operation, then benefits to bull trout could occur as stream temperatures during the warm summer months would be cooled and would likely approximate the water temperatures of Flower Creek upstream of the reservoir which is suitable for bull trout habitation. Such an action (implementation of dam operations to cool downstream water temperatures) were successfully implemented in a timely manner it would minimize take of bull trout.

The amount of take that may result from implementation of the proposed action is difficult to quantify for the following reasons:

- The number of bull trout that reside in Flower Creek Reservoir, either seasonally or year-round, is not known. The existence or extent of depressions that may result in isolated pocket of water in the reservoir drawdown zone is not known. Therefore, it is not possible to predict how many bull trout may be stranded in isolated pools during the drawdown period.

- The actual number of bull trout that may be entrained during the reservoir drawdown or during the one year construction period cannot be measured or ascertained with any certainty because of the unknown population size and seasonal occupancy of bull trout in the reservoir and the variability (temporally and spatially) of the risk of entrainment of individual fish within proximity of the dam's outlets.

- Likewise, the number of bull trout that may be entrained during the long-term operational life of the new Flower Creek Dam cannot be measured or ascertained with any certainty because of the unknown population size and seasonal occupancy of bull trout in the reservoir and the variability (temporally and spatially) of the risk of entrainment of individual fish within proximity of the dam's outlets.

- It is difficult to determine how many bull trout occur in vicinity of the project and how many of those may be subjected to higher sediment levels related to all construction activities of the Flower Creek Dam Replacement Project.

- The extent and frequency of adult bull trout migrations upstream in Flower Creek from the Kootenai River is unknown. Therefore, it is not possible to predict how many bull trout may be adversely affected (subject to take) by maintaining the fish passage barrier caused by the diversion dam.

- The actual amount and duration of effects to bull trout may vary based upon the timing and magnitude of stream flow changes in Flower Creek during construction, the number of bull trout present in the reservoir during drawdown, the amount and duration of higher sediment levels in Flower Creek, the amount and duration of reduced available habitat to bull trout, weather events, and number of other variables.

- Minimization measures to reduce sediment input to the drainage during construction activities, including reservoir drawdown and BMPs will likely be effective to varying degrees; however, the degree of effect of any one, or combination of minimization measures, is virtually impossible to predict with any precision.

- The number of bull trout that reside in Flower Creek downstream of the Flower Creek Dam, either seasonally or year-round, is not known. Therefore, it is not possible to predict how many bull trout may be adversely affected by warm water temperatures in this one mile reach of Flower Creek during the summer months.

- Likewise, the number of bull trout that reside in Flower Creek downstream of the water diversion dam, either seasonally or year-round, is not known. Therefore, it is not possible to predict how many bull trout may be adversely affected by warm water temperatures in Flower Creek downstream of the diversion dam during the summer months.

For this BO, we relied mainly on information provided in the biological assessment (USDA RD BA 2013) and associated technical reports provided by the consultants to help determine how, when, where, and to what degree we expect adverse effects to occur to bull trout and their habitat. In turn, we used the scientific literature on bull trout; Service regulatory and policy guidance; internal and external bull trout documentation and expertise; as well as professional judgment to ascertain the level of anticipated incidental take due to the adverse effects.

For the reasons stated above, the Service has determined that the actual amount or extent of the anticipated incidental take due to the adverse effects discussed above is unquantifiable. In cases where we determine the level of take is unquantifiable, the Service uses surrogates to measure the amount or extent of incidental take, and whether the amount of take anticipated has been exceeded. In this BO we use several surrogates to determine the extent of the effects of the anticipated incidental take: 1) operational stream flows seasonally discharged from the new Flower Creek Dam, 2) stream temperature change from pre-project conditions to post-project conditions in the action area during baseflow conditions, 3) the duration and amount of the reservoir drawdown, and 4) the location and extent of the construction activities (i.e., area affected by all the construction activities at the construction site) and the location of the physical structure of the new Flower Creek Dam (i.e., footprint).

Incidental take of bull trout is anticipated to occur within the action area of the project. The biological assessment (USDA RD BA 2013) suggests that 9.1 cfs is sufficient to maintain the pre-project habitat conditions during low flow or base flow conditions. Therefore, incidental take of bull trout is anticipated to occur should in-stream flows discharged from Flower Creek

Dam fall appreciably below 9.1 cfs (1.0 cfs or more or the natural reservoir inflow in Flower Creek upstream of the Reservoir) at some point during the operational life of the project.

The BA indicates that operations of the new dam will maintain a low-level outlet release of flows similar to the old dam, and therefore an average daily maximum stream temperature increase is not expected after the new dam begins routine operations. Consequently, it is expected that the pre-project baseline stream temperature regime (similar to water temperatures recorded in Flower Creek upstream or the Reservoir) would be maintained or perhaps improved especially during the low flow period. Incidental take could be exceeded if measured water temperatures in Flower Creek increase from pre-project conditions to post-project conditions during baseflow conditions (July 15 – October 15). If the average daily water temperatures increase during the baseflow condition is 1^0 C or greater at approximate locations as measured in Table 3 of the BA, then incidental take would be exceeded.

To minimize the extent of sediment mobilized by the reservoir drawdown, a gradual lowering of the reservoir elevation of a minimum 14 days or longer is warranted. The proposed action indicates that drawdown would occur over a 2 week period. As shoreline exposure increases during this period, it can be expected that the risk of sediment delivery would increase. Therefore, an extended and carefully controlled drawdown would minimize this risk. Furthermore, stranding and entrainment of fish through the existing Flower Creek Dam would also be minimized by a slow drawdown period and minimize disorientation and movement through the project reach (minimize the risk of take).

Sediment delivery is likely to occur during constructing activities related to de-constructing the old dam, constructing the coffer dam instream, and constructing the new dam in the new location. The incorporation of BMPs during these activities will significantly reduce sediment discharge into Flower Creek; however, BMPs are not 100% effective and cannot completely eliminate fine suspended sediment from entering the stream channel during some or all of these activities. Consequently, we expect that the construction actions (duration, timing, location) and the design configuration of the new dam (size of the new dam footprint and location) would not exceed or deviate in any major way from the description in the BA. A major departure from the project design and associated construction activities, as proposed, may exceed the anticipated incidental take level.

Commitments to monitor the project operations and affected areas of the new dam and reservoir will ensure that the effects of incidental take of bull trout are not exceeded. Annual reporting on these metrics by USDA will be required as per the terms and conditions of this BO. Upon discovery of any departures from these monitoring requirements, at minimum, USDA will be required to contact the Service.

As previously mentioned, the proposed action of replacing the old dam with the new dam 85 feet downstream of the old dam, as well as the existing lower diversion dam, will continue to cause direct take of bull trout through continued blockage of fish passage. Fish attempting to move upstream between the two dams and fish migration from the Kootenai River will encounter an upstream movement barrier created and maintained at these dams. Spawning movements will be altered, spawning may be delayed or abandoned, or spawning will take place in an area not

conducive to successful reproduction (current warm water situation downstream of the diversion dam likely has an adverse effect on spawning and rearing success).

It is currently unknown whether providing fish passage can help recover bull trout in this watershed because little is known about the current population levels, life history forms, distribution, and movement patterns. The greatest biological potential to improve connectivity and provide an opportunity to increase the bull trout population using this watershed, at present, appears to be passage of the migratory fish that ascend Flower Creek from the Kootenai River. Assuming this migration is occurring, providing fish passage at the lower water diversion dam would open access to one mile of good spawning and rearing habitat (assuming cold water temperatures are provided). An investigation of the feasibility of fish passage at the lower diversion dam could help determine these potential benefits.

B. Effect of the take

Through the analysis in this BO, the Service has determined that this level of anticipated take is not likely to result in jeopardy to bull trout and that no critical habitat will be destroyed or adversely modified by this project.

C. Reasonable and prudent measures

The Service has determined the following reasonable and prudent measures are necessary and appropriate to minimize the potential of incidental take of bull trout:

1. Identify and implement means to minimize adverse project effects to bull trout and bull trout habitat that will cause take of bull trout.

2. Monitor activities associated with the proposed action to ensure that all specified project activities comply with the biological assessment and biological opinion and that the specified level of incidental take associated with these elements of the project is not exceeded.

3. Implement reporting requirements as outlined in the terms and conditions below.

D. Terms and conditions

In order to be exempt from the prohibitions of section 9 of the Act, USDA shall require the project proponent (City of Libby) to comply with the following terms and conditions, which implement the reasonable and prudent measures, described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. The following terms and conditions are established to implement reasonable and prudent measure # 1:

    a. USDA shall require the City of Libby to prepare a Flower Creek Dam and Reservoir Operations Plan and submit the Plan to RD, in consultation with the Service, for

approval by January 1, 2015. The approved Plan will then be implemented by the City of Libby for a period of 5 years. At the end of the 5 year period of Operations Plan implementation of the Plan, the City of Libby will make recommendations for any Plan modifications to RD. RD, in consultation with the Service, shall approve a final Operations Plan with any modifications deemed appropriate by July 1, 2021. The City of Libby will operate Flower Creek Dam and Reservoir per the final Operations Plan for the life of the Project.

i. The Flower Creek Dam and Reservoir Operation Plan shall describe how the dam's low level water discharge port will be operated during the July 15 through October 15 time period of every year to maximize cold water releases from the dam.

ii. The Flower Creek Dam and Reservoir Operation Plan shall specifically describe how the dam's low level water discharge port and spillway discharge will be operated, on a year-round basis, in relation to the volume of Flower Creek flows coming into the Reservoir, in relation to downstream water demands at the water diversion dam, and in relation to the volume of flows that pass over the dam spillway.

iii. The Flower Creek Dam and Reservoir Operation Plan shall describe how the dam's low level water discharge port will be operated to maximize low level water releases in relation to the total volume of water passing through or over the dam.

iv. The Flower Creek Dam and Reservoir Operation Plan will describe the mechanical and maintenance support and operational requirements, site visit requirements, and other measures needed to assure cold water releases are maintained during the July 15 through October 15 time period.

b. USDA shall require the City of Libby to comply with and implement all project activities presented in the BA that are intended to minimize the adverse effects to bull trout from stranding and entrainment due to drawdown of Flower Creek Reservoir, and maintenance of the reduced reservoir level during construction.

c. USDA shall require the City of Libby to comply with and implement state-of-the-art Best Management Practices for control of sediment input into Flower related to all construction activities at all project facilities as defined in the proposed action.

d. USDA shall require the City of Libby to prepare a Flower Creek Water Diversion Dam Fish Passage Feasibility Study and submit the Study with recommendations to RD, in consultation with the Service, for approval by January 1, 2015.

i. The Flower Creek Water Diversion Dam Fish Passage Feasibility Study shall address the feasibility of developing alternative upstream fish passage methods for providing seasonal upstream fish passage for bull trout at the dam.

ii. The Feasibility Study shall describe physical requirements needed to modify the dam structure for a fish passage facility (including: directional flow devices, types of fishways appropriate to the low head dam, site specific types of dam or fishway modifications needed, volumes of water needed to operate the fishways, times of year appropriate water volumes are available and times that bull trout migration periods overlap (May – July15), development of jumping or staging pools, etc.).

iii. The Feasibility Study will approximate and present the design, engineering, construction and operational costs associated with at least two alternative fishways.

2. The following terms and conditions are established to implement reasonable and prudent measure # 2:

a. USDA shall require the City of Libby to monitor implementation of the proposed action to ensure that all bull trout related incidental take minimization measures (as outlined in term and condition #1.a. through 1.d.) are fully implemented.

b. USDA shall require the City of Libby to monitor implementation of the proposed cold water release operations for the low level outlet in Flower Creek Dam for a period of 5 years. Monitoring shall be accomplished in consultation with the Service and using water temperature monitoring of Flower Creek water temperatures, at minimum, at a point upstream of Flower Creek Reservoir (upstream of the backwater influence of the reservoir), at a point approximately 100 meters downstream of Flower Creek Dam, and at a point approximately 100 meters downstream of the water diversion dam.

3. The following terms and conditions are established to implement reasonable and prudent measure # 3:

a. Upon locating dead, injured or sick bull trout, or upon observing destruction of redds, notification must be made within 24 hours to the Montana Field Office at 406-449-5225. Record information relative to the date, time, and location of dead or injured bull trout when found, and possible cause of injury or death of each fish and provide this information to the Service.

b. USDA shall require the City of Libby to provide an annual report by March 31 each year for the first 5 years of full operations and thereafter as requested by the Service for the duration of the project's effects (5 years after the new dam is fully operational). At a minimum, the annual report should include any deviations from operations protocol, any new or updated information associated with the project, results of any monitoring activities, and a description of compliance with these term and conditions. Annual updates of the water temperature monitoring will be provided in these annual reports which will be provided annually by the City of Libby to USDA and submitted to the Service by April 30 each year for review of compliance with the terms and

conditions in this BO. At the end of the first 5 years of operation (anticipated to be 2021), a final report regarding the City of Libby's compliance to the agreed to proposed action (the subject of this consultation), including measures listed in this ITS to minimize take of bull trout will be approved by USDA and submitted to the Service by April 30.

c. During project operation USDA shall require the City of Libby to ensure the Service is promptly notified of any emergency or unanticipated situations arising that may be detrimental for bull trout relative to the proposed activity.

These reasonable and prudent measures, with their implementing terms and conditions are designed to minimize incidental take that might otherwise result from the proposed action. With implementation of these measures, the Service expects that the likelihood of take will be minimized. If during the course of the action, the project actions are not adhered to, the level of incidental take in the BO may be exceeded, such incidental take represents new information requiring re-initiation of consultation and review of the reasonable and prudent measures provided. USDA shall require the City of Libby to immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures. This BO will be in effect upon issuance to USDA and for the first 5 years of operation of the new dam at which time it will be reviewed for applicability to any potential changed circumstances in either the proposed action or the status of listed species. This BO will be amended at that time if deemed appropriate or if appropriate will be renewed for another 5 years or longer.

IX. Conservation Recommendations

Section 7(a)(1) of the Act directs 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.

1) USDA and the City of Libby should cooperate with Montana Fish, Wildlife and Parks, the U.S. Forest Service, and other agencies responsible for bull trout management and monitoring by allowing access to the project area for habitat surveys, population inventories, and related monitoring efforts.

2) Upon finalization of the Service's Draft Bull Trout Recovery Plan, USDA and the City of Libby should consider implementation of applicable recovery tasks.

3) Depending on the outcome of the Flower Creek Water Diversion Dam Fish Passage Feasibility Study, we suggest that USDA and the City of Libby consider preparing a Flower Creek Water Diversion Dam Fish Passage Proposal to fully take into account the water diversion purpose and existing diversion dam structure. Furthermore, we recommend that USDA consider the proposal an integral part of the Flower Creek Dam Replacement Project and give full consideration of funding a fish passage facility at this dam, or consider a partnership with other

entities interested in cost-sharing the funding of the facility.

So that the Service is kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

X. Reinitiation Notice

This concludes formal consultation on the actions outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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